

**COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**II, III & IV- B.TECH - I & II- SEMESTERS**

**CIVIL ENGINEERING**

**FOR  
B.TECH FOUR YEAR DEGREE COURSE  
(Applicable for the batches admitted from 2015-2016)**



**ANURAG GROUP OF INSTITUTIONS  
AUTONOMOUS  
VENKATAPUR, GHATKESAR, HYDERABAD – 500 088, TELANGANA STATE.**

**ANURAG GROUP OF INSTITUTIONS**  
Autonomous

**II-B. Tech. - I-Semester**

**Course Structure**

<b>Code</b>	<b>Subject</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
A53001	Mathematics-III	BS	4	1	0	4
A53002	Building Materials, Construction and Planning	PC	3	0	0	3
A53003	Strength of Materials-I	ES	3	1	0	3
A53004	Fluid Mechanics	ES	3	1	0	3
A53005	Surveying	PC	4	1	0	4
A53006	Engineering Geology	PC	3	0	0	3
A53007	Gender Sensitization	MC	2	0	0	0
A53201	Surveying Lab	PC	0	0	3	2
A53202	Engineering Geology Lab	PC	0	0	3	2
Total			22	4	6	24

**II-B. Tech. - II-Semester**

**Course Structure**

<b>Code</b>	<b>Subject</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
A54001	Probability and Statistics	BS	4	1	0	4
A54002	Elements of Electrical Engineering	ES	3	1	0	3
A54003	Strength of Materials-II	ES	4	1	0	4
A54004	Hydraulics & Hydraulic Machinery	PC	4	1	0	4
A54005	Concrete Technology	PC	3	0	0	3
A54006	Environmental Studies	MC	2	0	0	0
A54201	Strength of Materials Lab	PC	0	0	3	2
A54202	Fluid Mechanics & Hydraulic Machinery Lab	PC	0	0	3	2
A54203	Concrete Technology Lab	PC	0	0	3	2
Total			20	4	9	24

**III-B. Tech. - I-Semester**
**Course Structure**

Code	Subject	Category	L	T	P/D	C
A55001	Structural Analysis	PC	4	1	0	4
A55002	Design of RC Structures	PC	4	1	0	4
A55003	Environmental Engineering	PC	3	0	0	3
A55004	Soil Mechanics	PC	3	1	0	3
A55005	<b>Professional Elective-I</b> Ground Water Development & Management	PE	3	0	0	3
A55006	Environmental Impact Assessment and Mgmt.					
A55007	Building Services					
A55008	<b>Professional Elective-II</b> Water shed Management	PE	3	0	0	3
A55009	Rehabilitation and Retrofitting of Structures					
A55010	Air Pollution and Control					
A55011	Personality Development & Career Building	MC	2	0	0	0
A55201	Environmental Engineering Lab	PC	0	0	3	2
A55202	Soil Mechanics Lab	PC	0	0	3	2
Total			23	3	6	24

**III-B. Tech. - II-Semester**
**Course Structure**

Code	Subject	Category	L	T	P/D	C
A56001	Design of Steel Structures	PC	4	1	0	4
A56002	Water Resources Engineering	PC	4	0	0	4
A56003	Foundation Engineering	PC	3	0	0	3
A56004	Transportation Engineering	PC	3	1	0	3
A56005	<b>Professional Elective-III</b> Advanced Structural Analysis	PE	3	0	0	3
A56006	Ground Improvement Techniques					
A56007	Hazardous and Solid Waste Management					
A56008	<b>Professional Elective-IV</b> Prestressed Concrete	PE	3	0	0	3
A56009	Urban Planning and Development					
A56010	Remote Sensing & GIS					
A56011	Logical Reasoning & Quantitative Aptitude	MC	2	0	0	0
A56201	Transportation Engineering Lab	PC	0	0	3	2
A56202	Geo Spatial Tools Lab	PC	0	0	3	2
Total			22	2	6	24

**B. Tech. IV Year I-Semester****Course Structure**

<b>Code</b>	<b>Subject</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
A57001	Estimation and Costing	PC	3	1	0	3
A57002	Irrigation Engineering	PC	3	1	0	3
A57003	Advanced Structural Design	PC	3	1	0	3
A57004	<b>Professional Elective-V</b> Structural Dynamics and Earthquake Engineering	PE	3	0	0	3
A57005	Railways and Airport Engineering					
A57006	Earth Retaining Structures					
A57007	<b>Professional Elective-VI</b> Pavement Analysis & Design	PE	3	0	0	3
A57008	Soil Dynamics & Machine Foundations					
A57009	Construction Technology & Project Management					
A57010	<b>Open Elective-I</b> Managerial Economics and Financial Analysis	OE	3	0	0	3
A57011	Engineering Ethics					
A57012	Advanced Construction Materials					
A57201	Computer Aided Design Lab	PC	0	0	3	2
A57202	Advanced English Communication Skills Lab	HS	0	0	3	2
A57203	Industry Oriented Mini Project	PW	0	0	0	2
Total			18	3	6	24

**B. Tech. IV Year II-Semester****Course Structure**

<b>Code</b>	<b>Subject</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
A58001	<b>Open Elective-II</b> Finite Element Method	OE	3	0	0	3
A58002	Intellectual Property Rights					
A58003	Data Base Management Systems					
A58004	<b>Open Elective-III</b> Entrepreneurship Development	OE	3	0	0	3
A58005	Operating Systems					
A58006	Computational Methods in Engineering					
A58201	Comprehensive Viva	PW	0	0	0	3
A58202	Technical Seminar	PW	0	0	6	3
A58203	Project Work	PW	0	0	15	12
Total			6	0	21	24

Note: All End Examinations (Theory and Practical) are of three hours duration.

L – Lectures T – Tutorial P – Practical D – Drawing C-Credits

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-I Sem

L	T/P/D	C
4	1	4

## (A53001) MATHEMATICS-III

Prerequisite: Mathematics-I and Mathematics-II

### Course Objectives:

- To acquaint students with the fundamental concepts of Numerical Analysis
- To develop an understanding of the role of Numerical Analysis in engineering.
- To provide an understanding of the processes by which real life problems are analyzed
- Able to know basic properties of standard partial differential equations to solve engineering problems.

### Course Outcomes:

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

- Familiar with numerical solution of non Linear equations.
- Familiar with numerical interpolation and approximation of functions.
- Familiar with calculation and interpretation of errors in Numerical Methods
- Apply partial differential equations to solve complex engineering problems.

### UNIT I

**Solution of Non- linear Equations and Linear System of Equations:** Solution of Algebraic and Transcendental Equations – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method - Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method.

### UNIT II

**Interpolation:** Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations - Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

### UNIT III

**Numerical Differentiation, Numerical Integration & Curve fitting:** Numerical Diferentiation, Generalized Quadrature (Newton's Cote's formula), Trapezoidal, Simson's and Weddle's rules and problems. Curve fitting: Fitting a straight line – Second degree curve – exponential curve-power curve by method of least squares.

### UNIT IV

**Numerical solution of IVP's in ODE:** Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams-Bashforth Method-Milne Thamson Method.

## **UNIT V**

**Partial differential equations:** Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (Standard type) equations, Charpits Method, Method of separation of Variables for second order equations. Classification of general second order partial differential equations. Applications of Partial Differential Equations-One dimensional wave equation, Heat equation.

### **TEXT BOOKS:**

1. Grewal B.S (2007), Higher Engineering Mathematics, 40<sup>th</sup> Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Mathematical Methods, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
3. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.

### **REFERENCE BOOKS:**

1. Shahanaz Bathul (2007), Mathematical Methods, 3<sup>rd</sup> Edition, Hyderabad, Right Publishers.
2. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3<sup>rd</sup> Edition, New Delhi, Narosa Publication House.
3. Introductory Methods of Numerical Analysis. S.S. Sastry, Prentice Hall.
4. Numerical Analysis (Paper IV), First Edition 2010, Telugu Akademi, Hyderabad.
5. Schaum's Outline Series on Matrices.
6. Mathematical Methods of Science and Engineering (Aided with Matlab) Kanti B.Datta (2012), Seventh Edition, CENGAGE Learning.

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. CIVIL - I Sem

L	T/P/D	C
3	0	3

## (A53002) BUILDING MATERIALS, CONSTRUCTION & PLANNING

Prerequisite: -nil-

### Course Objectives:

- To provide the knowledge of various materials required in construction and their properties
- To provide the knowledge of design of various structural elements, farm work and their planning

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to

- Have the knowledge of construction methodology, materials and its planning
- Know the functional design of various elements such as arches, lintels, floors, stairs, doors & windows
- Have the complete knowledge of farm work and plastering.
- Get the innovative methods of construction by using the latest technology.

## UNIT I

**(a) Stone Masonry:** Cutting and dressing, selection of stones, types of stone masonry, principles of construction joints in masonry, lifting heavy stones, common building stones in India.

**(b) Brick Masonry:** Qualities of good bricks, classification of bricks, Tests on bricks as per IS codes, terms used in brickwork, commonly used types of bonds in brickwork such as stretchers and headers in English and Flemish bonds, principles of construction, Reinforced brickwork, brick noggin, parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls, Masonry construction using cement concrete blocks and clay blocks, precast construction, Introduction to methods and materials, precast elements like poles, cover, jallies, steps etc.

## UNIT II

**(a) Arches and lintels:** Terminology in construction, types, chajjas and canopies, precast lintel and arches.

**(b) Damp proofing:** Causes and effects of dampness, various methods of damp proofing, damp proofing in plinth protection, new techniques of damp proofing.

**(c) Floors:** General principles, types and method of construction, upper floors, finishing and testing of floor tiles, Synthetic and ceramic tiles.

**(d) Roofs:** Flat and pitched roofs, roof coverings, types and their construction, features, Thermal insulation.

## UNIT III

**(a) Stairs:** Types of stairs, functional design of stairs.

**(b) Doors and windows:** Purpose and materials of construction and types.

**(c) Building Services: Plumbing services:** Water distribution, Sanitary lines & fittings; **Ventilations:** Functional requirements, system of ventilations; **Air conditioning:** Essentials and types; **Acoustics:** Characteristics, absorption, design; **Fire protection:**

Fire hazards, classification of fire resistant materials and construction, fire safety norms.

#### **UNIT IV**

**(a) Plastering and pointing:** Necessity, types and methods.

**(b) Form work:** Centering and formwork, shoring, underpinning and scaffolding.

**(c) Painting:** White washing, colour washing and distempering, new materials and techniques.

#### **UNIT V**

**Building Planning:** Principles of building planning, Classification of buildings and building by laws.

#### **TEXT BOOKS:**

1. S. P. Arora and S. P. Bindra, 'A Text book on Building Construction', Dhanpat Roy Publications, New Delhi.
2. Rangwala, 'Building Materials', Charotar Publications.
3. V. N. Vazirani and S. P. Chandola, 'Engineering Materials', Khanna Publishers.
4. N. Kumara Swamy and A. Kameshwar rao, 'Building Planning and Drawing', Charotar Publishers
5. National Building Code of India 2003, Indian Standards Institution.

#### **REFERENCE BOOKS**

1. Building Materials by S. K. Duggal, New Age International Publications, New delhi.
2. Building Construction by P. C. Verghese, PHI Publications, New Delhi.
3. Construction Technology, Vol. I & II by R. Chuddy, Longman Publications, UK.
4. Basics of Civil Engineering by Subhash Chander, Jain brothers Publications.
5. Building by laws by State and Central Governments and Muncipal Corporations.
6. Building Construction by B. C. Punmia, Ashok Kr. Jain and Arun Kr. Jain, Laxmi Publications Pvt. Ltd, New Delhi.



