

**III B.Tech. Syllabus**

**SYLLABUS III YEAR B.TECH. (CIVIL ENGINEERING)**  
**AUTONOMOUS REGULATIONS 2015**  
**(Effective for the batches admitted in 2015-16 onwards)**



**DEPARTMENT OF CIVIL ENGINEERING**  
**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (A)**  
(Affiliated to AU, Approved by AICTE & Accredited by NBA)  
SANGIVALASA, Bheemunipatnam Mandal, Visakhapatnam District-531162



ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (AUTONOMOUS)  
DEPARTMENT OF CIVIL ENGINEERING

B.TECH. 4 YEAR DEGREE COURSE STRUCTURE

**B.TECH. III Year - I Semester**

Code	Subject	Cat.	Periods				Sessional Marks	End Exam Marks	Total Marks	Credits
			L	T	P	Total				
CIV311	Open Elective-I <sup>#</sup>	OE	3	1	-	4	40	60	100	3
CIV312	Environmental Engineering-II	PC	3	1	-	4	40	60	100	3
CIV313	Reinforced Concrete Structures-I	PC	4	1	-	5	40	60	100	4
CIV314	Structural Analysis – II	PC	3	1	-	4	40	60	100	3
CIV315	Fluid Mechanics-II	PC	4	1	-	5	40	60	100	4
CIV316	Geotechnical Engineering – I	PC	3	1	-	4	40	60	100	3
CIV317	Geotechnical Engineering Lab-I	PC	-	-	3	3	50	50	100	2
CIV318	Environmental Engineering Lab	PC	-	-	3	3	50	50	100	2
CIV319	Fluid Mechanics Lab-II	PC	-	-	3	3	50	50	100	2
CIV3110	Quantitative & Verbal Aptitude -I	HS	4	-	-	4	100	-	100	2
CIV3111	Technical Seminar *	PC	-	-	2	2	50	-	50	2
<b>Total</b>			24	6	11	41	540	510	1050	<b>30</b>

**B.TECH. III Year - II Semester**

Code	Subject	Cat.	Periods				Sessional Marks	End Exam Marks	Total Marks	Credits
			L	T	P	Total				
CIV321	Reinforced Concrete Structures-II	PC	3	1	-	4	40	60	100	3
CIV322	Estimation & Costing	PC	3	1	-	4	40	60	100	3
CIV323	Geotechnical Engineering – II	PC	3	1	-	4	40	60	100	3
CIV324	Transportation Engineering-I	PC	3	1	-	4	40	60	100	3
CIV325	Water Resources Engineering – I	PC	3	1	-	4	40	60	100	3
CIV326	Professional Elective – I	PE	3	-	-	3	40	60	100	3
CIV327	Geotechnical Engineering Lab-II	PC	-	-	3	3	50	50	100	2
CIV328	Computer Applications in Civil Engineering Lab-I	PC	-	-	3	3	50	50	100	2
CIV329	Quantitative & Verbal Aptitude – II	HS	4	-	-	4	100	-	100	2
CIV3210	Soft Skills Lab	HS	-	-	3	3	100	-	100	2
CIV3211	Industrial Training**	PC	-	-	-	-	-	-	-	-
<b>Total</b>			22	5	9	36	540	460	1000	<b>26</b>

*# Student should take minimum ONE Open Elective from either III year I semester or IV year I semester*

*\* To be evaluated continuously through II year -II semester and III year –I semester and results reported with III year –I semester*

*\*\* To be conducted after III year-II semester and evaluated in IV year-I semester*

## ENVIRONMENTAL ENGINEERING – II

**CIV312**

Instruction: 3 Lecture & 1 Tutorial / week

End Exam: 3 hours

**Credits: 3**

Sessional marks: 40

End Exam Marks: 60

### Prerequisites:

Engineering Chemistry; Environmental Engineering – I.

### Course Objectives:

The objective of this course is to:

1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
2. Provide knowledge of characterisation of wastewater generated in a community.
3. Summarize the appurtenance in sewerage systems and their necessity and Impart understanding and need of treatment of sewage.
4. Teach planning, and design of septic tank and Imhoff tank and the disposal methods of the effluent from these low cost treatment systems and realise the importance of regulations in the disposal of effluents in rivers.

### Course Outcomes:

At the end of this course, the students will be able to:

1. Identify Sources of wastewater generation and Estimate the Quantity of wastewater generated
2. Design the sewer and Storm water drain catering to the wastewater generated and analyse for various characteristics of sewage
3. Design the components of Primary treatment of wastewater
4. Design the biological components of wastewater treatment
5. Analyze and Identify the critical point of pollution in river for a specific amount of pollutant disposal

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2				2	3								3
	2	3	2	3			2	3								3
	3	3	3	3			3	3	2							3
	4	3	3	3			3	3	2							3
	5	3	3		2		3	3	2							3

## SYLLABUS

### UNIT – I

12Periods

**Introduction to sanitation:** Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – design of sewers

**Sewers and its appurtenances:** types of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers.

## **UNIT – II**

12Periods

**Hydraulics of sewers and storm drains:** Hydraulic Design of Sewers and storm Drains

**Sewage Characteristics:** Decomposition of Sewage. Sewage characteristics – Physical, Chemical and Biological Characteristics and their testing–BOD-first stage BOD exertion-COD-Relative Stability and Population Equivalent.

## **UNIT – III**

12Periods

**Treatment of sewage - Primary treatment:** Screens-grit chambers – grease traps – floatation – sedimentation – design of primary and pretreatment units.

## **UNIT – IV**

12Periods

**Secondary treatment:** Aerobic and anaerobic treatment process-comparison.

**Suspended growth process:** Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, miscellaneous methods, Oxidation ponds, Oxidation ditches, Aerated Lagoons.

**Attached Growth Process:** Trickling Filters-mechanism of impurities removal-classification–filter problems-design and operation- recirculation. RBC’s, Fluidized bed reactors

## **UNIT –V**

12Periods

**Anaerobic Processes:** Septic Tanks and Imhoff tanks -Principles and Design

**Bio-solids (Sludge) management:** Characteristics- thickening – digestion , drying and sludge disposal

**Disposal of sewage:** methods of disposal – disposal into water bodies- Oxygen Sag Curve-disposal on land.

## **TEXT BOOKS**

1. Garg, S.K. (2015), “Environmental Engineering (Vol.II): Sewage disposal and Air Pollution Engineering”, Khanna Publishers, Delhi 33<sup>th</sup> Edition.
2. Modi, P.N. (2010), “Sewage Treatment Disposal and Waste Water Engineering” Standard Book House, Delhi, 4<sup>th</sup> Edition.

## **REFERENCES**

1. Metcalf & Eddy (2002), “Wastewater Engineering: Treatment and Reuse” Tata McGraw-Hill, New Delhi, 4<sup>th</sup> Edition.
2. Raju, B.S.N. (1995), “Water supply and Waste Water Engineering” McGraw-Hill Education, New Delhi.
3. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G, (1985), “Environmental Engineering” McGraw-Hill international edition, New York, 7<sup>th</sup> Edition.

4. BIS 3025 (Part 44): Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Part 44: Biochemical Oxygen Demand (BOD) (First Revision)
5. Relevant NPTEL Courses.

## REINFORCED CONCRETE STRUCTURES - I

**CIV 313**

Instruction : 4 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 4**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Engineering Mechanics; Strength of materials; Structural Analysis - I.

### Course Objectives:

From this course students will learn the following

1. To understand the recommendations of IS: 456-2000
2. To master the concepts of limit state design
3. To learn how to design various types of beams, columns, slabs and footings

### Course Outcomes:

At the end of the course, the students will be able to:

1. Explain the principles of limit state method and design singly reinforced beams, doubly reinforced beams
2. Design flanged sections, understand the concept of shear, torsion, bond and design the beams for shear and torsion.
3. Design one way, two way and continuous slabs
4. Design columns subjected to axial loads.
5. Design isolated square and rectangular footings.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	3					2					3		
	2	3	3	3					2					3		
	3	3	3	3					2					3		
	4	3	3	3					2					3		
	5	3	3	3					2					3		

## SYLLABUS

### UNIT – I

12 Periods

**Design Philosophies** – Working Stress Method, Ultimate Load Method and Limit State Method

**Introduction to Limit State Design:** Concepts of limit state design- Characteristic loads- Characteristic strength -Partial loads and Material Safety factors- Representative stress-Strain curves- Assumptions in limit state design – Stress block parameters – Limiting moment of resistance.

**Singly And Doubly Reinforced Beams:** Limit state analysis and design of singly reinforced, doubly reinforced beams.

**UNIT – II**

12 Periods

**Flanged Sections:** Design of T and L beam sections.**Shear, Torsion and Bond:** Limit state analysis and design of sections for shear and torsion – Concept of bond, anchorage and development length, I.S Code provisions. Design examples in simply supported and continuous beams.**UNIT – III**

16 Periods

**Slabs:** Design of one way slabs – Two way slabs –Continuous slabs using IS coefficients.**UNIT – IV**

12 Periods

**Columns:** Short and Long columns, Minimum eccentricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial bending - Short columns subjected to biaxial bending and P-M interaction diagrams. (Only for Internal Assessment).**UNIT – V**

12 Periods

**Footings:** Introduction: Different types of footings–Design of isolated square and rectangular footings.**TEXT BOOKS**

1. Punmia, B.C., Jain, A.K. and Jain, A. K., “Limit State Design of Reinforced Concrete”, Laxmi Publications (P) Ltd., New Delhi, (16<sup>th</sup> Edition, 2016)
2. Vazirani, V.N., and Ratwani, M.M., “Design of Reinforced Concrete Structures” ,Khanna Publishers., New Delhi,

**REFERENCES**

1. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India Private Limited” , New Delhi, 2009
2. Pillai, S.U., & Devdas Menon, “Reinforced concrete design”, Tata McGraw Hill. New Delhi, (3<sup>rd</sup> Edition, 2009)
3. Jain, A.K., “Reinforced Concrete Design”, Charotor Publications.Anand(Gujarat) (16<sup>th</sup> Edition, 2016)
4. Ramamrutham, S., “Design of Reinforced Concrete Structures”, Dhanpat Rai Publishing Company (P) Ltd. New Dlehi(17<sup>th</sup> Edition, 2016)
5. B.I.S. 456-2000 “Code of practice for Plain and Reinforced Concrete”
6. Other Relevant B.I.S. Codes
7. Relevant NPTEL Courses.