**ANURAG GROUP OF INSTITUTIONS**  
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**II Year B.Tech. Civil-I Sem**

<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>-</b>	<b>3</b>

**(A53003) STRENGTH OF MATERIALS-I**

Prerequisite: Engineering Mechanics I & II

**COURSE OBJECTIVES:**

- To provide the knowledge on elasticity and plasticity of various materials.
- To know the mechanism of development of shear force and bending moment in beams due to various loads.
- To estimate the bending stresses shear stresses in beams of various cross sections.
- To estimate the slopes and deflection of beams by various methods.
- To impart the knowledge of principal stresses and strains

**COURSE OUTCOMES:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the meaning of basic terminology involved in estimation of strength of various materials.
- Understand the behaviour of beams under various loads through the shear force diagram, bending moment diagram, flexural and shear stress distribution diagrams.
- Understand the theories involved in the torsion of circular shafts
- Know the methods of estimation of deflection of beams and their limiting conditions.

**UNIT I**

**Simple Stresses And Strains:** Elasticity and plasticity-Types of stresses and strains-Hooke's law-stress-strain diagram for mild steel-working stress-factor of safety-Lateral strain, Poisson's ratio and volumetric strain-Elastic moduli and the relationship between them-Bars of varying section-composite bars-Temperature stresses.

**UNIT II**

**Shear Force and Bending Moment:** Definition of beam-Types of beams-concept of shear force and bending moment-S.F and B.M diagrams for cantilever, simply supported with or without overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads-point of contraflexure-Relation between S.F, B.M and rate of loading at a section of a beam

**UNIT III**

**Flexural Stresses:** Theory of simple bending-Assumptions-Derivation of bending equation:  $M/I=f/y=E/R$ -Neutral axis-Determination of bending stresses-section modulus of rectangular and circular sections (solid and hollow), I, T, and Channel sections and-Design of simple beams.

**Shear Stresses:** Derivation of formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T.

## UNIT IV

**Deflection of Beams:** Bending into a circular arc - slope, deflection and radius of curvature- Differential equation for the elastic line of a beam-Double integration and Macaulay's methods- Determination of slope and deflection for cantilever and simply supported beams, subjected to point loads, U.D.L, Uniformly varying loads-Mohr's theorems - Moment Area Method, Conjugate Beam Method, application to simple cases.

## UNIT V

**Torsion of Circular Section:** Theory of pure torsion – derivation of torsion equations-  $T/J = q/r = N\theta/L$  – assumptions made in the theory of pure torsion – torsional moment of resistance – polar section modulus – power transmitted by shafts – combined bending and torsion and end thrust – design of shafts according to theories of failure

**Springs:** Introduction – type of springs – carriage/leaf springs, helical springs-deflection of close and open coiled helical springs under axial pull and axial couple - springs in series and parallel.

### TEXT BOOKS:

1. D. S. Prakash Rao, 'Strength of Materials-A Practical Approach', University Press
2. S. Ramamrutham, 'Strength of Materials', Dhanpath Rai Publishers

### REFERENCE BOOKS:

1. Pytel A H and Singer F L, "*Strength of Materials*", Harper Collins, New Delhi.
2. Beer P F and Johnston (Jr) E R, "*Mechanics of Materials*", SI Version, McGraw Hill, NY.
3. Popov E P, "*Engineering Mechanics of Solids*", SI Version, Prentice Hall, New Delhi.
4. Timoshenko S P and Young D H, "*Elements of Strength of Materials*", East West Press, New Delhi.
5. Shames, I. H., Pitarresi, J. M., "*Introduction to Solid Mechanics*," Prentice-Hall, NJ.
6. NPTEL courses, <http://nptel.iitm.ac.in/courses.php>, web and video courses on **Strength of Materials by Prof. Sharma, S. C., and Prof. Harsha, S. P.**
7. Strength of Materials by Schaum's out line series-Mc.Grawhill International Editions.

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**II Year B.Tech. Civil-I Sem**

<b>L</b>	<b>T /P/D</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>3</b>

**(A53004) FLUID MECHANICS**

Prerequisite: Mathematics I & II

**COURSE OBJECTIVES:**

- To know the various fluid properties and fluid pressure measurement.
- To study the different equations of fluid motion.
- To impart the knowledge of boundary layer theory and flow in pipes.

**COURSE OUTCOMES:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the basic principles involved in fluid in static and dynamic condition.
- Know flow through pipes corresponding problems and flow measuring methods.

**UNIT I**

**Units of measurement** - Physical properties of fluids - specific gravity – viscosity - vapour pressure surface tension and capillarity - pressure at a point - variation of pressure in a fluid - Pascals law atmospheric, absolute, gauge and vacuum pressure - measurement of pressure: pressure gauges, Manometers: differential and Micro Manometers.

**UNIT II**

**Hydrostatic forces on submerged plane:** horizontal, vertical, inclined and curved surfaces - center of pressure. derivations and problems.

**UNIT III**

**Fluid Kinematics:** Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and irrotational flows - equation of continuity for one, two , three dimensional flows stream and velocity potential functions, flow net analysis.

**Fluid Dynamics:** forces acting on fluid in motion - Eulers and Bernoullie’s equations for flow along a stream line for 3-D flow, impulse momentum equations and its applications - forces on pipe bend.

**UNIT IV**

**Boundary Layer Theory:** Boundary layer concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect

**Laminar & Turbulent Flows:** Reynolds experiment - Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

## **UNIT V**

**Closed Conduit Flow:** Laws of Fluid friction -Darcy's equation, Minor losses \_ pipes in series -pipes in parallel - total energy line and hydraulic gradient line. pipe network problems, variation of friction factor with Reynolds number –Moody's Chart.

**Measurement of Flow:** Pitot tube, venture meter and orifice meter -classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches - broad crested weirs. Surge analysis, mouth piece

### **TEXT BOOKS**

1. P.N. Modi and S.M. Seth, 'Hydraulics and Fluid Mechanics including Hydraulic Machines', Standard Book House.
2. A.K. Jain, 'Fluid Mechanics including Hydraulic Machines', Khanna Publishers.
- R. K. Bansal, 'A Text Book of Fluid Mechanics and Hydraulic Machines', Laxmi Publications

### **REFERENCE BOOKS**

1. L. Victor, Streeter and E. Benjamin Wylie, 'Fluid Mechanics', Tata McGraw Hill.
2. K.R. Arora, 'Fluid Mechanics, Hydraulics and Hydraulic Machines', Standard Publishers.
3. K. Subramanya, 'Theory and Applications of Fluid Mechanics', Tata McGraw Hill.
4. M. Franck White, 'Fluid Mechanics', Tata McGraw Hill.

# ANURAG GROUP OF INSTITUTIONS

## (AUTONOMOUS)

II Year B.Tech. Civil-I Sem

L	T	P/D	C
4	1	-	4

### (A53005) SURVEYING

Prerequisite: -nil-

#### COURSE OBJECTIVES:

- To understand principles and classification of surveying.
- To understand principles and functioning of basic survey equipment such as chain, prismatic compass, plane table, levels.
- To impart the knowledge of calculating the areas and volumes and contours and their usage.

#### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments
- Estimate measurement errors and apply corrections
- Interpret survey data and compute areas and volumes

#### UNIT I

**Introduction:** Surveying objectives, plane surveying principles and classification, scales, linear measurements, instruments for surveying, preparation of map and plan.

**Chain surveying:** Measurement of distance, chain surveying principles, selection of stations, offsets, locating building corners, field book, chain surveying instruments, conventional signs.

**Compass Surveying:** Measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination, traversing with a chain and compass, plotting of traverse, adjustment of closing error.

**Plane Table Surveying:** Principle and instruments used in plane table surveying, working operations, methods of plane table surveying.

#### UNIT II

**Levelling and Contouring:** Description of a point (position) on the earth's surface, instruments for leveling, principle and classification of leveling, bench marks, leveling staff, readings and booking of levels, field work in leveling, longitudinal section and cross section, plotting the profile, height (level) computations, contours, characteristics of contours, contours of natural features, methods of contouring, interpolation, contour gradient, contour maps.

**Areas and volumes:** Computation of areas from plans, calculation of areas of a closed traverse, instruments for map areas computation, measurements from cross section, calculation of volumes from spot levels, earth work calculations, practical problems.

### **UNIT III**

**Theodolite Survey and Traversing:** Theodolite component parts, classification, theodolite observations, principle of theodolite survey and traversing, field work, traverse computations, practical problems.

**Tacheometric Surveying:** Instruments, principle of tacheometry, methods of tacheometry, tacheometric tables, reduction diagram, tacheometry as applied to subtense measurement, field work for tacheometric surveying, errors.

### **UNIT IV**

**Trigonometrical surveying:** Base of the object accessible, base of an inclined object accessible, reduced level of the elevated points with inaccessible bases, instrument axes at different levels.

**Curve Setting:** Types of curves, elements of a curve, setting out a simple curve, setting out a compound curve, checks on field work, reverse curve, transition curves, super elevation, deflection angles, transition curves, characteristics of transition curves, method of setting out a compound curve, types of vertical curves, setting out vertical curves, sight distance.

### **UNIT V**

**Triangulation:** Principle of triangulation, purpose and classification of triangulation surveys, layout of triangulation, field work, triangulation stations, triangulation computations, EDM instruments.

**Total Station:** types and applications  
Global Positioning System.

### **TEXT BOOKS:**

1. B.C. Punmia, A.K.Jain, Arun Jain, Surveying I and II, Laxmi Publications, 2005.
2. R. Subramanian, Surveying and Levelling, 2/e, Oxford University Press, 2014.
3. D.G Charles, R.W. Paul, Elementary Surveying, 14/e, Prentice Hall, 2014

### **REFERENCE:**

1. S.K. Roy, Fundamentals of Surveying, Prentice Hall of India, 2011.
2. T.P. Kanetkar, (2012), Surveying and Levelling, Part I and II, New Central Book Agency, 2012.
3. N. N. Basak, 'Surveying and Leveling', Tata McGraw Hill

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-I Sem

L	T	P/D	C
3	0	-	3

## (A53006) ENGINEERING GEOLOGY

Prerequisite: -nil-

### COURSE OBJECTIVES:

1. Role of geology and geophysics in Civil Engineering structures such as dams, reservoir, tunnels, excavations and man made or natural environmental disasters etc.
2. Impact of structural geology, ground water and weathering in civil engineering
3. Geological and geophysical implications on and civil structures.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

1. Know the application of geological, geophysical knowledge which will help in construction of resistant, long life civil structures on the earth.
2. Distinguishing between strong and weak rock structures and making weak structures strong in construction of dams, tunnels, reservoirs etc.
3. Understand that the engineering geology paves the way to produce strong geotechnical engineers which is back bone of civil structures.

### UNIT I

**Introduction:** Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of civil engineering construction due to geological drawbacks. Importance of physical geology, petrology and structural geology. Weathering of rocks; its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like granite mineralogy definition of mineral, importance of study of minerals, different methods of study of minerals, advantages of study of mineral by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals feldspar, quartz, flint, jasper, olivine, agate, hornblende, muscovite, biotite, asbestos, chlorite, kyanite, garnet, talc, calcite, study of other common economics of minerals such as pyrite, hematite, magnetite, chromite, galena, pyrolusite, graphite, magnetite, and bauxite.

### UNIT II

**Petrology:** Definition of rock. Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous, sedimentary and metamorphic rocks. Their distinguishing features, Macroscopic and microscopic study of granite, dolerite, basalt, pegmatite, laterite, conglomerate, sand stone, shale, limestone, gneiss, schist, quartzite, marble and slate. Rock excavation, stone aggregates.

### **UNIT III**

**Structural geology:** Indian stratigraphy and geological time scale. Out crop, strike and dip study of common geological structures, associating with rocks such as folds, faults unconformities and joints - their important types Geophysical studies importance of geophysical studies principles of geophysical study by gravity methods,. Magnetic methods, electrical methods, seismic methods, radio methods, and geothermal method.

### **UNIT IV**

Special importance of electrical resistivity methods, and seismic refraction methods, improvement of competence of sites by grouting etc, fundamental aspects of rock mechanics and environmental geology. Geology and dams and reservoirs Types of dams and bearing of geology of site in their selection. Geological considerations in the selection of a dam site. Analysis of dam failures of the past. Factor contributing to the success of a reservoir. Geological factors influencing water tightness and the life of the reservoirs. Geo hazards. Ground subsidence.

### **UNIT V**

**Ground Water & Water Table:** Common types of ground water springs, cone of depressions, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precaution to be taken for buildings construction in seismic areas, landslides, landslides hazards, water in landslides and their causes and effect measures to be taken to prevent the occurrence of importance of study of ground water . earthquake and land slides Tunnels purpose of tunnelling effects of tunnelling on the ground role of geological consideration ( litho logical, structural and ground water ) in tunnelling over break and lining in tunnels, tunnels in rock. Subsidence over old mines. Mining substances.

### **TEXT BOOKS:**

1. Parbin Singh, Textbook of Engineering and General Geology, SK Kataria and Sons.
2. N. Chennakesavulu, Textbook of Engineering Geology, Trinity Press.

### **REFERENCES:**

1. F.G Bell Fundamental of engineering geology Butterworths publications., New Delhi.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics CBS Publishers & Distribution
3. Subinoy Gangopadhyay – Engineering Geology, Oxford University Press.
4. P. K. Guha, Remote Sensing for the Beginner, East West press.



# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-I Sem

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## (A53007) GENDER SENSITIZATION (MANDATORY COURSE)

Prerequisite: Surveying

### Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To expose students to more egalitarian interactions between men and women.

### Course Outcomes:

- Students will have a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movement as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence

### Unit: I

**UNDERSTANDING GENDER :**Gender: Why Should We Study it? (Towards a World of Equals: Socialization: Making Women, Making Men (Towards a World of Equals: Unit2) introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste, Different Masculinities. Just Relationships: Being Together as Equals (Towards a World of Equals: Mary Kom And Onier. Love and Acid just do not Mix, Love Letters, Mothers and Fathers. Further Reading. Rosa Parks-The Brave Heart.

### Unit: II

**GENDER AND BIOLOGY:**Missing Women: Sex Selection and its Consequences (Towards a world of Equals:Unit-4)Declining Sex Ration, Demographic Consequences.Gender Spectrum:Beyond the Binary(Towards a World of Equals:Unit-1Two or Many? Struggles

with Discrimination. Additional Reading : Our Bodies, Our Health(Towards a World of Equals: Unit-13)

### **Unit-III:**

**GENDER AND LABOUR:** Housework: the Invisible Labour (Towards a World of Equals: Unit-3\*My Mother Doesn't Work\* "Share the Load"Women's Work: Its Politics and Economics Fact and Fiction. Unrecognized and Unaccount work Further Reading Wages and Conditions of Work

### **Unit-IV**

**ISSUES OF VIOLENCE:** Sexual Harassment: Say No!(Towards a World of Equals:Unit-6)Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading "Chupulu"Domestic Violence :Speaking Out (Towards a World of Equals: Unit-8)Is Home a Safe Place? When Women Unite (Film), Rebuilding Lives. Further Reading New Forums for justice. Thinking about Sexual Violence (Towards a World of Equals:)Blaming the Victim- " I Fought for my Life." Further Reading. The Caste Face of Violence.

### **Unit-V**

**GENDER STUDIES:** Knowledge: Through the Lens of Gender Point of view . Gender and the Structure of Knowledge . Further Reading: Unacknowledged Women Artists of Telangana.Whose History? Questions for historians and Others Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Telangana History.Essential Reading: All the units in the Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Sursie Tharu.

Note:Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or any other qualified faculty who has expertise in this field.

### **Reference Books:**

1. Sen, Amartya, "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making Hisoty...' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at:[http://blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-Indian-women-work/>](http://blogs.wsj.com/India/real-time/2012/11/14/by-the-numbers-where-Indian-women-work/)
3. K.Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2, Telugu and Kannada <http://harpercollings.co.in/BookDetail.asp?Book Code=3732>
4. Vimala. "Vantilliu (The Kitchen)". Women Writing in India: 600 Bc To the Present, Volume It: The 20<sup>th</sup> Century, Ed. Susie Tharu and K.Lalitha. Delhi: Oxford University Press, 1995. 599-601.

5. Shatrughna, Veena et al. Women's Work and its impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research, 1993.
6. Stree Shakti Sanghatana. "We Were Making History..." Life Stories of Women in the Telangana People's Struggle, New Delhi: Kali for Women, 1989.
7. Menon, Nivedita, Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8. Jayaprabha, A. "Chupulu (Stares)". Women Writing in India: 600BC to the Present. Volume II: The 20<sup>th</sup> Century Ed. Susie Tharu and K.Lalita, Delhi: Oxford University Press. 1995, 596-597.
9. Javed. Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis." International Journal of Humanities and Social Science Invention 2,.4 (2013).
10. Gautam, Liela and Gita Ramaswamy. "A 'conversation' between a Daughter and a Mother." Broadsheet on Contemporary Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.
11. Abdulali Sohaila. "I Fought For My Life... and Won." Available online at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>
12. Jeganathan pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Black Ravi Dayal Publishers, New Delhi, 2000.
13. K.Kapadia. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002.
14. S.Benhabib. Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics, London: Routledge, 1992.
15. Virginia Woolf. A Room of One's Own, Oxford: Black Swan, 1992.
16. T.Banuri and M. Mahmood, Just Development Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997.

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-I Sem

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## (A53201)SURVEYING LAB

Prerequisite: Surveying

### COURSE OBJECTIVES:

- To understand the practical applications of survey instruments.
- To know the field measurements and observations.
- To understand the different methods involved in survey field work.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Conduct survey and collect field data
- Prepare field notes from survey data
- Interpret survey data and compute areas and volumes

### LIST OF EXPERIMENTS:

1. Survey of an area by chain survey (closed traverse) & plotting
2. Chaining across obstacles
3. Traversing by compass survey
4. Determination of distance between two inaccessible points with compass
5. Radiation method and intersection methods by plane table survey
6. Two point and three point problems in plane table survey
7. Levelling – longitudinal and cross sectioning and plotting
8. Contouring by fly level
9. Measurement of horizontal and vertical angles using theodolite
10. Trigonometric levelling using theodolite
11. Curve setting using theodolite
12. Heights and distance using principles of tacheometric surveying
13. Introduction to total station: parts, functions and uses.

Note: Students are expected to perform minimum of ten experiments

### List of major equipment:

1. Chains and tapes
2. Compasses
3. Plane tables
4. Levelling instruments
5. Theodolite
6. Tacheometers

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## (A53202) ENGINEERING GEOLOGY LAB

Prerequisite: Engineering Geology

### COURSE OBJECTIVES:

- Determination of Physical and Optical properties of rocks and economic ore minerals
- Delineation of geological subsurface structures by solving structural problems
- Understanding features of geological maps and its applications.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Student can identify important rocks, minerals, ore minerals based on Physical and optical properties to distinguish between strong and weak rocks
- Students can unravel the surface and subsurface geological structures for taking appropriate decision to either construct or to strengthen the existing geological structures for raising civil structures

### LIST OF EXPERIMENTS:

1. Study of physical properties and identification of minerals referred under theory
2. Megascopic and microscopic description and identification of rocks referred under theory
3. Megascopic and microscopic identification of rocks and minerals
4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc,
5. Simple structural geology problems.

Lab Examination Pattern.

1. Description and identification of SIX minerals
2. Description and identification of six (including igneous, sedimentary and metamorphic) rocks
3. Interpretation of a geological map along with geological section
4. Simple strike and dip problems

# ANURAG GROUP OF INSTITUTIONS

## (AUTONOMOUS)

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### (A54001) PROBABILITY AND STATISTICS

Prerequisite: -nil-

#### COURSE OBJECTIVES:

- Understand Chance causes and random variable that describes randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.
- In the discrete case, study of the binomial and the Poisson random variables and the Normal random variable for the continuous case predominantly describe important probability distributions. Important statistical properties for these random variables provide very good insight and are essential for industrial applications.
- The types of sampling, Sampling distribution of means, Sampling distribution of variance, Estimations of statistical parameters, Testing of hypothesis of few unknown statistical parameters.
- Understanding the Experiment and the design of experiment.
- The random processes, The classification of random processes, Markov chain, Classification of states
- Stochastic matrix ( transition probability matrix ), Limiting probabilities, Applications of Markov chains

#### UNIT I

**Probability:** Sample space and events, Classical and Statistical definition of Probability, The axioms of probability, Some Elementary theorems of Probability, Conditional probability, Baye's theorem. Random variables, Discrete and continuous random variable,

#### UNIT II

Definitions of Probability Distribution function, Probability mass function, Probability density function and properties. Definitions of Mathematical expectation, Moments (about origin & Centre), Definition of moment generating function for discrete and continuous random variable.

**Discrete Distributions:** Binomial and Poisson distributions (definition and problems) their mean, variance and moment generating function.

**Continuous Distribution:** Normal and exponential distributions (definition and problems) related properties.

Concepts of Joint Distribution function of more than one random variable, Definition of joint, marginal and conditional distribution (for two variables only).

#### UNIT III

**Sampling distribution:** Populations and samples - Sampling distributions of mean ( $\sigma$  known and unknown)

**Estimation:** Concept of Point estimation and its properties (definition only), Concept of interval estimation with examples.

**Test of Hypothesis:** Null & Alternative Hypothesis, Critical region, Type I and Type II errors, level of significance, one tail, two-tail tests.

**Large sample test:** concerning means – proportions (One and Two samples).

#### **UNIT IV**

**Small sample test:** Chi-Square test, Student's t-test (Single mean, Difference of mean and Paired samples) and F-test.

**Design of Experiment:** Introduction to ANOVA (one – way, two – way), Principles of Design of Experiment, completely randomized design (CRD), randomized complete block design (RBD), Latin Square Design (LSD).(No Derivations only concept, definitions and problems)

#### **UNIT V**

**Stochastic Process:** Introduction to stochastic Process, Classification of Random Processes, Stationary and non-stationary random process, Stochastic Matrix.

**Markov Chain:** Classification of States, Classification of chains, Random Walk and Gambler Ruin.

#### **COURSE OUTCOMES:**

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge population. It is mainly useful for non-circuit branches of engineering.
- Students would be able to design their experiment with the basic norms and test their design efficiency. It is useful to all the branches of engineering.
- The student would be able to understand about the random process, Markov process and Markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able to find the limiting probabilities and the probabilities in nth state. It is quite useful for all branches of engineering

#### **TEXT BOOKS:**

1. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press.
2. Probability and Statistics for Engineers by Richard A Johnson, Pearson Education.
3. Introduction to Probability by Charles M Grinstead, J Laurie Snell, American Mathematical Society.

#### **References:**

1. A.V. Skorokhod, Basic Principles and Applications of Probability Theory, Springer.
2. Arnold O. Allen, Probability & Statistics, Academic Press.
3. Hwei P. Hsu, Theory and Problems of Probability, Random Variables, and Random Processes, Schaum's Outline Series, McGraw- Hill.
4. Mendan Hall, Probability & Statistics, Beaver Thomson Publishers.
5. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.
6. Montgomery: Design and Analysis of Experiments, Wiley.
7. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, JohnWiley & Sons, Ltd.
8. Zivorad R. Lazic, Design of Experiments in Chemical Engineering, Wiley-VCH.