## STRUCTURAL ANALYSIS - II

**CIV 314**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

**Prerequisites:**

Strength of Materials; Structural Analysis-I.

**Course Objectives:**

1. Apply suitable methods for analysing statically indeterminate frames.
2. Apply suitable methods for analysing Trusses.
3. Apply suitable methods for analysing Arches and suspension bridges.

**Course Outcomes:**

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

1. Analyse statically indeterminate Trusses
2. Analyse statically indeterminate frames by using Slope Deflection Method and Moment Distribution Method
3. Analyse statically indeterminate frames by using Kani's Method and Column Analogy Method
4. Analyse Three and Two Hinged arches
5. Analyse Three and Two Hinged Suspension Bridges

**Mapping of course outcomes with program outcomes:**

		PO												PSO				
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO	1	3	3													3		
	2	3	3													3		
	3	3	3													3		
	4	3	3													3		
	5	3	3													3		

### SYLLABUS

**UNIT – I**

12 Periods

**Analysis of statically indeterminate trusses** (having not more than 7 members and 3 supports) containing (a) External redundant supports (b) internal redundant members using (i) Method of consistent deformation (ii) Castigliano's theorem – II.

**UNIT – II**

12 Periods

**Analysis of statically indeterminate frames** (single storey, single bay portal frames only) using (i) Slope-deflection method (ii) Moment distribution method.

**UNIT – III**

12 Periods

**Analysis of statically indeterminate frames** (portal frames with single storey and single bay) using (i) Kani's method, (ii) Column Analogy method.

Analysis of structures for lateral load using portal method and cantilever method. (Only for Internal Assessment)

#### **UNIT – IV**

12 Periods

**Arches:** Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

#### **UNIT – V**

12 Periods

**Suspension bridges:** Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

#### **TEXT BOOKS**

1. Reddy C.S, (2010), "Basic Structural Analysis", Tata McGraw-Hill Education Pvt. Ltd, Third Edition, New Delhi.
2. Prakash Rao D.S, (1996), "Basic Structural Analysis", Universities Press, New Delhi.

#### **REFERENCES**

1. Wang C.K, (1982), "Statically indeterminate structures", Tata McGraw-Hill Education Pvt. Ltd.
2. Hibbeler R.C, (2012), "Structural Analysis,6e", Pearson Education, 8<sup>th</sup> Edition.
3. Bhavikatti S.S, (Vol II -, 2013), "Structural Analysis – II", Vikas Publishing House, 4<sup>th</sup> Edition.
4. Jindal R.L, (1980), "Indeterminate Structures", S. Chand Publishers, 3<sup>rd</sup> Edition.
5. Relevant NPTEL Courses.

## FLUID MECHANICS - II

**CIV 315**

Instruction : 4 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 4**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Engineering Mechanics; Fluid Mechanics - I

### Course objectives:

1. To understand the design philosophy of turbines and pumps
2. To understand the fundamental concept for methods of dimensional analysis
3. To know the design used for supplying water and generating power

### Course outcomes:

At the end of the course, the students will be able to:

1. Apply the principles of dimensional analysis and explain the boundary layer theory.
2. Determine forces on submerged bodies and apply Impulse momentum equation to determine Impact of jet.
3. Analyse various types of Turbines and their performance characteristics.
4. Analyse various types of Pumps and their performance characteristics.
5. Determine discharge and design most economical channel section for uniform flow in open channels

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3													3
	2	3	3													3
	3	3	3													3
	4	3	3													3
	5	3	3													3

## SYLLABUS

### UNIT – I

14 Periods

**Dimensional Analysis and Similitude:** Dimensional Homogeneity - Methods of Dimensional Analysis – Rayleigh’s Method – Buckingham’s  $\pi$  theorem – Superfluous and Omitted Variables - Similitude – Model Analysis – Dimensionless numbers – Similarity Laws – Model testing of partially submerged bodies – Types of models.

**Boundary Layer Theory:** Introduction – characteristics of laminar boundary layer – boundary layer growth over a flat plate (without pressure gradient) – Boundary thicknesses – Stability parameter – Turbulent boundary layer – boundary layer separation – Boundary layer on rough surfaces – laminar sublayer.

## UNIT – II

14 Periods

**Flow past submerged bodies:** Introduction – Types of Drag – Drag on a sphere – Drag on a cylinder – Von Karman Vortex Trail – Drag on a flat plate – Development of Lift on immersed circular cylinder – Magnus effect.

**Impact of Jets:** Impulse momentum equation – Momentum Correction factor, Force on Stationary flat plate – moving flat plate - Force on Stationary curved vanes – moving curved vanes.

## UNIT – III

14 Periods

**Hydraulic Turbines:** Introduction - Classification based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbine, Choice of Type of Turbine, Component Parts & Working principle of a Pelton Turbine, Francis Turbine - Velocity Triangles - Hydraulic and Overall efficiencies.

**Performance of turbines:** Performance under Unit head, power and speed – Performance under specific conditions - Specific Speed and its importance. Performance Characteristic Curves – Operating Characteristic Curves – Cavitation - Draft Tube.

## UNIT – IV

18 Periods

**Centrifugal Pumps:** Types of Pumps – Selection Criterion – Comparison between Centrifugal & Reciprocating Pumps - Centrifugal Pumps – Component Parts & Working Principle – Classification of Centrifugal pumps - Cavitation – Maximum Suction lift – NPSH. Specific Speed of pumps – Performance Characteristics of Centrifugal Pumps – Dimensionless characteristics – Constant efficiency curves of Centrifugal Pumps

**Reciprocating Pumps:** Component Parts – Working Principle of single acting and double acting reciprocating pumps – Discharge Co-efficient, Volumetric efficiency and Slip. Work done and Power Input – Indicator Diagram, Effect of acceleration and friction on Indicator Diagram - Air Vessels.

## UNIT – V

15 Periods

**Flow through Open Channels:** Classification of open channels, Uniform Flow: Chezy's and Manning's formula, Hydraulic mean depth, hydraulic radius. Most economical trapezoidal and rectangular channel section – Specific energy, Critical Flow.

Steady Rapidly Varied Flow: Hydraulic Jump in a horizontal rectangular channel, Specific force Computation of energy loss.

## TEXT BOOKS

1. Modi, P.N. & Seth, S.M. (2009), “Fluid Mechanics and Hydraulic Machinery”, Standard Book House, New Delhi, 19<sup>th</sup> Edition.
2. Jain, A.K. (2008), “Fluid Mechanics”, Khanna Publishers, New Delhi, 4<sup>th</sup> Edition.

## REFERENCES

1. Kumar, K.L., Chand, S. & Co. (2008), “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd, New Delhi, 8<sup>th</sup> Edition.
2. Subramanya, K. (2008), “Flow in Open Channels”, McGraw Hill Education, New Delhi, 3<sup>rd</sup> Edition.
3. Chow, V.T. (2009), “Open-Channel Hydraulics”, The Blackburn Press, Caldwell, NJ USA, 1<sup>st</sup> Edition
4. White, F. M. (2011) “Fluid Mechanics”, Tata McGraw Hill Publication, New Delhi, 7<sup>th</sup> Edition.
5. Relevant NPTEL Courses.

## GEOTECHNICAL ENGINEERING - I

**CIV 316**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Engineering Mechanics; Engineering Geology.

### Course Objectives:

The main objective of the course is to impart basics of soil mechanics to the student

1. To identify and classify soils based on index properties.
2. To determine the stresses in soils with and without flow of water through them.
3. To use methods for effective compaction of soils for construction of embankments and earth dams.
4. To determine the magnitude and duration of settlement of buildings in clayey deposits.

### Course outcomes:

By the end of the course, student will be able to:

1. Determine the physical characteristics of soils from the given data by solving the phase diagram problems.
2. Determine the gradation characteristics and index properties of soil from the given data and classify soils based on I.S.1498-1970 and evaluate their relative suitability for construction.
3. a) Analyse the soil mass for total and effective stresses due to self-weight and foundation loads using Boussinesq and Westergaard theories, identifying their applicability and limitations; b) Determine the permeability of soil from laboratory test data, identifying the applicability and limitations of these tests and determine the average permeability of a stratified soil deposit
4. a) Analyse a quick condition in a saturated soil mass and derive the equation for critical hydraulic gradient; b) Determine the compaction characteristics using relevant laboratory test data and evaluate the borrow sites to identify most economical site; explain the methods of quality control during compaction of a subgrade/embankment.
5. Analyse the saturated clay deposit to estimate the magnitude and duration of settlements due to foundation loads

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3														
	2	3					3									2
	3	3	2													2
	4	3							2							3
	5	3	2						2							3

## SYLLABUS

### UNIT - I

12 Periods

**Introduction:** Origin and Formation of soils; Residual and Transported soils.

**Physical Properties of Soil:** Three phase system - phase diagram - physical properties-Functional Relationships between physical properties-determination of water content, specific gravity, In-situ density-Relative density and its determination.

### UNIT - II

12 Periods

**Plasticity Characteristics of soil:** Atterberg's limits and their determination-liquid limit, plastic limit, shrinkage limit and index properties-Activity-Free swell index-Free swell ratio-Swell potential.

**Soil Classification:** Soil classification-need and criteria for soil classification-IS Particle size classification-Classification tests-grain size analysis, sedimentation analysis-hydrometer analysis- grain size distribution curves. Unified Soil Classification-AASHTO Classification-Group Index- Indian Standard Soil classification- Coarse grained soils- Fine grained soils-Plasticity chart.

### UNIT - III

12 Periods

**Stress Distribution:** Stresses due to self weight-total, neutral and effective stresses- Vertical stress due to applied loads- Boussinesq theory- Concentrated load-Strip footing-below centre of circular footing- Rectangular footing-Newmark's influence chart - Pressure bulb-Significant depth- Westergaard theory - 2:1 distribution method

**Permeability:** types of soil water, Permeability-Darcy's law-Factors effecting permeability-laboratory tests-Average permeability of stratified soils.

### UNIT - IV

12 Periods

**Seepage Analysis:** Seepage pressure-quick sand condition-critical hydraulic gradient-flow nets, properties-uses of flow nets.

**Compaction:** Principle of compaction, OMC and MDD, Lab tests-IS light weight and heavy weight compaction tests, factors effecting compaction., zero air void line-effect of compaction on engineering properties of soil, field compaction-compaction equipment based on soils, relative compaction, field tests for compaction control.

### UNIT - V

12 Periods

**Consolidation:** Definition and significance-mechanism-Terzaghi's soil-spring analogy -lab consolidation test- $e$ - $\log p$  curve-Coefficient of compressibility-coefficient of volume change-compression index-determination of consolidation settlement - Terzaghi 1D theory-time settlement calculations. Determination of coefficient of consolidation-time fitting methods-Rectangular hyperbola method- Preconsolidation pressure-normally consolidated and over consolidated clay-Over consolidation Ratio - secondary consolidation.

## **TEXTBOOKS**

1. Narasinga Rao, B.N.D.(2015), Soil Mechanics and Foundation Engineering, Wiley Publishers
2. Arora, K.R. (2001), “Soil Mechanics and Foundation Engineering”, Standard Publishers, Delhi.

## **REFERENCES**

1. Murthy, V.N.S. (2009), “A text book of Soil Mechanics and Foundation Engineering”, UBS Publishers Distributors Ltd., New Delhi.
2. Punmia, B.C. (1995) “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi.
3. Braja M. Das, (2005), “Fundamentals of Geotechnical Engineering”, Thomson Asia Pvt. Ltd., Singapore.
4. Craig, R.F. (2014), “Soil Mechanics”, McGraw hill, New Delhi
5. Gopal Ranjan and Rao,A.S.R. (2007), “Basic and Applied Soil Mechanics”, New age International (P) Ltd, New Delhi.
6. Relevant NPTEL Courses.



## GEOTECHNICAL ENGINEERING LAB - I

**CIV 317**

Instruction : 3 Practicals / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 50

End Exam Marks : 50

### Prerequisites:

Geotechnical Engineering-I (Basics)

### Course Objectives:

To enable a student to determine the various index and engineering properties of a soil by experimentation and classify soils.

### Course outcomes:

By the end of the course, student will be able to:

1. Determine the specific gravity and gradation characteristics of the given sample of coarse grained soil and classify the soil as per I.S.1498-1970
2. Determine the specific gravity and consistency limits of the given sample of fine grained soil and classify the soil as per I.S.1498-1970
3. Determine the in-situ density, permeability and compaction characteristics of the given sample of soil using relevant laboratory test.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2		2		2		1	2	2				2	
	2	3	2		2		2		1	2	2				2	
	3	3	2		2		2		1	2	2				2	

## SYLLABUS

### LIST OF EXPERIMENTS

1. Determination of hygroscopic water content and specific gravity of soils
2. Grain size distribution - Sieve analysis
3. Hydrometer Analysis
4. Determination of Liquid and Plastic limits (Casagrande method)
5. Determination of Liquid limit ( Cone Method)
6. Determination of Shrinkage limit of soil
7. Determination of Optimum moisture content and Maximum dry density (Standard Proctor's)
8. Determination of Permeability by Constant head method
9. Determination of in-situ density by sand replacement method
10. Determination of in-situ density by core cutter method.

### Demonstration experiments

11. Consolidation test
12. Permeability by Variable head method

### **TEXTBOOKS**

1. Narasinga Rao, B.N.D.(2015), “Soil Mechanics and Foundation Engineering”, Wiley Publishers
2. Arora, K.R. (2001), “Soil Mechanics and Foundation Engineering”, Standard Publishers, Delhi – 110 006.

### **REFERENCES**

1. Punmia, B.C. (1995), “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi.
2. SP 36: Part 1: 1987 Compendium of Indian standards on soil engineering, Part 1: Laboratory testing of soils for civil engineering purposes, Bureau of Indian Standards, New Delhi
3. Other Relevant I.S. Codes
4. Relevant NPTEL Courses.

## ENVIRONMENTAL ENGINEERING LAB

**CIV 318**

Instruction : 3 Practical's / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 50

End Exam Marks : 50

### Prerequisites:

Engineering Chemistry; Environmental Engineering – I.

### Course Objectives:

The course will address the following:

1. Estimation some important characteristics of water and wastewater in the laboratory.
2. It also gives the significance of the characteristics of the water and wastewater.

### Course Outcomes:

At the end, the students will be able to:

1. Determine Physico-chemical characteristics of water
2. Analyse the given water sample to determine the optimum coagulant dosage
3. Test and Decide whether the water sample is safe for drinking purpose according to IS 10500:2012
4. Estimate the strength of the sewage in terms of DO, BOD and COD

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		2		3	2	2	3	3					3
	2	3	3		2		3			3	3					3
	3	3	3		2		3	2	2	3	3					3
	4	3	3		2		3			3	3					3

## SYLLABUS

### LIST OF EXPERIMENTS:

1. Determination of pH and Electrical Conductivity of Water.
2. Determination of turbidity in water.
3. Determination of Optimum coagulant dose.
4. Determination and Estimation of total solids, organic solids and inorganic solids and settle able solids by Imhoff Cone.
5. Determination and estimation of Total Hardness–Calcium & Magnesium.
6. Estimation of Acidity in water
7. Estimation of Alkalinity in water
8. Determination of Available and Residual Chlorine content in water
9. Determination of Dissolved Oxygen by Wrinklers Method.

10. Determination of Biological Oxygen Demand by Winklers Method
11. Estimation of Iron content in water.
12. Estimation of chloride content in water
13. Estimation of fluoride content in water.
14. Determination of C.O.D.

## **REFERENCES**

1. Garg S. K. (2001), “Environmental Engineering Vol. I”, Khanna Publications, New Delhi, 5<sup>th</sup> Edition.
2. Sawyer, C.N., McCarty, P.L., and Parkin, G.F. (2000), “Chemistry for Environmental Engineering”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 4<sup>th</sup> Edition.
3. BIS 10500- 1991, Indian Standard DRINKING WATER – SPECIFICATION (Second Revision).
4. BIS 3025 (Part 44): Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Part 44: Biochemical Oxygen Demand (BOD) (First Revision)
5. Relevant NPTEL Courses.

## FLUID MECHANICS LAB - II

**CIV 319**

Instruction : 3 Practicals / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 50

End Exam Marks : 50

### Prerequisites:

Fluid Mechanics – I & II.

### Course Objectives:

The objective of the course is to enable the student to calibrate different types of flow measuring devices to measure flow in tanks, pipes and open channels.

### Course Outcomes:

At the end of this course student will be able to

1. Determine various losses in pipes
2. Compute coefficient of impact of jet on flat and hemispherical vanes
3. Analyse performance characteristics of Pumps and turbine
4. Determine Chezy's Constant and Manning's Coefficient in open channel

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		2					3	3					3
	2	3	3		2					3	3					3
	3	3	3		2					3	3					3
	4	3	3		2					3	3					3

## SYLLABUS

### LIST OF EXPERIMENTS:

1. To Study major losses in pipes – Pipe friction – To compute Darcy- Weisbach friction factor.
2. To Study performance characteristics of centrifugal pump
3. To Study performance characteristics of reciprocating pump
4. To Study constant head characteristic curves of Pelton turbine
5. To Study performance characteristics of Francis turbine
6. To compute coefficient of impact of jet on flat and hemispherical vanes
7. To compute Chezy's Constant and Manning's Coefficient of an open channel.
8. To compute energy loss in a hydraulic jump.

### REFERENCES

1. Modi, P.N. & Seth, S.M. (2009), "Fluid Mechanics and Hydraulic Machinery", Standard Book House, New Delhi, 19<sup>th</sup> Edition.
2. Jain, A.K. (2008), "Fluid Mechanics", Khanna Publishers, New Delhi, 4<sup>th</sup> Edition.
3. Relevant NPTEL Courses.

## QUANTITATIVE & VERBAL APTITUDE – I

**CIV 3110**

Instruction : 4 Periods / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 100

End Exam Marks : -

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### **Course objectives:**

#### **Quantitative Aptitude -I**

1. To prepare the students on various principles related to numerical computations.
2. To explain concepts related to numerical estimation.
3. To illustrate and explain the fundamentals related to geometry and mensuration.

#### **Verbal Aptitude-I:**

1. To categorize and explain principles of grammar in order to minimize errors in English.
2. To list and quote high frequency words by giving relevant examples.
3. To categorize, apply and use data as per the requirement.
4. To construct and make use of idioms, phrasal verbs and other expressions used in professional contexts.
5. To critically evaluate reading material for better comprehension

### **Course Outcomes:**

#### **Quantitative Aptitude –I**

The student will be able to

1. Solve problems related to numerical computations in company specific and other competitive tests.
2. Able to recall and use the concepts to solve problems numerical estimation with respect to company specific and competitive tests.
3. Apply basic principles related to geometry and mensuration & solve questions in company specific and competitive tests.

#### **Verbal Aptitude-I**

The student will be able to

1. Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
2. Answer questions on synonyms, antonyms, hyponyms, hypernyms and other vocabulary based exercises while attempting company specific and other competitive tests.
3. Use their logical thinking ability and solve questions related to reasoning based exercises.
4. Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
5. Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences.

**Mapping of Course Outcomes with Program outcomes:**

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
QA	1	3	2						1	1			1	1	
	2	3	2						1	1			1	1	
	3	3	2						1	1			1	1	
VA	4	2	1						2	3			1	3	
	5	1							2	3			1	3	
	6	1	2						2	3			1	3	
	7	1							2	3			1	3	
	8	1	2						2	3			1	3	

**SYLLABUS**

**Section –A (Quantitative Aptitude –I)**

**UNIT I** **6 Periods**

**Numerical computation:**

Applications based on Numbers, Chain Rule, Ratio Proportion

**UNIT II** **6 Periods**

**Numerical estimation - I**

**Applications Based on** Time and work, Time and Distance

**UNIT III** **4 Periods**

**Numerical estimation – II**

Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest

Partnerships, Shares and dividends

**UNIT IV** **4 Periods**

**Data interpretation**

Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams

**UNIT V** **4 Periods**

Application to industry in Geometry and Mensuration

**Books for practice**

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications

**References**

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)

2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta Asisha Arihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
8. Elementary and Higher algebra by HS Hall and SR knight.