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-II Sem

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## (A54002) ELEMENTS OF ELECTRICAL ENGINEERING

Prerequisite: -nil-

### COURSE OBJECTIVES:

- Student will be able to get the knowledge on fundamental principles of electrical circuits, electrical machines and energy sources.
- Understand the operation of electrical machines power supplies and generating sources.
- Apply the knowledge of electrical circuits and machines to real time systems.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- To identify the basic principles behind electrical circuits and machines.
- To understand the principles of electrical circuits, theorems, electrical machines and energy sources.
- To apply the knowledge in real time systems and will be able to solve the real time problems

### UNIT I

**D.C. Circuits:** Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources; Power and energy; *Electromagnetism* covering, Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF; Concepts of self inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields;

### UNIT II

**Single Phase A.C. Circuits:** Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series- parallel circuits.

### UNIT III

**Three Phase A.C. Circuits:** Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method;

### UNIT IV

**DC Machines:** Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor;

### UNIT V

**Transformers, Three Phase Induction Motors & Energy Sources:** Principle of operation



and construction of single phase transformers (core and shell types). EMF equation, losses and efficiency.

Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter.

**Energy Sources:** Sources of Electrical Energy Introduction to Wind, Solar, Fuel cell, Tidal, Geo-thermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation;

**TEXT/REFERENCE BOOKS:**

1. Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill
2. Hayt and Kimberly, Engineering Circuit Analysis, Tata McGraw Hill
3. Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill
4. Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India
5. Hughes, E. 2005), Electrical Technology .Pearson
6. Parker Smith (2003), Problems in Electrical Engineering , CBS Publishers
7. Van Valkenburg Network Analysis, Prentice Hall, India
8. H. Lee Willis (2004)m Power Distribution Planning Reference Book, CRC Press

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-II Sem

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## (A54003) STRENGTH OF MATERIALS-II

Prerequisite: Strength of Materials-I

### COURSE OBJECTIVES:

- To impart the knowledge of direct and bending stresses in columns.
- To impart the knowledge of analysis of simple indeterminate structures.
- The theory involved in the various columns with various end conditions.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Understand the behaviour of columns under various loads.
- Understand the behaviour of columns and struts and the theories involved.
- Know the analysis of indeterminate beams and curved beams.

### UNIT I

**Direct and Bending Stresses:** Stresses under the combined action of direct axial load and bending moment - core of a section – determination of stresses in the case of chimneys, retaining walls and dams - conditions for stability - stresses due to direct loading and bending moment about both axis.

**Unsymmetrical Bending:** Introduction - principal axes - centroidal principal axes of section –moments of inertia referred to any set of rectangular axes - resolution of bending moment into two rectangular axes through the centroid - location of neutral axis - stresses in beams subjected to unsymmetrical bending - deflection of beams under unsymmetrical bending – concept of shear centre.

### UNIT II

**Principal Stresses and Strains:** Introduction-stresses on an inclined section of a bar under axial loading-compound stresses-normal and tangential stresses on an inclined plane for biaxial stresses - two perpendicular normal stresses accompanied by a state of simple shear-Mohr's circle of stresses-principal stresses and strains-analytical and graphical solutions.

**Thin Cylinders:** Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – change in diameter and volume of thin cylinders – spherical shells.

### UNIT III

**Fixed beams:** Fixed beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – shear force and bending moment diagrams - deflection of fixed beams - effect of sinking of support - effect of rotation of support.

**Continuous beams:** Introduction - Clapeyron's theorem of three moments - analysis of continuous beams with constant moment of inertia with one or both ends fixed - continuous

beams with overhang, continuous beams with different moment of inertia for different spans - Effects of sinking of supports - shear force and bending moment diagrams

#### **UNIT IV**

**Columns and Struts:** Introduction – types of columns – short, medium and long columns - axially loaded compression members - crushing load – Euler’s theorem for long columns – assumptions – derivation of Euler’s critical load formulae for various end conditions - equivalent length of columns- slenderness ratio – Euler’s critical stress - limitations of Euler’s theory – Rankine formula - long columns subjected to eccentric loading – Secant formula – empirical formulae - straight line formula - Prof Perry’s formula

**Beam columns:** Laterally loaded struts subjected to uniformly distributed and concentrated loads - maximum BM and stress due to transverse and lateral loading.

#### **UNIT V:**

**Strain Energy:** Resilience - Gradual, sudden, impact and shock loadings-simple applications.

**Energy Theorems:** Introduction - strain energy in linear elastic system, expression of strain energy due to axial load, bending moments and shear force - Castigliano’s first theorem – deflection of simple beams and pin jointed trusses. Castigliano’s second theorem - Analysis of indeterminate trusses and frames whose degree of redundancy is not exceeding two.

#### **TEXT BOOKS:**

1. D. S. Prakash Rao, ‘Strength of Materials-A Practical Approach’, University Press
2. S. Ramamrutham, ‘Strength of Materials’, Dhanpath Rai Publishers

#### **REFERENCE BOOKS:**

1. Pytel A H and Singer F L, “*Strength of Materials*”, Harper Collins, New Delhi.
2. Beer P F and Johnston (Jr) E R, “*Mechanics of Materials*”, SI Version, McGraw Hill, NY.
3. Popov E P, “*Engineering Mechanics of Solids*”, SI Version, Prentice Hall, New Delhi.
4. Timoshenko S P and Young D H, “*Elements of Strength of Materials*”, East West Press, New Delhi.
5. Shames, I. H., Pitarresi, J. M., “*Introduction to Solid Mechanics*,” Prentice-Hall, NJ.
6. NPTEL courses, <http://nptel.iitm.ac.in/courses.php>, web and video courses on Strength of Materials by Prof. Sharma, S. C., and Prof. Harsha, S. P.
7. Strength of Materials by Schaum’s out line series-Mc.Grawhill International Editions.

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## (A54004) HYDRAULICS AND HYDRAULIC MACHINERY

Prerequisite: Fluid Mechanics

### COURSE OBJECTIVES:

- To provide the knowledge of the flow in open channels and hydraulic models.
- To provide the types, working principles of various turbines and pumps.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Understand the behaviour of flow in open channels and the hydraulic similitude.
- Know the types, working principles and the usage of various turbines and pumps.

### UNIT I

**Open Channel Flow:** types of flows – geometric properties of channels - velocity distribution – energy and momentum correction factors - Chezy's, Manning's and Bazin formulae for uniform flow –Most economics sections - critical flow- specific energy - critical depth - computation of critical depth: critical, sub-critical and super critical flows – application to channel transitions.

### UNIT II

**Non uniform flow in channels:** dynamic equation for gradually varies flow: mild, critical, steep, horizontal and adverse slopes - surface profiles: classification and characteristics - direct step method, rapidly varied flow - hydraulic jump - energy dissipation – surge in open channels.

### UNIT III

**Dimensional Analysis:** Introduction – dimensions – dimensional homogeneity – methods: Rayleigh's method and Buckingham's pi theorem - study of hydraulic models - similitude: geometric, kinematic and dynamic similarities - dimensionless numbers - model laws and - types of models - merit and limitations of models – scale effect in models - prototype relations.

### UNIT III

**Impact of Jets:** hydrodynamic force of jets on stationery flat, moving flat, stationary curved vanes and moving curved vane: jet striking centrally and at tip, velocity triangles at inlet and outlet - expressions for work done and efficiency - angular momentum, principle, applications to radial flow turbines.

**Hydraulic Turbines:** Elements of hydroelectric power plants - heads and efficiencies of turbines - classification of turbines: pelton wheel, Francis turbine, Kaplan turbine - work done, efficiency, velocity diagram, working proportions and design - draft tube theory – surge tank.

**Performance of Turbines:** Performance under unit head – under specific conditions – expressions for specific speeds in terms of known coefficients for different turbines – performance characteristic curves.

## **UNIT V**

**Centrifugal Pumps:** component parts of centrifugal pumps - working of centrifugal pump – types – work done – head of pump - minimum starting speed – losses and efficiencies - specific speed - multi stage pumps - pumps in parallel - performance of a pumps characteristic curves - Net Positive Suction Head (NPSH) - Cavitations.

**Hydropower engineering:** types of hydro power plants – definition of load factor, utilization factor, capacity factor – components of hydropower plants.

## **TEXT BOOKS**

1. P.N. Modi and S.M. Seth, ‘Hydraulics and Fluid Mechanics including Hydraulic Machines’, Standard Book House.
2. A.K. Jain, ‘Fluid Mechanics including Hydraulic Machines’, Khanna Publishers.
3. R. K. Bansal, ‘A Text Book of Fluid Mechanics and Hydraulic Machines’, Laxmi Publications

## **REFERENCES**

1. L. Victor, Streeter and E. Benjamin Wylie, ‘Fluid Mechanics’, Tata McGraw Hill.
2. K.R. Arora, ‘Fluid Mechanics, Hydraulics and Hydraulic Machines’, Standard Publishers.
3. K. Subramanya, ‘Theory and Applications of Fluid Mechanics’, Tata McGraw Hill.
4. M. Franck White, ‘Fluid Mechanics’, Tata McGraw Hill.

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## (A54005) CONCRETE TECHNOLOGY

Prerequisite: Building Materials, Construction and Materials

### Course Objectives:

- To impart the knowledge of the materials required for making the concrete
- To know the properties of various materials used in the concrete
- To provide the knowledge of mix design of concrete and the properties of green & hardened concrete.

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Have the complete knowledge of types and properties of materials require for making concrete
- Know the properties of the green and hardened concrete
- Know the methods of finding the properties of materials and concrete
- Know the IS codal specifications of concrete and its materials.
- Have the knowledge of special concretes.

### UNIT I

**Cement:** Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Test on physical properties – Different grades of cement.

**Water:** Quality of mixing water.

**Aggregates:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate

– Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

### UNIT II

**Fresh Concrete:** Water / Cement ratio – Abram's Law – Gel space ratio - Workability – Factors affecting workability – Measurement of workability by different tests – Setting time of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete

### UNIT III

**Mix Design:** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design-ACI method of mix design - British method.

**Admixtures:** Types of Admixtures – Mineral and chemical admixtures- properties – dosages

– effects – usage.

#### **UNIT IV**

**Hardened Concrete:** Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

**Tests on Hardened Concrete:** Compression tests – Tension tests – Factors affecting strength – Flexure test – Splitting tensile test – Pull-out test.

**NDT:** Codal provisions – Ultrasonic Pulse Velocity – Rebound Hammer Tests – Core cutting test.

**Properties of Hardened Concrete:** Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

#### **UNIT V**

**Special Concretes:** Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete Polymer concrete – Types of Polymer concrete – High performance concrete – Self compacting concrete.

#### **TEXT BOOKS:**

1. M.S.Shetty, 'Concrete Technology', S.Chand & Co.
2. P.K. Mehta and J.M. Paulo Monteiro, Concrete Microstructure Properties and Materials,4/e, McGraw-Hill Professional.

#### **REFERENCES:**

1. A.M. Neville and J.J. Brooks, Concrete Technology,2/e,Prentice Hall, 2010.
2. A.R. Santhakumar, "Concrete Technology", Oxford University Press India
3. M.L. Gambhir, Concrete Technology, 5/e, Tata McGraw-Hill Education.

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

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## (A54006) ENVIRONMENTAL STUDIES (MANDATORY COURSE)

Prerequisite: -Nil-

### COURSE OBJECTIVES:

- To impart the knowledge of multidisciplinary nature of environmental studies.
- To provide the knowledge of natural resources, environmental pollution, waste management technology.
- To impart the knowledge of rules and regulations of environmental policy.

### COURSE OUTCOMES:

**On successful completion of this course, it is expected that the students will be able to,**

- Understand the natural resources such as water, mineral, food, energy, land and their associated problems.
- Understand causes of the environmental pollution and their controlling measures.
- Know environmental policy rules and regulations.

### UNIT I

**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance  
– Need for Public Awareness.

- (a) **Ecosystems:** Concept of an ecosystem – Classification, structure and function of different ecosystems - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids.
- (b) **Biodiversity and its conservation:** Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT II

**Natural Resources:** Renewable and non-renewable resources – Natural resources and associated problems: Forest resources – Use and over – exploitation, deforestation, – Timber extraction, mining, dams and other effects on forest and tribal people: Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, man



induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources: Equitable use of resources for sustainable lifestyles.