**Websites:**

1. [www.m4maths.com](http://www.m4maths.com)
2. [www.Indiabix.com](http://www.Indiabix.com)
3. 800score
4. Official GRE site
5. Official GMAT site

**Section –B (Verbal Aptitude –I)**

**UNIT I**

**7 Periods**

**Grammar:**

Parts of speech( with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement ( to differentiate between number and person) , clauses (use of the appropriate clause , conditional clauses), phrases(use of the phrases, phrasal verbs), degrees of comparison(comparing apples and oranges, comparison and number), modifiers(misplaced and dangling modifiers, absence of modifiers), determiners, parallelism in structure(symmetry in two part sentences), word order, subjunctive mood, redundancy, special types of sentences, miscellaneous types, identifying errors in a given sentence, correcting errors in sentences.

**UNIT II**

**4 Periods**

**Vocabulary:**

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants (with emphasis on high frequency words), homonyms, hyponyms, hypernyms and General idioms.

**UNIT III**

**5 Periods**

**Reasoning:**

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), to use logical reasoning and eliminate the unrelated word from a group.



## UNIT IV

4 Periods

### Usage:

Sentence completion (with emphasis on signpost words and structure of a sentence), contextual meanings (to use the appropriate word according to the situation), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), punctuation depending on the meaning of the sentence, run on errors, sentence fragments, comma splices.

## UNIT V

4 Periods

### Reading Comprehension:

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author's intention of writing a passage), strategies for quick and active reading (importance given to skimming, scanning), summarizing, reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

### Books for Practice

1. Practical English Grammar A. J. Thomson, A. V. Martinet by Oxford University press
2. Remedial English Grammar for Foreign Students by FT wood published by Macmillan *Publishers*
3. Objective English-Edgar Torpe, Showick Thorpe-Pearson Education
4. Cambridge and Oxford Dictionaries

### Reference Books and websites:

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications Pvt.Ltd.)
2. Websites: Indiabix, 800 score, official CAT, GRE and GMAT sites
3. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
4. Collins Cobuild English Grammar by Goyal Publishers
5. Word Power Made Easy by Norman Lewis-Goyal Publishers

## TECHNICAL SEMINAR

**CIV 3111**

Instruction : 2 Practical / week

End Exam : -

**Credits : 2**

Sessional Marks : 50

End Exam Marks : -

### Prerequisites:

Basic Communication Skills; Basics in Civil Engineering.

### Course Objectives:

The objective of this course is

1. To enhance the communication skills of the students through participation and giving seminars.
2. To develop an overview of civil engineering and its applications in the students.
3. To promote teamwork and lifelong learning among the students.

### Course Outcomes:

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

1. To impart skills in preparing detailed presentation describing the topic and results
2. To effectively communicate by making an oral presentation before an evaluation committee
3. To demonstrate the ability to work as an individual and in a team effectively to achieve the task

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3			3	3				3	3		3	3	3	3
	2	3			3					3	3		3	3	3	3
	3	3			3					3	3		3	3	3	3

### OUTLINE OF SYLLABUS

Students have to prepare a report on a case study, design or practical application in civil engineering and make a presentation in teams of maximum 2 students. Duration of each seminar shall be 20 minutes per team including discussion. Evaluation to be done by a Panel of Examiners nominated by HoD with at least one faculty member of specialization related to the seminar topic.

### REFERENCES

1. National & International Journals / Standard Magazines / Reports / Case Studies in civil engineering.
2. NPTEL courses in civil engineering.
3. World Wide Web resources on state of the art in civil engineering.

## REINFORCED CONCRETE STRUCTURES - II

**CIV 321**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Reinforced Concrete Structures – I

### Course Objectives:

From this course students will learn the following

1. To learn how to design various types of staircase.
2. To learn design of retaining walls.
3. To learn design of piles and pile caps
4. To learn the basic concepts of prestressed concrete.

### Course Outcomes:

At the end of the course, the students will be able to:

1. Design and draw the reinforcement detailing of staircase.
2. Design and draw the reinforcement detailing of cantilever retaining wall.
3. Design and draw the reinforcement detailing of counterfort retaining wall.
4. Design and draw the reinforcement detailing of pile and pile caps.
5. Explain the basic concepts of pre-stressed concrete, know the different prestressing systems, analyse the prestressed concrete members and determine the losses in prestressing.

### Mapping of course outcomes with program outcomes:

		PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO	1	3	3	3			3		2						3		
	2	3	3	3			3		2						3		
	3	3	3	3			3		2						3		
	4	3	3	3			3		2						3		
	5	3	3	3			3								3		

## SYLLABUS

### UNIT – I

12 Periods

**Staircase:** Introduction - Classification of staircase - Design of dog-legged staircase - design of open well staircase with quarter span landing

### UNIT – II

12 Periods

**Retaining Walls:** Types of retaining walls - forces on retaining walls - active and passive earth pressure, stability requirements.

**Cantilever Retaining Wall:** Preliminary proportioning of cantilever retaining walls. Design of cantilever retaining wall - with horizontal back fill – with horizontal back fill and traffic load – with sloping back fill.

**UNIT – III**

12 Periods

**Counterfort Retaining Wall:** Preliminary proportioning of counterfort retaining walls. Design of counterfort retaining wall.

**UNIT – IV**

12 Periods

**Piles and Pile caps:** Classification of piles - Design of bored cast in situ piles, Pile Caps design for three or four piles.

**UNIT – V**

12 Periods

**Prestressed Concrete:** Introduction - Reinforced Concrete versus Prestressed Concrete - Use of high strength concrete and high tensile steel - Prestressing Systems (Freyssinet, Gifford Udall, Magnel Blaton) - Analysis of simple prestressed rectangular sections (Concentric tendon, Eccentric tendon, Parabolic tendon, Bent tendon ) - Prestressing Losses

**TEXT BOOKS**

1. Punmia, B.C., Ashok Kumar Jain, and Arun Kumar Jain, (2016), “Limit State Design of Reinforced Concrete” Laxmi Publications (P) Ltd., New Delhi, 16<sup>th</sup> Edition.
2. Varghese, P.C., (2009) “Advanced Design of Reinforced Concrete Design”, Prentice Hall of India Private Limited, New Delhi.
3. Krishnam Raju, N., “Prestressed Concrete”, Tata McGraw Hill, New Delhi, 5<sup>th</sup> Edition.

**REFERENCES**

1. Pillai, S.U., & Devdas Menon, (2009), “Reinforced concrete design”, Tata McGraw Hill, New Delhi, 3<sup>rd</sup> Edition.
2. Jain, A.K., (2016) “Reinforced Concrete Design”, Charotar Publications Anand, Gujarat, 16<sup>th</sup> Edition.
3. I.S 456 – 2000 “Code of practice for Plain and Reinforced Concrete” 4<sup>th</sup> Revision, Bureau of Indian Standards, New Delhi, April 2007
4. Relevant I.S. Codes.
5. Relevant NPTEL Courses.

## ESTIMATION & COSTING

**CIV 322**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

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**Prerequisites:**

Civil Engineering Materials; Building Technology; Building Planning and Design.

**Course Objectives:**

1. To understand the types of estimates
2. To understand rate analysis and process of preparation of bills
3. To study about the specification writing
4. To understand the valuation of land and buildings

**Course outcomes:**

By the end of the course, student will be able to:

1. Explain various methods of estimation
2. Paraphrase the specifications for buildings
3. Calculate rate analysis for all works related to civil engineering projects
4. Carry out detailed estimation of load bearing and framed buildings
5. Perform detailed estimation for steel in R.C.C items and their bar bending schedule.

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1												3		
	2	3												3		
	3	3	3				3					2		3		
	4	3	3				3							3		
	5	3	3				3							3		

### SYLLABUS

**UNIT – I**

12 Periods

**Introduction:** Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

**UNIT – II**

12 Periods

**Specifications:** Specifications for framed buildings: Meaning, purpose, types of specifications, Method of preparation of specification, general specification, detailed specifications of different items of framed buildings and other structures.

### UNIT – III

12 Periods

**Rate analysis:** Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings .

### UNIT – IV

12 Periods

**Estimation:** Estimation of load bearing structures by Long wall - short wall method and Centre line method.

Detailed estimate of framed buildings - Estimation of Different items of works in substructure, Earthwork, P.C.C, Foundation Concrete, D.P.C in R.C.C building- Single Bedroom, Double Bed Room and Triple bedroom with partition walls and verandah.

### UNIT – V

12 Periods

**Estimation of Superstructure:** Estimation of various items of R.C.C building works in superstructure: Super structure walls and columns, slab beams, plinth beam, columns, Deductions, Plastering and White Washing and Color Washing, Sloped Roof Buildings; G.I. and A.C. Sheet, Electricity and water supply. Sanitation works etc

Estimation of Prefabricated structures.

### TEXT BOOKS

1. Datta, B.N. (1998), “Estimating and costing”, Charator Publishing House.
2. Chakraborti, M. (2001),” Estimating Costing”, Specification and Valuation in Civil Engineering.

### REFERENCES

1. Birdie .G.S. (2000), “A Text Book on Estimating and Costing”, Dhanpat Rai and Sons, New Delhi.
2. Vajarani, V.N. (1997), “Estimating and costing”, Khanna Publishers.
3. Bhasin, P.L. (2000), “Quantity Surveying”, 2<sup>nd</sup> Edition, S. Chand & Co.
4. Relevant NPTEL Courses.

## GEOTECHNICAL ENGINEERING – II

**CIV 323**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

**Prerequisite:**

Engineering Mechanics; Geotechnical Engineering – I.

**Course Objectives:**

The main objective of the course is to impart principles of geotechnical engineering to the student

1. To determine shear strength parameters using suitable laboratory test data and explore, analyze and interpret site soil characteristics.
2. To determine the lateral earth pressure using earth pressure theories and estimate the factor of safety of an earth slope.
3. To estimate safe bearing capacity/load capacity of a shallow foundation /pile foundation to facilitate their design.

**Course outcomes:**

By the end of the course, student will be able to:

1. Determine the shear parameters from the given laboratory shear test data; select appropriate test based on in-situ soil and drainage conditions with suitable justification; Outline measures to address problems of liquefaction and sensitivity.
2. Select suitable method of soil exploration with justification; examine the suitability of a sampler based on its design features; illustrate the contents of a good geotechnical investigation report.
3. Determine the lateral earth pressure for the given backfill conditions using the Rankine or Coulomb’s theory and outline the applicability and limitations of the methods.
4. Estimate the safe bearing capacity and settlement of soil with given properties for a shallow footing using the Terzaghi or Meyerhof’s theory and I.S.Code method, outline the suitability of the methods with justification.
5. a) Determine the load capacity of pile / pile group using static or dynamic formulae / pile load test data; and analyse their settlement. b) Estimate the factor of safety of an earth slope using Swedish circle, Bishop or friction circle method or from the Taylor’s stability charts

**Mapping of course outcomes with program outcomes:**

		PO												PSO				
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO	1	3	2				2										2	
	2	3			2		2										3	
	3	3	2														2	
	4	3	2				2		2								3	
	5	3	2				2		2								3	

### SYLLABUS

**UNIT – I**

12 Periods

**Shear Strength:** Introduction-Principal stresses and principal planes- Mohr's circle of stress– Mohr-Coloumb failure theory – Laboratory shear tests – Direct shear test – Triaxial compression test– Unconfined compression test – Vane shear test – Shear strength of saturated cohesive soils – Sensitivity and Thixotropy - Shear strength of cohesionless soils - liquefaction.

## **UNIT – II**

**10 Periods**

**Subsurface Exploration:** Introduction – Planning and stages in sub-surface exploration – Methods of exploration – Test pit – Trenches – Geophysical methods: Seismic refraction and Electrical resistivity method – Boring : Auger boring, Wash boring and Rotary drilling – Types of soil sample: disturbed and undisturbed soil samples – Design Features of soil sampler affecting soil disturbance – standard penetration test – static and dynamic cone penetration test – bore log report.

## **UNIT - III**

**12 Periods**

**Lateral Earth Pressure** – Types of Lateral earth pressure - Rankine's theory - Active and passive earth pressure for cohesion less and cohesive soils - Earth pressure at rest - Coloumb's wedge theory - Rebhan's and Culmann's graphical solutions – Wall friction.

## **UNIT – IV**

**12 Periods**

**Bearing capacity of Shallow footings-** definition –Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's theory, types of shear failure - Effect of water table, shape of footing, eccentricity of load on bearing capacity- Meyerhof's theory- Skempton's theory- Vesic's theory- I.S.6403 method - Bearing capacity from SPT & SCPT- Allowable Bearing pressure-Causes and methods of minimizing settlement-Plate load test - Permissible Settlements - Differential Settlement.

## **UNIT – V**

**14 Periods**

**Pile Foundations:** Introduction- Classification of piles- Load Transfer mechanism-load carrying capacity of pile - static and dynamic formula - pile load test - penetration test - pile groups - Efficiency - Feld's rule - Converse Lebarre formula, Settlement of piles and pile groups - Negative skin friction.

**Stability of Slopes:** Types of Slopes –types of slope failure– Factor of safety- Procedure for Swedish circle method and method of slices- Bishop's Simplified method of slices-Friction circle method-Taylor's stability number.

## **TEXT BOOKS**

1. Narasinga Rao, B.N.D.(2015), Soil Mechanics and Foundation Engineering, Wiley Publishers
2. Arora, K.R. (2001), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi – 110 006.

## **REFERENCES**

1. Gopal Ranjan and Rao, A.S.R. (2007), "Basic and Applied Soil Mechanics", New age International (P) Ltd.



2. Murthy, V.N.S. (1999), “A text book of Soil Mechanics and Foundation Engineering”, UBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Gopal Ranjan and Rao A.S.R. (2002), “Basic and Applied Soil Mechanics”, New Age International (P) Limited, New Delhi.
4. Punmia, B.C., (1995), “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi.
5. Swami Saran (1998), “Analysis and Design of sub structures”, Limit State Design, Oxford & IBH Publishing Co. Pvt Ltd., New Delhi.
6. Braja M. Das, (2005), “Principles of Foundation Engineering”, Thomson Asia Pvt. Ltd., Singapore.
7. I.S. 6403 - 1981 Code of practice for determination of bearing capacity of shallow foundations, Bureau of Indian Standards, New Delhi,
8. I.S. SP 36 Part – II - 1988 Compendium of Indian standards on soil engineering, Part 2: Field testing, Bureau of Indian Standards, New Delhi.
9. Relevant NPTEL Courses.

## TRANSPORTATION ENGINEERING - I

**CIV 324**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Surveying – I & II.

### Course Objectives:

The objective of the course is to prepare the student to

1. To know about the history of highway development, surveys and classification of roads.
2. To study about the pavement materials and design the geometric elements of highways.
3. To know about the construction procedure of various types of pavements and study the pavement maintenance.
4. To study about the traffic characteristics and design of intersections.

### Course Outcomes:

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

1. Estimate the recommended length of road network and carry out Engineering surveys
2. Design cross section elements, sight distance, horizontal and vertical alignment of a highway
3. Design flexible and rigid pavements as per IRC
4. Identify various highway constructions techniques and highway maintenance
5. Design signal time and rotary intersection by analyzing traffic studies.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	3												3
	2	3	3	3			3									3
	3	3	3	3			3		2							3
	4	3					3									3
	5	3	3	3			3									3

## SYLLABUS

### UNIT – I

10 Periods

**Highway development and planning** – History of Roads - Classification of roads, necessity of highway planning surveys preparation of master plan highway planning in India. Classification of roads, Highway alignment - Factors controlling alignment, Engineering surveys, Drawing & report.

## UNIT – II

10 Periods

**Highway Geometric Design** – Design of Cross sectional elements, Sight distance – Stopping Sight Distance & Overtaking Sight Distance, horizontal alignment – Super elevation & Transition Curves, vertical alignment – Summit Curves and Valley Curves.

## UNIT – III

10 Periods

**Pavement Design:** Design Of Highway Pavements Design factors; Design of flexible pavements – IRC method,; Design of Rigid pavements - Westergard's stress equation for wheel loads and temperatures stress.

## UNIT – IV

10 Periods

**Highway construction and maintenance:** Highway materials and their properties and tests - Construction of water bound macadam roads, Bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways; Importance of highway drainage; Requirements; Surface drainage; Sub–surface drainage.

## UNIT – V

10 Periods

**Traffic engineering:** Introduction - Traffic characteristics- Road user, vehicular & travel pattern; Traffic studies (Surveys); Traffic Control devices ; Traffic operation- signal design; Types of intersections; Design of rotary intersection; Street lighting.

## TEXT BOOKS

1. Khanna, S.K. and Justo C.E.G. (2015), “Highway Engineering”, Nem Chand & Bros, ISBN-13: 978-8185240770.
2. Kadiyali, L.R., (2011), “Traffic engineering and Transport planning”, Khanna Publishers, ISBN-13: 978-8174092205.

## REFERENCES

1. Chakroborty, P. and Das, A. (2003), “Principles of Transportation Engineering” Prentice Hall of India, New Delhi, 6<sup>th</sup> Edition.
2. Sharma, R.C. and Sharma, R.K. (2012), “Principles, Practice and Design of Highway Engineering” S Chand & Company, ISBN-10: 8121901316.
3. Relevant NPTEL Courses.

## WATER RESOURCES ENGINEERING - I

**CIV 325**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Engineering Geology; Fluid Mechanics – II.

### Course Objective:

To provide the necessary background for understanding the occurrence and movement of water in hydrosphere and to enable the student to understand Irrigation Engineering Principles and practices.

### Course Outcomes:

By the end of the course, the student will be able to

1. Estimate and Analyse the rainfall in any given area and prepare Intensity-Duration-Frequency curves.
2. Identify hydraulic properties of an aquifer & Estimate specific capacity, efficiency and yield of a well.
3. Determine the capacity of the reservoir and its operating schedules
4. Determine the quantity of water required for a crop by choosing an appropriate method of irrigation.
5. Design of Canal by Lacey's and Kennedy's theory

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3													3
	2	3	3													3
	3	3	3	3												3
	4	3	3	3								2				3
	5	3	3	3												3

## SYLLABUS

### UNIT – I

12 Periods

**Surface Water Hydrology:** Water Resources in India, Hydrology in water Resources Planning – Precipitation – Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, consistency of rainfall record – Double mass curve, Infiltration – Factors affecting and its determination, Evaporation and Evapo – Transpiration. Runoff – factors affecting runoff, methods of determination of runoff, stream gauging, hydrograph analysis, base flow separation, unit hydrograph – Hydrograph of different durations, applications of unit hydrograph, S-hydrograph.

### UNIT – II

12 Periods

**Ground Water Hydrology:** Definitions, sub surface distribution of water, ground water movement, Darcy's law–permeability. Well hydraulics – steady flow in different types of aquifers and wells – determination of hydraulic properties of aquifer, well losses, specific capacity of well, and well efficiency, pumping test and recovery test methods for determination of well yield, Data acquisition by using piezometers.

### UNIT – III

12 Periods

**Reservoir Planning:** Types of reservoir investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, purpose of reservoir, reservoir yield, mass curve and demand curve, determination of reservoir capacity, yield from a reservoir of given capacity, operating schedules, guide curve for reservoir operation, apportionment of total cost of a multipurpose project. Reservoir sedimentation, control of reservoir sedimentation, life of reservoir.

### UNIT – IV

12 Periods

**Irrigation:** Definition of irrigation, types of irrigation systems – direct and indirect, lift and inundation irrigation system, methods of irrigation – surface and sprinkler methods, drip irrigation, Soil moisture constants, depth of water held by soil in root – zone. Water requirements of crops, duty, delta and base period their relationship, crops – seasons, factors affecting duty and methods of improving duty, consumptive use of water – determination of canal capacities for cropping patterns.

### UNIT – V

12 Periods

**Canal Systems:** Classification of irrigation canals – canal alignment, design of unlined canals, regime theories – Kennedy's and Lacey's theories, tractive force method, design problems –balancing depth.

### TEXT BOOKS

1. Punmia, B.C. and Lal Pande B.B. (1992), "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 12th edition.
2. Garg, S.K. (1999), Irrigation Engineering and Hydrology Structures, Khanna Publishers, Delhi, 14<sup>th</sup> Edition.