### UNIT III

- (a) **Environmental Pollution:** Definition, Cause, effects and control measures of:  
a. Air pollution, b. Water pollution, c. Soil pollution, d. Marine pollution  
e. Noise pollution, f. Thermal pollution, g. Nuclear pollution, h. e-Waste.
- (b) **Social Issues and the Environment:** From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management. -Climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

### UNIT IV

- (a) **Waste management technology:** Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides. Waste water and sewage treatment technology: primary, secondary and tertiary treatments. Bioremediation, Photo-remediation, ZLD (zero liquid discharge), membrane technology. Application of GIS and GPS system in environmental science.
- (b) **Environmental policy, Rules and regulations.** EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act –Forest Conservation Act.-Public awareness. Global environmental problems and global efforts.

### UNIT V

- (a) **Towards sustainable future:** concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. Environmental education, Conservation of resources. Urban sprawl, sustainable cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, Basic principles of Green engineering, clean development mechanism (CDM), Low carbon life cycle, Polluters-pay principle.
- (b) **Field work:** Visit to a local area to document environmental assets River/forest grassland/hill/ mountain Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds, Visit to effluent treatment Plant/sewage treatment plant Study of simple eco systems pond, river, hill slopes, etc.

**Mini projects by students which is mandatory.**

### TEXT BOOKS:

1. Agarwal, K.C., Environmental Biology, Nidi Publication Ltd., Bikaner, 2001.
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmadabad, 2002.

### REFERENCE BOOKS:

1. Clark, R.S., Marine Pollution, Clarendon Press, Oxford, 2002.
2. Cunningham, W.P., et al. , Environmental Encyclopedia, Jaico Publishing House, Mumbai.

# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

II Year B.Tech. Civil-II Sem

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## (A54201) STRENGTH OF MATERIALS LAB

Prerequisite: Strength of Materials-I & II

### COURSE OBJECTIVES:

- To know the functioning and methods of conducting the practical on various equipment to know the properties of materials.
- To know the behaviour of various materials under the loading conditions.

### COURSE OUTCOMES:

On successful completion of this course, it is expected that the students will be able to,

- Understanding the working principles of various machines to conduct the test on materials.
- To know the behaviour of members and their limiting conditions on loading.

1. Torsion Test
2. Bending test on steel/wood cantilever beam
3. Bending test on simply supported beam
4. Hardness test
5. Tension test
6. Test on Helical Spring
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's reciprocal theorem.
11. Demonstration on use of electrical resistance gauges
12. Deflection test on cantilever beams

Note: Students are expected to perform minimum of ten experiments

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**II Year B.Tech. Civil -II Sem**

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### **(A54202) FLUID MECHANIS AND HYDRAULIC MACHINERY LAB**

Prerequisite: Fluid Mechanics & Hydraulic Machinery

#### **COURSE OBJECTIVES:**

- To understand the measurement of flow through open channels and pipes and the problems faced there in.
- To provide the knowledge of working principles of various pumps and turbines.

#### **COURSE OUTCOMES:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the flow measuring equipment and their functioning.
- To know the usage of pumps and turbines.

#### **List of Experiments:**

1. Calibration of venture meter
2. Determination of coefficient of discharge of orifice
3. Determination of coefficient of discharge of mouthpiece
4. Calibration of contracted rectangular notch
5. Calibration of contracted triangular notch
6. Determination of friction factor of a pipe.
7. Determination of coefficient for minor losses.
8. Verification of Bernoulli's equation.
9. Impact of jet on vanes.
10. Study of hydraulic jump.
11. Performance test on pelton wheel turbine.
12. Performance test on Francis turbine
13. Performance characteristics of a single stage centrifugal pump.
14. Performance characteristics of a multi stage centrifugal pump.
15. Performance characteristics of a reciprocating pump.

Note: Students are expected to perform minimum of ten experiments

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### (A54203) CONCRETE TECHNOLOGY LAB

Prerequisite: Concrete Technology

#### Course Objectives:

- To provide the knowledge of various tests conducted on cement, aggregates and concrete.
- To provide the knowledge of IS codal provisions.
- To know various materials used in the concrete and their properties

#### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Understand conducting the tests on various materials used in making the concrete
- Do the consultancy work on concrete materials

#### LIST OF EXPERIMENTS

##### I. Tests on Cement:

1. Fineness and normal consistency of cement
2. Initial setting time and final setting time of cement
3. Specific gravity of cement
4. Compressive strength of cement

##### II. Tests on Aggregate:

1. Fineness modulus of fine and coarse aggregate
2. Specific gravity and bulk density of fine and coarse aggregate
3. Bulking of sand

##### III. Tests on Concrete:

1. Workability tests on concrete by slump and Vee-bee
2. Young's modulus and compressive strength of concrete
3. Splitting tensile strength of concrete
4. Flexural strength of plain concrete
5. Non-destructive testing on concrete (for demonstration)

Note: Students are expected to perform minimum of ten experiments

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**(A55001) STRUCTURAL ANALYSIS**

Prerequisite: Strength of Materials I & II

**Course Objectives:**

- To provide the knowledge of Analysis of indeterminate structures.
- To provide the knowledge of conventional methods of structural Analysis

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Analyze the independent structures by using the conventional methods
- Have the knowledge of influence lines and moving loads & their applications for analyzing the simple structures

**UNIT I**

**Indeterminacy of Structures:** Degree of static indeterminacy of pin jointed and rigid jointed plane and space structures - degree of kinematic indeterminacy of rigid jointed plane structures

**Arches:** Elastic theory of arches - Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

**Two Hinged Arches:** parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading and temperature effects.

**UNIT II**

**Moment Distribution Method:** Stiffness of member with farther end fixed and hinged – moment distribution – distribution factor - application to continuous beams with and without settlement of supports - application to portal frames with and without sway.

**UNIT III**

**Slope-Deflection Method:** Derivation of slope deflection equations - Application to continuous beams with and without settlement of supports - Application to portal frames with and without sway (DOF not exceeding 3).

**UNIT IV**

**Influence Lines and Moving Loads:** definition of Influence Line (IL) - IL for support reactions, shear force (SF) and bending moment (BM) at a section for ss beams with and without overhang - Load position for maximum reaction, SF and BM at a section due to moving point loads, udl longer than span and shorter than the span- two/several point loads - Maximum BM under a chosen point load - Absolute maximum BM for a girder.

Influence lines for forces in members of Pratt and Warren trusses.

Influence lines for three hinged arches.

**UNIT V:**

**Approximate Methods:** Application to building frames – portal method – Cantilever method - Substitute frame method.

**Beams curved in plan:** Introduction – circular beams loaded uniformly and supported on symmetrically placed columns - semi circular beam simply supported on three equally spaced supports.

**TEXT BOOKS:**

1. Structural Mechanics Vol I & II, Junnarkar S B, Charotar Publishers
2. Structural Analysis by A. K. Jain
3. Theory of Structure by, S. Ramamrutham, Dhanpath Rai & Sons
4. R. Subramanian ,Strength of Materials, 2/e, Oxford University Press, 2010.
5. T.S. Thandavamoorthy, Structural Analysis, 2/e, Oxford University press.

**REFERENCE BOOKS:**

1. Structural Analysis Volume – I , Devdas Menon, Narosa Publication
2. Structural Analysis Volume – I, Bhavikatti, 3rd edition, Vikas Publishers.
3. Basic Structural Analysis, C S Reddy, Tata McGraw Hill
4. Theory of Structures, Timoshenko & Young, Tata McGraw Hill
5. Intermediate Structural Analysis, C K Wang, McGraw Hill
6. Elementary Structural Analysis, Norries & Wilbur, McGraw Hill
7. Structural Analysis, Laursen H I, McGraw Hill
8. Structural theorems and their application, B G Neal, Pergamon Press.
9. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.

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III Year B.Tech. CIVIL - I Sem

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## (A55002) DESIGN OF REINFORCED CONCRETE STRUCTURES

Prerequisite: Strength of Materials & Structural Analysis

### Course Objectives:

- To provide the basic concepts of reinforced concrete design
- To impart the knowledge of various methods of design
- To provide the design of simple structural elements such as beams, Columns, footings & slabs

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Know the methods of design of R.C. Structural elements
- Know the IS codal provisions of various R.C. Structural elements
- Design the structural elements with innovative ideas.

### UNIT I

**Concepts of RC Design:** Working stress method - Ultimate load method - Limit State method - Stress-strain curve for concrete, steel - Partial safety factor - Characteristic values - Stress Block parameters – IS:456 2000 provisions.

### UNIT II

**Design and Detailing of Beams:** Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

**Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, IS Code provisions. Design examples in simply supported and continuous beams, detailing.

### UNIT III

**Design and Detailing of Slabs and Stair Cases:** Design of one way, two way and continuous slabs using IS Codes - Limit state of serviceability for deflection and cracking – IS Code provisions - Introduction to yield line theory - Design principles of staircases.

### UNIT IV

**Design and Detailing of Short and Long Columns:** Subjected to axial loads – uniaxial and biaxial bending - IS Code provisions.

### UNIT V

**Design and Detailing of Footings:** Different types of footings – Design of isolated, square, rectangular and circular footings - Introduction to combined footings.

### TEXT BOOKS:

1. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e Standard book house, 2012.
2. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.

3. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India,2013.

**REFERENCE BOOKS:**

1. Plain and Reinforced Concrete, Vol. I, Jain & Jaikrishna, Nemchand Brothers.
2. Design of Reinforced Concrete Structures, Dayaratnam P, Oxford & IBH.
3. Ultimate Strength Design for Structural Concrete, Arthur P D & Ramkrishnan V, Wheeler & Co.
4. Limit State Theory for Reinforced Concrete Design, Huges B P, Pitman.
5. Reinforced Concrete, Warner R F, Rangan B C & Hall A S, Pitman.
6. Reinforced Concrete, H.J. Shah, Charotar Publisher.
7. Theory of Reinforced Concrete, Shina & Roy
8. Limit State Design - Reinforced Concrete, Shah & Karve,
9. Illustrated Reinforced Concrete Design, V.L. Shah & S.R. Karve
10. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University, 2014.



# ANURAG GROUP OF INSTITUTIONS (AUTONOMOUS)

III Year B.Tech. CIVIL - I Sem

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## (A55003) ENVIRONMENTAL ENGINEERING

Prerequisite: Environmental Studies

### Course Objectives:

- To provide the knowledge of source of water and its distribution.
- To impart the knowledge of various treatment required for potable water
- To provide the knowledge of characteristics of sewage and its treatment.

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Have the complete knowledge of source of water, its demand and standards.
- Have the knowledge of various treatment methods in treating the drinking water and sewage
- Design the various treatment plants and water distribution system

### UNIT I

**Introduction:** waterborne diseases – protected water supply – populations forecasts, design period – water demand – types of demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

**Sources of water:** Selection of water source based on quality, quantity and other considerations – intakes – infiltration galleries, confined and unconfined aquifers distribution system – requirements – methods and layouts.

### UNIT II

Layout and general outline of water treatment units – sedimentation, uniform settling velocity – principles – design factors – surface loading – jar test - optimum dosage of coagulant – coagulation fluctuations clarifier design – coagulants – feeding arrangements

**Filtration:** – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – types of disinfection theory of chlorination - chlorine demand other disinfection treatment methods.

### UNIT III

Distribution systems – types of layouts of distribution systems – design of distribution system – Hardy cross and equivalent pipe methods and service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meter – laying and testing of pipe lines – pump house.

Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water over flows combined flow.

Layouts and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles and design of biological treatment – trickling filters – standard and high rate.