### REFERENCES

1. Modi, P.N. (2004), "Irrigation, Water Resources and Water Power Engineering", Standard Book House, Delhi, 6<sup>th</sup> Edition.
2. Jayarami Reddy, P. (1999), "A Text book of Hydrology", Laxmi Publication, Delhi.
3. Subramanya, K. (1994), Engineering Hydrology, Tata-Mc Graw Hill Publishing, Delhi, 1<sup>st</sup> Revised Edition.
4. Relevant NPTEL Courses.

**PROFESSIONAL ELECTIVE - I**  
**SOLID WASTE MANAGEMENT**

**CIV 326(A)**

Instruction : 3 Lectures / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

**Prerequisites:**

Environmental Science.

**Course Objectives:**

The course content enables students to:

1. Develop insight into the collection, transfer, and transport of municipal solid waste.
2. Explain the design and operation of a municipal solid waste landfill.
3. Examine the design and operation of a resource recovery facility.

**Course Outcomes:**

At the end of the course students are able to:

1. Analyse the characteristics of solid waste and discuss problems due to improper disposal of solid waste
2. Describe the significance of recycling, reuse and reclamation of solid wastes
3. Summarize various methods of collection, transfer and transport of wastes.
4. Classify various methods of processing and transformation of solid wastes
5. Explain Design aspects and operational problems of Landfill

**Mapping of course outcomes with program outcomes:**

		PO											PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1	3	1	2	-	3	3	2	1	-	1	-	3	3	2
	2	3	3	3	2	3	3	2	1	2	1	2	1	3	2	2
	3	3	2	-	2	2	3	1	2	1	1	3	2	3	3	3
	4	3	-	3	-	-	3	3	3	1	-	3	2	3	2	3

**SYLLABUS**

**UNIT – I**

9 Periods

**Introduction:** Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

**UNIT – II**

9 Periods

**Basic Principles:** Definition of Solid Waste Management - Reduction, reuse, recycling and recovery principles of waste management - Waste generation and handling at source-Functional elements of solid waste management

### UNIT – III

9 Periods

**Collection, Transfer and Transport of Wastes:** Collection of solid wastes- Collection methods and service. Transfer station-Processing and segregation of the solid waste- various methods of material segregation.

### UNIT – IV

9 Periods

**Processing and Transformation of Solid Wastes:** Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration advantages and disadvantages of incineration.

### UNIT – V

9 Periods

**Disposal of Solid Waste:** Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

### TEXT BOOKS

1. George Tchobanoglous, Hilary Theisen and Samuel Vigil (1993), “Integrated Solid Waste Management”, McGraw Hill Publishers, USA, 2<sup>nd</sup> Edition.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. (2013), “Environmental Engineering”, McGraw-Hill, New York, 7<sup>th</sup> Edition.

### REFERENCES

1. Oweis, I.S. and Khera, R.P. (1998), "Geotechnology of Waste Management", PWS Publishing Co., New York, 2<sup>nd</sup> Edition.
2. Bagchi, A. (2004), “Design of Landfills and Integrated Solid Waste Management”, John Wiley & Sons, New Jersey, 3<sup>rd</sup> Edition.
3. Sharma, H. D. and Reddy, K. R. (2004) “Geoenvironmental Engineering”, John Wiley & Sons, New Jersey, 1<sup>st</sup> Edition.
4. Relevant NPTEL Courses.

## ENVIRONMENTAL IMPACT ASSESSMENT

**CIV 326(B)**

Instruction : 3 Lectures / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Environmental Sciences.

### Course objectives:

The objectives of this course is to

1. To study about the basics, methods of assessment and importance of Environmental Impact Assessment.
2. To know about the Environmental Management and Prediction Methods
3. To study about the Environmental Management Plan
4. The broad education necessary to understand the impact of engineering solutions in global economic, environmental and social context

### Course outcomes:

By the end of the course the students will be able to

1. Explain the importance of Environmental Impact Assessment
2. Describe the effect of a activities on various environmental attributes
3. Identify and Analyse Environmental Impacts of projects
4. Evaluate the criteria for selection of method
5. Analyse impact studies and demonstrate control measures

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	2	2	3	2	3	2	-	-	2	1	3	3	2
	2	3	2	3	3	2	3	3	3	-	1	3	2	3	2	2
	3	3	-	3	2	3	3	2	-	-	2	2	2	3	3	3

## SYLLABUS

### UNIT – I

9 Periods

**Introduction:** Introduction to EIA. Definition of E IA and EIS, preparation of EIS, Elements of EIA, Agency Activities, Environmental setting.

### UNIT – II

9 Periods

**Environmental attributes:** Environmental attributes, air, water, soil, ecology, noise Socio-Economic aspects, Culture and human aspects (Human settlements-Rehabilitations)

### UNIT – III

9 Periods



**Environmental impacts:** Identification, measurement, Aggregation, Secondary and Cumulative Impacts.

**UNIT – IV**

9 Periods

**Impact Assessment Methodologies:** Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement.

**UNIT – V**

9 Periods

**Case studies:** Economic impact analysis, energy production impact analysis, cost benefit analysis, Environmental impact mitigation and control measures.

**TEXT BOOKS**

1. Ravi Jain, Urban, L.V., Gary S. Stacey and Harold Balbach (2001), “Environmental Impact Analysis”, McGraw Hill Professional, New York, 2<sup>nd</sup> Edition.
2. Anjaneyulu, Y., Valli Manickam (2011), “Environmental Impact Assessment Methodologies”, B.S. Publication, New Delhi, 2<sup>nd</sup> Edition.

**REFERENCES**

1. Larry W. C. (1996), “Environmental Impact Analysis”, Mc. Graw Hill Publishers, New York, 2<sup>nd</sup> Edition.
2. John Glasson, Riki Therivel and Andrew Chadwick. (2005), “Introduction to Environmental Impact Assessment” Routledge Publication, London, 3<sup>rd</sup> Edition.
3. Relevant NPTEL Courses.

## REPAIR AND REHABILITATION OF STRUCTURES

**CIV 326(C)**

Instruction : 3 Lectures / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Engineering Chemistry; Concrete Technology; Reinforced Concrete Structures I & II.

### Course Objectives:

1. To learn about the non-destructive testing
2. To know the corrosion control techniques in steel
3. To know about crack control techniques in concrete
4. To adopt different strengthening techniques in concrete structures.

### Course outcomes:

By the end of the course, student will be able to:

1. Explain various non-destructive tests to determine structural health
2. Describe miscellaneous non-destructive tests
3. Outline the mechanism of corrosion and its control in steel
4. Identify defects in concrete.
5. Analyse techniques to strengthen reinforced concrete structures.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2	1	1	2	1	-	-	-	1	1	-	3	-	-
	2	3	2	1	1	2	-	-	-	-	1	-	1	3	1	-

## SYLLABUS

### UNIT – I

9 Periods

#### Non-destructive strength test

Techniques to test the existing strength- - Destructive tests- core sampling and testing -Non Destructive tests – rebound hammer test, ultrasonic pulse velocity test, pull out test, penetration techniques, acoustic emission techniques.

### UNIT – II

9 Periods

#### Other non – destructive tests

Chemical test – carbonation and chloride content – Corrosion potential assessment – cover meter survey, half cell potential survey, resistivity measurement

Fire damage assessment – differential thermal analysis – X ray diffraction

Structural integrity/ soundness assessment – radiography, impact echo test, dynamic testing of structures –interpretation and evaluation of test result data

### **UNIT – III**

9 Periods

#### **Corrosion**

Corrosion of reinforcement- Factors affecting corrosion of reinforcement embedded in concrete-Mechanism of electrochemical corrosion-Chloride attack-Carbonation-Corrosion Control.

### **UNIT – IV**

9 Periods

#### **Failures in concrete**

Cracks in concrete-types and causes of concrete cracks-Repair of cracks-Common type of repairs-Sealing, Stitching, providing additional steel, Drilling & Plugging-Polymer based repairs-Resin based repairs.

### **UNIT – V**

9 Periods

#### **Strengthening of Reinforced Concrete structures**

Retrofitting-Strengthening of structure-Strengthening methods-Jacketing-Beams, Columns-Grouting-External Prestressing.

### **TEXT BOOKS**

1. “Handbook on Repair And Rehabilitation of RCC Buildings”, CPWD Published (2002).

### **REFERENCES**

1. Bungey, J. H., Millard, S.G. and Grantham, M.G. (2006), “Testing of Concrete in Structures”, Taylor and Francis, London, 4<sup>th</sup> Edition.
2. Shetty, M. S., (2006), “Concrete technology” S. Chand Publications, New Delhi, 7<sup>th</sup> Edition,
3. Ghambir, M.L., (2013), “Concrete technology”, McGraw-Hill Education, New Delhi, 5<sup>th</sup> Edition.
4. Neville, A.M. (2011), “Properties of Concrete”, Prentice Hall, New Delhi, 5<sup>th</sup> Edition.
5. Relevant I.S. Codes.
6. Relevant NPTEL Courses.

## RS & GIS APPLICATIONS IN CIVIL ENGINEERING

**CIV 326(D)**

Instruction : 3 Lectures / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

**Prerequisites:**

Nil

**Course Objectives:**

1. To Learn about the principles of remote sensing and Electromagnetic radiations
2. To know about satellites, satellite parameters
3. To learn about the image interpretation and processing techniques
4. To study about GIS and various data models.
5. To know the applications of remote sensing and GIS in civil engineering projects.

**Course outcomes:**

By the end of the course, student will be able to:

1. Explain various ranges of spectrum in Electro Magnetic Radiation
2. Demonstrate the working principles of satellites.
3. Interpretate and analyse the images from GIS Analysis
4. Describe overlay operations of maps in GIS
5. Apply the tools of GIS in various civil engineering applications

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3			3								3	3	3
	2	3	3			3								3	3	3
	3	3	3			3								3	3	3
	4	3	3			3								3	3	3
	5	3	3			3							2	3	3	3

### SYLLABUS

**UNIT – I**

9 Periods

Remote Sensing – Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials – Spectral Signature and Spectral Signature curves for water, soil and Earth Surface, Energy sources and radiation principles.

**UNIT – II**

9 Periods

Satellites - Classification – Satellite Sensors – satellite and sensor parameters - Resolution – Types of sensor systems used in RS, RS satellites, land sat, spot, IRS, IKONOS, QUICKBIRD., RS data products.

### **UNIT – III**

9 Periods

Image interpretation - Elements of image interpretation, concepts of digital image processing image Rectification and Restoration, Image enhancement, Image classification. Characteristics of different platforms, Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems.

### **UNIT – IV**

9 Periods

Introduction, GIS overview, Introduction to GIS - elements of GIS, Computer hardware - Software. Data Input, Verification, data storage and database management and output applications, Map Overlay - Vector and raster data model , overlay operation Errors and quality control.

### **UNIT – V**

9 Periods

RS and GIS in civil engineering projects: Soil mapping and characteristics. Application in water resource engineering. Environmental pollution monitoring. Regional and urban mapping, planning systems and waste disposal sites.

### **TEXTBOOKS**

1. Lillesand, T.M. & Kiefer R.W. (2007), “Remote Sensing and image interpretation”, John Wiley & Sons (Asia), Newyork.

### **REFERENCES**

1. Anji Reddy, M. (2011), “Remote sensing and Geographical information system”, B.S Publications.
2. Burrough, P. A. (1998), “Principles of Geographical information systems for land resource assessment”, Clarendon Press, Oxford, 2<sup>nd</sup> Edition.
3. Stan Aronoff, (1991), “Geographic Information Systems - A Management Perspective”, WDL Publications, Ottawa, Canada, Reprint Edition.
4. Kennie, J.J.M., Matthews, (2005), “Remote sensing in Civil Engineering”, Mc-Millan.
5. Floyd F. Sabins, (2005), “Remote Sensing Principles and Interpretation”, Jr. W.H. Freeman & Co., 3<sup>rd</sup> Edition.
6. Relevant NPTEL Courses.

## URBAN PLANNING AND SMART CITIES

**CIV 326(E)**

Instruction : 3 Lectures / week

End Exam : 3 Hours

**Credits : 3**

Sessional Marks : 40

End Exam Marks : 60

**Prerequisite:**

Building Planning & Drawing

**Course Objectives:**

To provide exposure to the student in urban planning and smart cities, the latter being the recent development.

**Course outcomes:**

By the end of the course, student will be able to:

1. Identify the Goals, Objectives, Components and Benefits of Planning the concept of smart city.
2. Explain the Urbanization Policies in India and the World
3. Discuss the importance of Sustainable Urban Development and its Parameters.
4. Outline Goals and Objectives of Sustainability and their practices.
5. Summarize the report of core indicator requirements with reference to ISO 37120.

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	3	-	3	-	3	3	-	-	2	-	-	2	3	3
	2	2	2	3	2	3	3	3	3	-	2	-	-	2	2	3
	3	3	3	3	3	3	3	3	3	-	-	3	-	-	3	3

**UNIT – I**

9 Periods

**Introduction:** Various definitions of town and country planning; Goals and objectives of planning; Components of planning; Benefits of planning;

Definition of Smart City; Evolution of Smart City concept; Smart City components and characteristics

**UNIT – II**

9 Periods

**Urbanization Policies in India:** Over view of world urbanization, National Urbanization policy, basic issues in urbanization policy; role of national and state level policies; five year plans, latest attempts at urbanization policy formulation in the country; salient features of the report of the National Commission of Urbanization; Census definition of urban places; functional classification of urban places; India’s Smart City Mission

**UNIT – III**

9 Periods

**Sustainable Urban Development:** Changing perspectives in man-environment relationship with focus on issues of population, urbanization, resource depletion and pollution; limits to growth vis-a-vis sustainable economy; growth and environmental imperatives of developing

vs. developed countries; definitions, concepts and parameters in sustainable development with particular reference to Brundtland Commission, Agenda 21, Eco-city approach.

#### **UNIT – IV**

9 Periods

**STAR Framework of Sustainability:** Introduction, Goals & Objectives; Built Environment: Ambient Noise & Light; Community Water Systems; Compact & Complete Communities ; Housing Affordability; Infill & Redevelopment ; Public Parkland; Transportation Choices;

Climate & Energy: Climate Adaptation; Greenhouse Gas Mitigation; Greening the Energy Supply; Energy Efficiency; Water Efficiency ; Local Gov GHG & Resource Efficiency; Waste Minimization;

Natural Systems; Green Infrastructure; Biodiversity & Invasive Species; Natural Resource Protection; Outdoor Air Quality; Water in the Environment; Working Lands;

Innovation & Process; Best Practices & Processes; Exemplary Performance; Local Innovation; Good Governance

#### **UNIT – V**

9 Periods

**ISO 37120 City indicators:** Core Indicator requirements; Supporting Indicator requirements; Data Sources; Environment; Solid waste; Transportation; Urban planning; Wastewater; Water and Sanitation; Reporting and record maintenance

#### **TEXT BOOKS**

1. Peter Hall, (2010), “Urban and Regional Planning”, Routledge Publishing, 4<sup>th</sup> Edition.
2. Kulshrestha, S. K., (2012), “Urban and Regional Planning in India - A Handbook for Professional Practice,” Sage Publications, New Delhi.

#### **REFERENCES**

1. STAR Community Rating System, Version 2.0, October 2016, STAR Communities Washington, DC
2. Sustainable development and resilience of communities-Indicators for city services and quality of life, ISO/DIS 37120, 2013, Switzerland.
3. Relevant NPTEL Courses.

## GEOTECHNICAL ENGINEERING LAB - II

**CIV 327**

Instruction : 3 Practicals / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 50

End Exam Marks : 50

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### Prerequisites:

Geotechnical Engineering – I, Geotechnical Engineering Lab-I

### Course Objectives:

To enable a student to determine the shear strength, CBR, Free Swell index and swelling pressure of the soil.

### Course outcomes:

By the end of the course, student will be able to:

1. Determine the shear strength characteristics of the given sample of soil.
2. Determine the Swell pressure and CBR of the given sample of soil under I.S. light compaction condition.
3. Determine the Free swell index and relative density of the given soil sample and also identify the soil for the given sample using field identification tests.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	2		2		2		2	2	2				2	
	2	3	2		2		2		2	2	2				2	
	3	3	2		2		2		2	2	2				2	

## SYLLABUS

### LIST OF EXPERIMENTS

1. Field identification of soils
2. Relative density – Sand
3. Unconfined compression test for fine grained soils
4. California Bearing Ratio (CBR) Test
5. Direct shear test
6. Swell pressure test
7. Free swell Index
8. Vane shear test
- Demonstration Experiments (Subject to availability)
9. Triaxial Compression Test
10. S.P.T
11. D.C.P.T



**TEXTBOOKS**

1. Narasinga Rao, B.N.D.(2015), “Soil Mechanics and Foundation Engineering”, Wiley Publishers
2. Arora, K.R. (2001), “Soil Mechanics and Foundation Engineering”, Standard Publishers, Delhi – 110 006.

**REFERENCES**

1. Punmia, B.C. (1995), “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi.
2. SP 36: Part 1: 1987 Compendium of Indian standards on soil engineering, Part 1: Laboratory testing of soils for civil engineering purposes, Bureau of Indian Standards, New Delhi
3. Other Relevant I.S. Codes.
4. Relevant NPTEL Courses.

## COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB - I

**CIV 328**

Instruction : 3 Practicals / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 50

End Exam Marks : 50

### Prerequisites:

Remote Sensing & GIS (Basics)

### Course Objective:

The objective of this course is to

1. Maximize the efficiency of planning and decision making
2. Integrate information from multiple sources
3. Eliminate surplus data and minimizing repetition

### Course Outcomes:

1. Analyse map/toposheet by using tools of GIS
2. Create thematic maps and interpretate the given geographical data
3. Apply GIS tools in civil engineering problems

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	3		3								3	3	3
	2	3	3	3		3								3	3	3
	3	3	3	3		3								3	3	3

## SYLLABUS

### LIST OF EXPERIMENTS

#### Exercises in GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps
3. Estimation of features and interpretation
4. Developing digital elevation model
5. Simple applications of GIS in civil engineering

### REFERENCES

1. Basudeb Bhatta, (2011), "Remote sensing and GIS", Oxford Higher Education, New Delhi, 2<sup>nd</sup> Edition.
2. Anji Reddy, M. (2011), "Remote sensing and Geographical information system", B.S Publications.
3. P. A. Burrough, (2<sup>nd</sup> Edition, 1998), "Principles of Geographical information systems for land resource assessment", Clarendon Press, Oxford.
4. Relevant NPTEL Courses.

## QUANTITATIVE & VERBAL APTITUDE – II

**CIV 329**

Instruction : 4 Periods / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 100

End Exam Marks : -

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### **Course Objectives:**

#### **Quantitative aptitude-II**

1. To categorize, apply and use thought process to distinguish between concepts of reasoning
2. To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
3. To critically evaluate numerous possibilities related to puzzles.

#### **Verbal aptitude-II**

1. To prepare the students on the various aspects of writing, organizing data, and applying their writing skills in their professional career.
2. To demonstrate and recommend the techniques required when interacting in different situations.
3. To apply the professional qualities/skills necessary for a productive career and to instill confidence through attitude building.
4. To plan activities in order to expose students to the different abilities required for working in a team, encourage them to glean information on current affairs and promote factual reading.
5. To illustrate and explain the intricacies/nuances involved in framing responses to the questions asked, reading between lines and reading beyond lines.

### **Course Outcomes:**

#### **Quantitative Aptitude-II**

The student will be able to

1. Use their logical thinking and analytical abilities to solve reasoning questions from company specific and other competitive tests.
2. Solve questions related to permutation & combinations and probabilities from company specific and other competitive tests.
3. Understand and solve puzzle related questions from specific and other competitive tests.