### UNIT IV

Characteristics of sewage – cycle of decay – decomposition of sewage, examination of

sewage – BOD – COD. Equations , design of sewers – shape and materials – sewer appurtenances man holes – inverted siphon – catch basins – fusing tanks – ejectors, pumps and pump houses and house drainage – components requirements – sanitary fittings – traps – one pipe and two pipe systems of plumbing ultimate disposal of sewage – sewage farming – dilution.

#### **UNIT V**

Waste water treatment plant- Flow diagram – primary treatment design of screens – grid chambers – skimming tanks –sedimentation tanks – principles of design – biological treatments – trickling filters – standard and high rate - Construction and design of oxidation ponds. Sludge digestion tanks – factor affecting – design of digestion tanks – sludge disposal by drying – septic tanks working principles and design – soak pits.

#### **TEXT BOOKS**

1. K.N. Duggal, Elements of Public Health Engineering, S Chand, 1988
2. P.N. Modi, Water Supply Engineering - Environmental Engineering (Vol I), Standard Book House, 2006

#### **REFERENCE BOOKS**

1. S.K. Garg, Environmental Engineering Vol I: Water Supply Engineering, Khanna Publishers, 2004.
2. Gurucharan Singh Water Supply and Sanitary Engineering Vol, 1; Standard Publishers, Distributors, 2013.
3. J. Mark Hammer Water and Wastewater Technology ; John Wiley and Sons, 2013.
4. Manual on Water Supply and Treatment; CPH and EEO, Ministry of Urban Development; Govt, of India, New Delhi.

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**(A55004) SOIL MECHANICS**

Prerequisite: Strength of Materials I & II

**Course Objectives:**

- To provide the basic knowledge of soil formation and the properties of various soils.
- To provide the knowledge load bearing capacity of various soils and the effect of seepage and permeability on soils
- To impart the knowledge of methods of improving the load bearing capacity of the soils.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the soil formation, the effect of permeability and seepage on soils.
- Know the methods of tests conducting on soils
- Know the lab tests and field tests on soils.
- Know the methods of improving the load bearing capacity on various soils

**UNIT I**

**Introduction:** Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density.

**Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

**UNIT II**

**Permeability:** Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting – laboratory determination of coefficient of permeability – Permeability of layered soils – Insitu permeability tests (Pumping in & pumping out test).

**Effective Stress & Seepage Through Soils:** Total, neutral and effective stresses – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

**UNIT III**

**Compaction:** Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties. – Field compaction Equipment – compaction quality control.

**Consolidation:** Types of compressibility – immediate settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normal consolidation soil, over consolidated soil and under consolidated soil – preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation : square root time and logarithm of time fitting methods.

**UNIT IV**

**Shear Strength of Soils:** Importance of shear strength - Mohr – Coulomb Failure theories- Types of laboratory strength tests – strength tests based on drainage conditions- strength envelopes – Shear strength of sands – dilatancy Critical void ratio – Liquefaction- shear strength of clays.

## **UNIT V**

**Slope Stability:** Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's simplified method – Taylor's stability number – stability slopes of earth dams under different conditions.

### **TEXT BOOKS**

1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications.
2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers.

### **REFERENCES:**

1. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork
2. Geotechnical Engineering by Purushotham Raj
3. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi
4. C. Venkataramaiah, Geotechnical Engineering, ,New Age International, 2006.
5. H. Iqbal Khan, Text Book of Geotechnical Engineering, Prentice Hall of India, 2005.
6. M. Braja Das, Principles of Geotechnical Engineering,Cengage Learning, 2013.
7. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.
8. Rodrigo Salgado, The Engineering of Foundations, McGraw Hill, 2006.

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**(A55005) GROUND WATER DEVELOPMENT AND MANAGEMENT**  
(PROFESSIONAL ELECTIVE-I)

Prerequisite: -nil-

**Course Objectives:**

- To enable the students to know the ground water occurrence.
- To know the various theories and methods of knowing the ground water levels.
- To know the methods of artificial recharging of ground water.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the availability of ground water, its movement and its contour applications
- Know the methods of artificial recharge of ground water and RS & GIS applications

**UNIT I**

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention. Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system.

**UNIT II**

Ground water flow contours their applications. Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests.

**UNIT III**

Analysis of Pumping Test Data – II: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jacob and Chow's simplifications, Leak aquifers. Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

**UNIT IV**

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

**UNIT V**

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

**TEXT BOOKS:**

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

**REFERENCES:**

1. Groundwater by Bawvwr, John Wiley & sons.
2. Groundwater System Planning & Management – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.
4. Geotechnical Engineering K.R. Aurora

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### (A55006) ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT (PROFESSIONAL ELECTIVE-I)

Prerequisite: Environmental Engineering

#### Course Objectives:

- To impart the basic concepts of EIA and its methodologies
- To know the environmental audit and legislation
- To impart the knowledge of soil quality, EIA in surface water, air and biological environment and causes and effects of deforestation

#### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Appreciation of the contexts and role of EIA in environmental management
- Understanding of the elements of EIA and the processes by which they are applied
- Confidence to apply the framework of EIA to relevant situations.

#### UNIT I

**Basic Concept of EIA:** Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

#### UNIT II

**E I A Methodologies:** Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis. Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives.

#### UNIT III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact. Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

#### UNIT IV: Environmental Audit & Environmental legislation

Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

#### UNIT V

Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Motar Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

**TEXT BOOKS:**

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

**REFERENCES:**

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi



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**(A55007) BUILDING SERVICES**  
**(PROFESSIONAL ELECTIVE–I)**

Prerequisite: Design of RC Structures

**Courses Objective:**

- To design a building with all essential facilities for better life style
- To create a sustainable structure
- To design a green building

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the essential requirement of a building and their installations
- Design a building with sound proof
- Know the requirement of fire fighting and safety measures of a building
- Understand the mechanical instruments requirement and their installation in a building

**UNIT I**

**Plumbing work:** Water supply and sanitary provisions, Accessories of sanitary provision, methods of plumbing, problems associated with plumbing work.

**UNIT II**

**Acoustics, Sound Insulation and Noise Control:** Basic terminology and definitions, Physics of sound, behaviour of sound in an enclosed space, requisites for acoustic environment, acoustic design approaches for different building types, with reference to applicable standards, selection of acoustic materials, noise and its control, control of structure borne sound and noise from different mechanical equipment.

**UNIT III**

**Electrical and Allied Installations: day lighting , basic design, artificial lighting** .Different types of wiring, need of earthing, comparison between fuse and MCB, substation, types of lightening fixtures, electricity distribution in multi-storeyed building. Building protection against lightening, Planning and layout of electrical installations within a building complex.

**UNIT IV**

**Ventilation:** Functions of ventilation, supply of fresh air, convective cooling, Stack effect, physiological cooling, provision for air movement; wind effect, Air flow through buildings, cross-ventilation, position and size of openings, air flow around buildings, humidity control.

**Air Conditioning, Heating and Mechanical** (Thermodynamics of human body.) Ventilation: Requirement of air conditioning, air conditioning system, elements of air conditioning, Working and p-H diagram of vapour compression cycle, refrigeration effect,

## **UNIT V**

**Mechanical Equipment & Installation:** Installation of lifts and escalators, different types of Security and alarm systems. Hot Water Provision (Solar and Electrical), Special features required for physically handicapped and elderly.

**Firefighting and safety measures :** Planning considerations in buildings using non-combustible materials, escapes, Fire detection and fire fighting systems. Heat and smoke detectors, Fire alarm system, Automatic sprinklers.

**Assignment:** Case Study of any Building & its services

### **TEXT BOOKS:**

- 1 Building Services Engineering by David V Chadderton
- 2 General Specification for Electrical Work – Part – I, II & III, Government of India Publication, Jain Book Depot.

### **REFERENCE BOOKS:**

- 1 General Specification of Heating & Ventilation - 2004, Government of India Publication, Jain Book Depot.
- 2 Handbook on Functional Requirement of Buildings.
- 3 Building Services Environmental & Electro – Mechanical Services, by S M Patil, Jain Book Depot.

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## (A55008) WATERSHED MANAGEMENT (PROFESSIONAL ELECTIVE –II)

Prerequisite: -nil-

### Course Objectives:

- To provide the concept and characteristics of watershed management system
- To know the principles and measures to control the soil erosion
- To know the cropping management system

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Understand the need of watershed development in India
- Know the controlling techniques of soil erosion
- Plan the watershed management activities and preparation of action plan

### UNIT I

**Introduction:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

**Characteristics of Watershed:** size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

### UNIT II

**Principles Of Erosion:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

**Measures to Control Erosion:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

### UNIT III

**Water Harvesting:** Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

**Land Management:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

### UNIT IV

**Ecosystem Management:** Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

### UNIT V

Planning of watershed management activities, people's participation, preparation of action plan, administrative requirements.

**TEXT BOOKS:**

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers

**REFERENCE:**

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India

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**(A55009) REHABILITATION AND RETROFITTING OF STRUCTURES**  
(PROFESSIONAL ELECTIVE-IV)

Prerequisite: Design of RC Structures

**Course Objectives:**

- To understand the maintenance and repair strategies required for concrete, steel, timber and masonry structures.
- To understand the advanced technologies available in repairing of structures
- To know the seismic retrofitting of structures

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the behavior of existing constructions.
- Understand the main causes of structural failures and will be able to give the guidelines to their repairs and retrofitting.
- Give the guidelines and retrofitting procedures required for seismic prone structures

**UNIT I**

**Maintenance and Repair Strategies:**

Maintenance, Facets of Maintenance, importance of Maintenance, various aspects of Inspection, Condition Assessment of a structure, Various methods of Condition assessment , NDT and NDE ,Repair Strategies , Repairs-Rehabilitation-Retrofitting-Strengthening-Upgradation of a Structure, Selection of Materials and Techniques for Repair

**UNIT II**

**Repairs to Masonry and Concrete Structures:**

Methods of crack repair in masonry and concrete structures, routing and sealing of cracks, removal and surface preparation in masonry and concrete structures, reinforcement repair, anchorage, placement methods; Shot-creting and guniting, Grouting- Portland cement grouting, chemical grouting, Dry packing, polymer impregnation, Strengthening of structures flexural strengthening, Shear Strengthening, strengthening of columns- jacketing of Columns, strengthening by interior and external reinforcing, External Pre-stressing, Fiber wrapping, Corrosion Protection: surface treatment, joint sealants, cathodic protection

**UNIT-III**

**Repairs to Timber and Steel Structures:**

Testing of Timber Structures for rots, Creosote retention, Planning for repairs in Timber Structures- Repairs to Timber Structures, Dynamic Loading and Fatigue, welding technology, weldability, Cleaning and surface Preparation of Corroded Structural Steel, replacement and addition of new members, different Types of Steel and Composite Joints.

## **UNIT IV**

### **Repairs to Special Structures and Special Repairing Techniques:**

Repairs to Concrete Structures under water , Repairs to Bridges , Repairs to Water Tanks , Repairs to Tunnels , Repairs to Dams – At least one case study for each of these structures –

## **UNIT V**

### **Seismic Retrofitting of Structures:**

Retrofit of Reinforced Concrete Buildings - Retrofit of Steel Buildings - Retrofit of Foundations - Base Isolation and Energy Dissipation - Retrofit Case Studies

### **TEXT BOOKS:**

1. Den Campbell, Allen and Harold Roper, “Concrete Structures Materials, Maintenance and Repair”, Longman Scientific and Technical, UK, 1991.
2. Allen R.T and Edwards S.C, “Repair of Concrete Structures”, Blakie and Sons, UK, 1987
3. Philip H. Perkins”Repair , Protection and Waterproofing of Concrete Structures”,Elsevier Applied Science Publisher, London,Newyark, 1986
4. P.C. Guha “ Maintenance and Repairs of Buildings “ , New Central Book Agency , Kolkata 2006.