#### **Verbal aptitude-II:**

The student will be able to

1. Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, make notes, statement of purpose (for admission into foreign universities), letters of recommendation (for professional and educational purposes)
2. Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in

- JAM sessions/versant tests with confidence and convey oral information in a professional manner using reason
3. Prepare his/her resume, apply the business English concepts learnt in the course, and refine one's overall demeanor which would be very essential to face the corporate world
  4. Prepare his/her resume, apply the business English concepts learnt in the course, and refine one's overall demeanor which would be very essential to face the corporate world
  5. Respond to their interviewer/employer with a positive mind, customize answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process

**Mapping of Course Outcomes with Program outcomes:**

CO		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
QA	1	2	1							2	2			2	2	
	2	3	1							2	2			2	2	
	3	2	2							2	2			2	2	
VA	1									3	3				3	
	2									3	3				3	
	3									3	3				3	
	4									3	3				3	
	5									3	3				3	

**SYLLABUS**

**Section –A (Quantitative Aptitude –II)**

**UNIT I**

**8 Periods**

**Numerical Reasoning:**

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

**UNIT II**

**4 Periods**

**Combinatorics:**

Counting techniques, Permutations, Combinations and Probability

**UNIT III**

**4 Periods**

Data sufficiency  
Syllogisms

**UNIT IV**

**4 Periods**

**Application of Base system:**

Clocks (Base 24), Calendars (Base7), Cutting of Cubes and cuboids

## UNIT V

4 Periods

### **Puzzle Solving & Time Management using various problems solving tools and techniques:**

Selective puzzles from previous year placement papers

Selective puzzles from book Puzzles to puzzle you by shakunataladevi

Selective puzzles from book more puzzles by shakunataladevi

Selective puzzles from book puzzles by George summers

#### **Books for practice**

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications
3. Puzzles to puzzle you by shakunataladevi orient paper back publication
4. More puzzles by shakunataladevi orient paper back publication
5. Puzzles by George summers orient paper back publication.

#### **References:**

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)
2. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
3. Reasoning by BS Sijwali Arihant publications
4. Reasoning Arun Sharma McGrawhill publications

#### **Websites:**

1. [www.m4maths.com](http://www.m4maths.com)
2. [www.Indiabix.com](http://www.Indiabix.com)
3. 800score
4. Official GRE site
5. Official GMAT site

## **Section –B (Verbal Aptitude –II)**

### UNIT I

4 Periods

General Essay writing, writing Issues and Arguments( with emphasis on creativity and analysis of a topic), paragraph writing, story writing, guidance in framing a 'Statement of purpose', 'Letters of Recommendation', business letter writing, email writing, email and business letter writing etiquette, letters of complaints/responses to complaints. Information transfer is taught with the help of tables, bar diagrams, and pie charts while framing /sending lengthy data where testing is done through Reading comprehension and Critical reasoning. Contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, words often mis-spelt, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases. Enhanced difficulty level in spotting errors will be taken up with reference to competitive test based exercises.

## **UNIT II**

**4 Periods**

Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive non verbal communication. Analogies, YES-NO statements (sticking to a particular line of reasoning)

## **UNIT III**

**4 Periods**

Corporate readiness, business idioms and expressions, reading newspapers/magazines, brushing up on general awareness, latest trends in their respective branches, resume preparation, understanding business /corporate language, managing emotions, problem solving, importance of team work, goal orientation, professional grooming, positive attitude, assertiveness and inter personal skills. Data sufficiency (answering questions within the ambit of the given text), Fact-Inference-Judgment (to identify statements as FIJ), Syllogisms (with emphasis on fallacies in reasoning), strong and weak arguments.

## **UNIT IV**

**6 Periods**

Voice, direct & indirect speech, question tags, one word substitutes, and foreign phrases. An overview on group discussions, preparation for a group discussion, intricacies of a group discussion, topics for GDs (with special focus on controversial topics), structure of participation in a group discussion, roles played by the participants in a group discussion, constructive criticism, standard procedures followed whilst participating in a group discussion, frameworks that can be used for discussion, analysis of the discussion and exposure to case-based group discussions.

## **UNIT V**

**6 Periods**

Different types of interviews (with emphasis on personal interview), preparation for an interview, areas of questioning, answering questions on general traits like strengths/weaknesses/hobbies/extracurricular activities, choosing role models, importance of non verbal communication while participating in interviews, tips to reduce nervousness during personal interviews, handling stress, suggestions for responding to tough/unknown questions, preparation on self and personality development.

**Note: The concepts learnt in Semester I will be tested in the Mid-term and Semester end exams during the II Semester as well.**

### **Reading/ Listening material:**

1. Newspapers like 'The Hindu', 'Times of India', 'Economic Times'.
2. Magazines like Frontline, Outlook and Business India.
3. News channels NDTV, National News, CNN

### **References:**

1. Books written by Stephen Covey and Dale Carnegie-Seven Habits of Highly Effective People etc-Simon & Schuster, Running Press book publishers
2. Books written by Bertrand Russell-Oxford University Press

### **Suggested General Reading**

1. Who Moved My Cheese? By Spencer Johnson-GP Putnam's Sons
2. The art of War-Sun Tzu by Nabla, Barnes & Noble
3. The Monk Who Sold Ferrari-Robin Sharma by Harper Collins, Jaico Publishers
4. The Hobbit and other books by JRR Tolkein-Harper Collins

### **Suggested Authors**

1. William Dalrymple
2. V.S.Naipaul
3. Kushwanth Singh
4. Ernest Hemingway
5. Charles Dickens
6. Leo Tolstoy
7. R.K. Narayan
8. Amitav Ghosh
9. Vikram Seth
10. Oscar Wilde

<b>SOFT SKILLS LAB</b>	
<b>CIV3210</b>	<b>Credits : 02</b>
Instruction: 3Period	Sessional Marks: 100

**Prerequisites:**

Basic English language skills- LSRW. English theory and English Language Lab.

**Course Objectives:**

1. To inculcate effective communication skills with appropriate body language.
2. To produce potent leaders, productive team players and effective individuals with proper professional ethics.
3. To enable students to make successful oral presentations using relevant content.
4. To train students for Group discussions and job Interviews which improves their employability skills.
5. To facilitate students the importance of setting realistic goals and achieving them using time management techniques.

**Course Outcomes:**

At the end of the course, students will be able to:

1. Comprehend the core engineering subjects using effective communication skills.
2. Present accurate and relevant information efficiently, using suitable material aids.
3. Work effectively as an individual as well in teams and emerge as responsible leaders.
4. Participate in group discussions and interviews using analytical and problem solving abilities, which enhance their employability skills.
5. Set time bound goals and realize them through strategic plans for successful career.

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1										3		3		3	
	2				2	2					3		2		3	
	3				3				3	3	3		2		3	
	4				3					3	3		2		3	
	5				2								2		2	

**SYLLABUS**

**UNIT – I**

9 Periods

**Art of communication**

1. Definition of Communication
2. Types of Communication
3. Non-verbal Communication
4. Listening skills
5. Feed back



**D.A.** - Practice of proper hand shake, practice of different postures and gestures and activity on giving feedback

**UNIT – II** 6 Periods

**Presentation Skills**

1. Purpose
2. Effective presentation strategies
3. Analysis of audience
4. Preparing an outline of the presentation,
5. Audio –visual aids
6. Body language.

**D.A.** -Group presentation by each team

**UNIT – III** 9 Periods

**Group Discussions**

1. Introduction- as a part of selection process-guidelines for GD
2. Types of GD
3. Nature of topics of G.D
4. Roles to be played by participants in a GD
5. Evaluation process

**D.A**–Group discussions

**UNIT – IV** 6 Periods

**Team Building and Leadership**

1. Importance of team work
2. Different stages of team formation
3. Good team vs. effective team
4. Team player and Team leader
5. Types of leadership
6. Decision making and negotiating skills

**D.A**-Decision making for a given situation

**UNIT – V** 3 Periods

**Time- Management**

1. Importance of time-management
2. Time-Management models
3. Prioritization
4. The art of saying ‘No’
5. Identifying Time Wasters

**D.A** -Time- Bound activities devised by the facilitator

**UNIT – VI** 3 Periods

**Goal-Setting**

1. Different type of Goals (Immediate and Short term)
2. ‘SMART’ Goals

3. Strategies to achieve goals

**D.A** - Prepare a chart of immediate, short term and long term goals

## **UNIT – VII**

9 Periods

### **Job- Interviews**

1. Preparing Resumes and C.V's
2. Preparing for the interview
3. FAQ's (Integrity, Stress management, Close- Ask questions)

**D.A** –Mock interviews

## **REFERENCES**

1. Sanjay Kumar and Pushpalata, *Communication Skills* ,Oxford University Press , 2011.
2. Allan Pease, *Body Language*, Sheldon Press,1997.
3. John A. Kline and BhavnaBhalla, *Speaking Effectively; Achieving Excellence in Presentations*, Pearson publication, 2013.
4. Marc Mancini, *Time Management*, Tata McGraw Hill publishing Comp.Ltd.,2003.
5. Peter Veruki, *The 250 Job Interview Questions*,Adams Media Corporation Avon, Massachusetts,1999.

## INDUSTRIAL TRAINING

**CIV 3211**

Instruction : -

End Exam : -

**Credits : -**

Sessional Marks : -

End Exam Marks : -

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### Prerequisites:

Basic knowledge of Civil Engineering

### Course objectives:

The objective of this course is to provide exposure to the students to the practical aspects of Civil Engineering projects

### Course outcomes:

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

1. Investigate and analyze at least one complex civil engineering problem with substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
2. Select and apply appropriate techniques, resources, and modern engineering and IT tools to complex civil engineering activities with an understanding of the limitations.
3. Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to one civil engineering problem.
4. Function effectively as an individual, and as a member or leader in teams as well as to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
5. Demonstrate knowledge and understanding of the engineering and management principles and apply these to manage at least one civil engineering project, as a member and leader in a team.

### Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		3					3	3		3	3	3	3
	2	3	3			3				3	3		3	3	3	3
	3	3	3	3						3	3		3	3	3	3
	4	3	3							3	3	3	3	3	3	3
	5															

## SYLLABUS

At the end of III Year II Semester, the Students have to undergo Industrial Training during Summer vacation, at Industries (Engineering Departments/ Companies) approved by the Department, for a minimum period of 4 weeks. The work done by the students shall be reported at regular intervals to the Guide. The quantum and quality of the work done by the student shall be of adequate standard and approved by the Guide/HoD. The work done by the students shall be submitted to the Department at the end of the Training Period duly certified

by the Guide along with a Certificate from the Industry. The evaluation of Industrial Training shall be carried by a Committee appointed by the Head of the Department during IV Year I Semester and the Marks shall be reported along with the Sessional Marks of IV Year I Semester.