### **REFERENCES:**

1. H.W.Kwon “ Maintenance and Repair of Concrete under water” , 11th International Conference Proceedings ,Conclinic Co. Ltd., 2013
- 2..CPWD “ Handbook on Repair and Rehabilitation of RC buildings “ , Director General of CPWD , New Delhi,2002
3. IITM & CPWD “ Hand book on Seismic Retrofit of buildings “ , Narosa Publishing House
4. American Wood Council “ National Design Specification “ , 2005

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**(A55010) AIR POLLUTION AND CONTROL**  
(PROFESSIONAL ELECTIVE-II)

Prerequisite: -nil-

**Course Objectives:**

- To learn the source of air pollution and its effects on humankind
- To learn the meteorology and plume dispersion
- To design and operation of air pollution equipment

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand in general terms, the major issues and challenges facing and air transportation in the 21<sup>st</sup> century.
- Properties of atmosphere and its influence on the control of air pollution
- Manage the air quality in atmosphere for better living

**UNIT I**

Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

**UNIT II**

Effects of air pollutants on man, material and vegetation: global effects of air pollution – green house effect, heat islands, acid rains, ozone holes etc.

Thermodynamics and kinetics of air-pollution – applications in the removal of gases like SO<sub>x</sub>, NO<sub>x</sub>, CO, HC etc., air-fuel ratio, computation and control of products of combustion.

**UNIT III**

Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

Lapse Rates, Pressure Systems, Winds and moisture plume behavior and plume rise models; Gaussian Model for Plume Dispersion.

**UNIT IV**

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

**UNIT V**

General Methods of Control of NO<sub>2</sub> and SO<sub>2</sub> emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management – Monitoring of SPM, SO<sub>2</sub>; NO and CO Emission Standards.

**TEXT BOOKS:**

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata McGraw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York.

**REFERENCE:**

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



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**(A55011) PERSONALITY DEVELOPMENT AND CAREER BUILDING**  
(MANDATORY COURSE)

Prerequisite: -nil-

**1. Introduction:**

The world is in need of skilful employees who can contribute towards organizational growth. The professionals are expected to be confident and maintain amicable relations with clients and customers. With this backdrop, this course helps the students understand the importance of various aspects of professional life.

The course aims at making the students familiar with the corporate world and grooms them accordingly. This course is designed to improvise communication principles, interpersonal communication and public speaking of learners.

**2. Objectives:**

- a. To prepare the students to understand and acquire different personality traits
- b. To mould the students for global challenges and international careers
- c. To excel the students in areas of self – management and Ethics at work place.

**3. Learning Outcomes:**

- a. Apply the learning from the class in day-to-day life
- b. Manage and Implement their expertise in personal and professional life
- c. Evaluate their learning everyday and enhance the requisite skills

**UNIT I**

**Self – Improvement:** Self Esteem, SWOT-Analysis, Attitude, Image Matters

**UNIT II**

**Communication Essentials:** Communication Basics, Barriers to Communication, Listening Skills, Communication Styles, Fitting In and Getting Along, Communicating Electronically

**UNIT III**

**Work Skills:** Self – Management Tools, Efficient Work Habits, Our Diverse Society, Understanding Other Cultures, Fairness in the Workplace, Right and Wrong in the Workplace

**UNIT IV**

**Leadership Skills:** What Makes a Leader, Empowering and Influencing Others, Leading Change and Innovation.

**UNIT V**

**Career Planning:** Analyse Your Interest and Qualifications, Networking and Other Sources of Job Leads, Job Search Documents, the Job Interview, Planning Your Career, Networking – It Never Stops.

**TEXT BOOK:**

1. Personal Development for Life and Work by Masters Wallace, published by CENGAGE Learning

**REFERENCES:**

1. Covey, Stephen. Seven Habits of Highly Effective People. New York: Simon and Schuster, Inc., 1989
2. Ruble, Peter . “Is Perception Reality?” [www.ezinearticles.com](http://www.ezinearticles.com)
3. Peale, Norman V. The Power of Positive Thinking. New York: Simon and Schuster, 2002.
4. Carneige, Dale. How to win friends & Influence People. Maanu Graphics Publishers
5. Sharma, Robin. The Monk Who Sold His Ferrari. Jaico

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## (A55201) ENVIRONMENTAL ENGINEERING LAB

Prerequisite: Environmental Engineering

### Course Objectives:

- To know the various lab tests involve in knowing the properties of water and sewage
- To provide the knowledge of methods of conducting the lab test

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Know the standard limits of water and sewage.
- Have the knowledge of consultancy potential of water and sewage test.

### LIST OF EXPERIMENTS

1. Determination of pH and turbidity
2. Determination of conductivity and total dissolved solids (Organic and Inorganic)
3. Determination of alkalinity/acidity
4. Determination of chlorides
5. Determination of iron
6. Determination of dissolved oxygen
7. Determination of nitrates
8. Determination of optimum dose of coagulant
9. Determination of chlorine demand
10. Determination of total phosphorous
11. Determination of B. O. D.
12. Determination of C. O. D.
13. Presumptive coliform test

Note: Students are expected to perform minimum of ten experiments

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**(A55202) SOIL MECHANICS LAB**

Prerequisite: Soil Mechanics

**Course Objectives:**

- To impart the knowledge of various tests conducted to know the properties of soils
- To impart the knowledge of field tests involved in knowing the soil properties

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Have the knowledge of field tests and lab tests conducted on soils.
- Get the complete knowledge of properties of various soil.
- Have the innovative methods of conducting the tests on soils.
- Do the consultancy work on soil properties.

**LIST OF EXPERIMENTS**

1. Attenberg Limits (Liquid Limit, Plastic Limit)
2. (a) Field density by core cutter method and (b) Determination of specific gravity of soil
3. Field density by sand replacement method
4. Grain size distribution by sieve analysis
5. Grain size distribution by hydrometer analysis
6. Permeability of soil by constant and variable head test methods
7. Standard Proctor's compaction tests
8. Determination of coefficient of consolidation (Square root time fitting method)
9. Unconfined compression tests
10. Triaxial compression test
11. Direct shear test
12. Vane shear test
13. Differential free swell index

Note: Students are expected to perform minimum of ten experiments

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**(A56001) DESIGN OF STEEL STRUCTURES**

Prerequisite: Strength of Materials

**Course Objectives:**

- To provide the knowledge various materials used and their properties in the steel design
- To provide the knowledge of various connections involved in steel structures
- To provide the knowledge of design principles of various elements of steel structures

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Have the knowledge of various steels used in the construction of steel design and their properties.
- Have the thorough knowledge of IS codal provisions and the design of various structural steel elements such as beams, girders, columns, columns bases.
- Design various connections involved in the steel structures.

**UNIT I**

**Materials** - Composition of steel - types of structural steel - mechanical properties of steel - concept of plasticity - yield strength - loads and combinations - local buckling behavior of steel - concept of limit state design - limit states - design strengths - deflection limits - serviceability - stability check.

**Bolted Connections:** Types of bolts – types of joints - failure of joints - specifications - design strength - efficiency of joint - prying action.

**Welded connections:** Types of welded joints - specifications - design requirements.

**UNIT II**

**Design of Tension Members** - Design strength - design procedure – splice - lug angle.

**Design of Compression Members:** Buckling class - slenderness ratio - design strength - design of angle section.

**UNIT III**

**Design of Columns and Column Bases:** Rolled steel columns - built-up columns: laced and battened - slab base - gusseted base.

**UNIT IV**

**Design of beams:** types of sections – classification of cross sections - bending and shear strength of beams – web buckling – web crippling – design - built-up beams – bearing plates - laterally supported beams.

**Beam Connections:** Design of eccentric connections – framed, seated and stiffened seated connections.

**UNIT V**

**Design of welded plate girder:** Elements - economical depth - design of main section - connections between web and flange - design of stiffeners - design of web splice & flange splice.

**TEXT BOOKS**

1. Design of steel structures – N.Subramaniam, oxford university press -2009.
2. Limit state design of steel structures, S.K. Duggal, Tata Mcgraw –Hill, 2010.
3. Design of steel structures Vol I&II by Ramachandra, Standard Publications.

**REFERENCE BOOKS**

1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800- 2007, Structures Publications, 2012.
2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013.
3. R. Narayanan, Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4. Ramachandra and V. Gehlot, Design of Steel Structures, Scientific Publishers, 2009

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(A56002) WATER RESOURCES ENGINEERING

Prerequisite: Fluid Mechanics

## Course Objectives:

- To provide the knowledge of hydrology and hydrologic cycle and its applications.
- To provide the knowledge of ground water occurrence and the importance of irrigation.
- To impart the knowledge of design of irrigation canals.

## Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Have the knowledge of rain water, ground water and their utility.
- Design the irrigation structures and canals.

## UNIT I

Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data – Adjustment of record – Rainfall double mass curve. Runoff – factors affecting Runoff – Runoff over a catchment – Empirical and Rational Formulae.

Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-evapo transpiration-Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices..

## UNIT II

Distribution of Runoff-Hydrograph Analysis Flood Hydrograph – effective Rainfall - base flow separation – Direct Runoff Hydrograph- Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph, from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

## UNIT III

Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissibility and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of wells – Well Construction – Well Development

## UNIT IV

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, Duty and delta, factors affecting duty- Design discharge for water course. Depth and frequency of Irrigation, irrigation efficiencies – water Logging.

## **UNIT V**

Classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for a canal design canal lining.

Design Discharge, Computation of design discharge-rational formula, SCS curve number method, flood frequency analysis introductory part only – Stream Gauging – measurement and estimation of stream flow. -

### **TEXT BOOKS:**

1. Jayaram Reddy, 'Engineering Hydrology', Laxmi publications pvt. Ltd., New Delhi
2. S K Garg, Irrigation Engineering & Hydraulic Structures, Khanna Publishers
3. P N Modi, Irrigation Engineering & Hydraulic Structures, Standard Book House,2014

### **REFERENCE BOOKS:**

1. G L Asawa, Irrigation Engineering, Wiley Eastern
2. B.C. Punmia and B.B. Lal Pande, Irrigation and Water Power Engg, 16 e, Laxmi Publications, 2014.
3. J D Zimmerman, Irrigation, John Wiley & Sons
4. Varshney, Gupta & Gupta, Theory and Design of Irrigation Structures, Nem Chand & Bros.



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(A56003) FOUNDATION ENGINEERING

Prerequisite: Soil Mechanics

## Course Objectives:

- To provide the knowledge of stress distribution in soils, methods of finding the load bearing capacity of soils and settlement of soils.
- To provide the knowledge of various kinds of foundations.
- To impart the knowledge of earth pressure theories and there causes .

## Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Know the knowledge of stress distribution in soils due to various kinds of loads
- Know the various methods of load bearing capacity of soils and settlement of soils
- Design the various kind of foundations, Retaining walls caissons.

## UNIT I

**Stress Distribution in Soils:** Boussinesq's and Westergaard's theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

## UNIT II

**Earth Pressure Theories:** Lateral Earth pressure, earth pressure at rest, earth pressure theories, Rankine's theory of earth pressure, Coulomb's earth pressure theory, Culmann's graphical method.

**Retaining Walls:** Type of Retaining walls, stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

## UNIT III

**Bearing Capacity of Soils:** Karl von Terzaghi's equation for bearing capacity in soils – its modification for continuous, square, rectangular and circular footings, general and local shear failure conditions. Plate load test as per IS specification. Allowable bearing capacity. Standard penetration test and use of N values for estimating soil condition and bearing capacity. Proportioning of footings and rafts.

## UNIT IV

**Shallow Foundations – Bearing Capacity Criteria:** Types of choice of foundation – location of depth – safe bearing capacity – Terzaghi, Meyerhof, Skempton IS methods.

**Shallow Foundations – Settlement Criteria:** Safe bearing pressure based on N value – allowable bearing pressure: safe bearing capacity – plate load test – allowable settlements of structures.

## **UNIT V**

**Pile Foundation:** Types of piles – load carrying capacity of piles based on static pile formulae – Dynamic pile formula –pile load tests- load carrying capacity of pile groups in sands and clays – settlement of pile groups.

**Well Foundation:** Types – different shapes of wells – components of wells – functions and design criteria – sinking of wells – tilts and shifts.

## **TEXT BOOKS**

1. Soil Mechanics and Foundation Engineering, B.C.Punmia, Laxmi Publications, 2010
2. Soil Mechanics and Foundation Engineering, K.R.Arora, Standard Publishers, New Delhi

## **REFERENCE BOOKS:**

1. Soil Mechanics in Engineering Practice by K. Terzaghi & R.B. Peck Wiley 3rd Ed.
2. Design Aids in Soil Mechanics and Foundation Engineering by S.R. Kaniraj, TMH New Delhi, 2004
3. Foundation Design Manual by N.V. Nayak, Dhanpat Rai Publications, New Delhi
4. Relevant Indian Standard Specifications and Codes.
5. Gopala Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, New age Publishers, 2000.
6. C. Venkataramaiah, Geotechnical Engineering, New Age Publishers, 2006.
7. V.N.S. Murthy, Soil Mechanics, Foundation Engineering, UBS Publishers, 2011.
8. J.E. Bowles, Foundation Analysis and Design, McGraw Hill, Publishers, 2001.

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**(A56004)TRANSPORTATION ENGINEERING**

Prerequisite: Building Materials

**Course Objectives:**

- To provide the knowledge of highway development, planning and its geometric design
- To provide the knowledge of traffic regulations and its management.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Have the knowledge of highway planning, survey involved and its geometric design
- Have the knowledge of basic parameter of traffic regulations and management.
- Have the knowledge of pavement design as per the IRC codal provisions

**UNIT I**

**Highway Development and Planning:** High way development in India – necessity for high way planning – different road development plans. Classification of roads – road network patterns – high way alignment – factors affecting alignment – engineering surveys – drawings and reports, road projects initiation need based planning.

**UNIT II**

**Highway Geometric Design:** Importance of geometric design – design controls and criteria – high way cross section elements – sight distance elements – stopping sight distance, over taking sight distance and intermediate sight distance – design of horizontal alignment – design of super elevation and extra widening – design of transmission curve – design of vertical alignments – gradients – vertical curves. Typical cross sections for different types of roads

**UNIT III**

**Traffic Engineering:** Basic parameters of traffic – volume , speed and density – traffic volume studies – data collection and presentation – parking studies and parking characteristics – road accidents – causes and preventive measures – accident data recording – condition diagram and collision diagrams . traffic infrastructures and safety audits

**UNIT IV**

**Traffic Regulation and Management:** Road traffic signs – types and specifications – road markings – need for road markings – types of road markings – design of traffic signals – Webster method – IRC method intelligent transportation systems typical architectures

**UNIT V**

**Traffic Intersection Design:** types of intersections – conflicts at intersections – types of at – grad intersections – canalization: objectives – traffic islands and design criteria – types of grade separated intersections – rotary intersections – concept of rotary and design criteria – impact of geometrics on intersection with reference safety, operational capacity

**Pavement Design:** Pavement types, factors to be considered for pavement design –

Concept of layer theory, design wheel load, ESWL, EALF, vehicle damage factor, design by CBR developed by US corps of Engineers, IRC cumulative standard axiles methods (IRC 37: 2002).

### **TEXT BOOKS**

1. Khanna and Justo, Highway Engineering, 10/e, Nem Chand and Bros, 2014.
2. L.R. Kadiyali, N.B. Lal, Principles and Practice of Highway Engineering, 6/e, Khanna Publication, 2014.

### **REFERENCE BOOKS**

1. Highway Engineering by S.B.Bindra, Dhanpat Rai & Sons Publications, 4<sup>th</sup> edition
2. Traffic Engineering and Transportation Planning – Dr.L.R.Kadyali, khanna publications
3. Principles of Traffic Engineering by Garber & Hoel, CengageLlearning.
4. W.R. McShane and R.P. Roess, Traffic Engineering, Prentice Hall India, 2010.
5. C. JotinKhisty and B. KentLal, Introduction to Highway Engineering,3/e, Prentice Hall India, 2002.

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**(A56005) ADVANCED STRUCTURAL ANALYSIS**  
(PROFESSIONAL ELECTIVE-III)

Prerequisite: Structural Analysis

**Course Objectives:**

- To use the matrix algebra for the analysis of simple structures
- To provide the knowledge of analysis of indeterminate skeletal structures

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Analyze the skeletal structures by matrix methods
- Simplify the analysis by taking the advantage of symmetry of structures

**UNIT I**

**Flexibility Matrix Method:** Degree of indeterminacy of plane & space structures (static and kinematics) - description of method, flexibility coefficients, steps in the analysis, application to beams and trusses with kinematic indeterminacy not exceeding three.

**UNIT II**

**Stiffness Matrix Method:**, stiffness matrix of a spring element, analysis of spring systems, discretization, assembly of global stiffness matrix, stiffness matrix of a bar element, analysis of bar systems, discretization and analysis of tapered bar structures.

**Analysis of Beams by Stiffness Method:** Stiffness matrix of a beam element equivalent nodal load vector due to point load, udl and a couple, steps in the analysis, application to the problems with not more than three DOF.

**UNIT III**

**Analysis of Plane Trusses by Stiffness Method:** Global local coordinate systems, stiffness matrix of a truss element in local axis, transformation matrix, stiffness matrix in global axis, forces in the members, steps in the analysis, application to plane trusses with not more than 3 DOF, trusses involving with members of too long and too short in length and with change of temperature.

**UNIT IV**

**Analysis of Plane Frames by Stiffness Method:** Stiffness matrix of a plane frame element in local axis, steps in the analysis, transformation matrix, stiffness matrix of a plane frame element in global axis, steps in the analysis, application to frames with not more than three DOF.

**UNIT V**

**Additional topics:** Use of symmetry and anti-symmetry, analysis of trusses with inclined supports, beams with shear deformations, beams with hinged ends. Banded matrix, semi band width, band minimization techniques

**TEXT BOOKS:**

1. Matrix methods of structural analysis by P.N. Godbole, R.S. Sonparote, S.U. Dhote, PHI Learning private Limited, Delhi.
2. Matrix analysis of framed structures by William Weaver, J. R. and James M. Gere, CBS Publishers and distributors, New Delhi.
3. Matrix structural analysis by J. L. Meek, McGraw Hill

**REFERENCES:**

1. Introduction to finite elements in engineering by T. R. Chandrupatla, A.D. Belegundu, Prentice Hall.
2. Matrix methods of structural analysis by M. B. Kanchi, Wiley Eastern Limited.

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**(A56006) GROUND IMPROVEMENT TECHNIQUES**  
(PROFESSIONAL ELECTIVE-III)

Prerequisite: Soil Mechanics & Foundation Engineering

**Course Objectives:**

- To understand the techniques required in improving in-situ soil.
- To identify basic deficiencies of various soil deposits
- To know the problems of expansive soils and application of geosynthetics.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the ground improvement techniques such as dewatering, insitu densification, soil stabilization to improve the load bearing capacity of soils
- Methods involving the improvement of expansive soils and utilization of geosynthetics

**UNIT I**

**Expansive soils:** Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

**UNIT II**

**In-situ densification methods in granular Soils:** Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

In – situ densification methods in Cohesive soils:– preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

**UNIT III**

**Stabilization:** Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

**UNIT IV**

**Dewatering:** Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.

**Grouting:** Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- post grout test.

**UNIT V**

**Geosynthetic:** Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.

**Miscellaneous:** Pre-stressed Anchors, Rock Anchoring, Contiguous Pile Foundations, Soil Nailing and Uplift Anchors.

**TEXT BOOKS:**

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi

**REFERENCES:**

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercey, USA



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**(A56007) HAZARDOUS SOLID WASTE MANAGEMENT**  
(PROFESSIONAL ELECTIVE-III)

Prerequisite: Environmental Engineering

**Course Objectives:**

- To understand the source of solid waste, their properties and its handling
- To know the types of hazardous waste and their disposal
- To aware the legal aspects of hazardous waste management

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Know the various type solid waste, their properties and their treatment
- Know the types of hazardous waste, their disposal and their legal aspects
- Understand the methods of solid and hazardous waste disposal
- Aware the site remedial technology

**UNIT I**

**Solid Wastes:** sources, types, composition, physical, chemical, and biological properties of solid wastes / sources and types of hazardous and infectious wastes in municipal solid wastes.

**Solid waste generation and collection:** Handling, Storage, Processing, Transportation.

**UNIT II**

**Disposal of Solid waste:** materials separation and processing, thermal conversion, biological and chemical conversion, recycling of material in municipal solid wastes, Land-filling, Composting, gas generation, closure of land-fills.

**Hazardous Wastes:** Fundamentals, fate, and Transport of contaminants, Toxicology origin, quantity and quality parameters.

**UNIT III**

**Biomedical / infectious Waste:** Composition, Collection, Handling and Disposal.

**Legal aspects of Hazardous Waste Management:** Collection, Conveyance, Treatment and Disposal.

**UNIT IV**

**Hazardous Waste Management Practices:** Environmental Audits, Pollution Prevention.

**Treatment and Disposal Methods:** Physicochemical processes, Biological Methods, Stabilization & Solidification, Thermal Methods, Land Disposal.

**UNIT V**

**Site Remediation:** Site & Subsurface Characterization, Remedial Technologies.

**TEXT/REFERENCE BOOKS:**

1. Integrated Solid Waste Management, Techobanglous, Thiesen and Vigil, McGraw Hill.
2. Hazardous Waste Management, Lagrega, Buckingham and Evans, McGraw Hill, N.Y.
3. Solid Waste Management in Developing Countries, A D Bhide, Nagpur Publications.

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**(A56008) PRESTRESSED CONCRETE**  
(PROFESSIONAL ELECTIVE-IV)

Prerequisite: Design of RC Structures

**Course Objectives:**

- To impart the knowledge of systems of pre-stress concrete and their disadvantages
- Know the analysis of pre and post tensioning simple structures
- Design the flexural members for shear, bond and torsion and design the end blocks.
- Analysis and design of composite section and their application in design of prestressed concrete bridges.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the advantages of pre-stressed concrete structural elements over the conventional elements
- Analysis and design of simple pre-stressed concrete structures

**UNIT I**

Definition, classification and systems of pre stress ship, properties of materials in PSC, loss of prestress, losses of prestress in pretension and post tensioned members

**Unit II**

Cable profile, Kern points, load balancing concept, Analysis of simple sections and stress diagrams for prestress, dead and live loads., Analysis of composite section and stress diagrams for prestress, dead and live loads

**UNIT III**

Simply supported and continuous beams. Concordant cable profile, design of sections, flexural strength of rectangular I and T sections using IS code provisions

**UNIT IV**

**Design for shear:** shear failure, web shear failure, flexural shear failure, shear compression failure , shear tension failure. shear strength of beams of uncracked and cracked in flexure

**UNIT V**

Deflections of PSC members for simply supported beams with point loads and UDLs. analysis and design of end block by Guyon's method for not more than two cables.

**TEXT BOOKS:**

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

**REFERENCE:**

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.

**Codes:** BIS code on prestressed concrete, IS 1343.

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**(A56009) URBAN PLANNING & DEVELOPMENT**  
(PROFESSIONAL ELECTIVE-IV)

Prerequisite: Transportation Engineering

**Course Objectives:**

- To enable students to have the knowledge on planning and development of urban areas
- To impart the knowledge of legislation and management of urban systems

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the basic issues, classification and planning of urban areas
- Know the planning and development of urban development projects
- Aware the legislation, development and management of urban systems

**UNIT I**

**Basic Issues:** Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, peri-urban areas, Central Business District (CBD), Classification of urban areas – trend of urbanisation at International, National, Regional and State level.

**UNIT II**

**Planning Process:** Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.

**UNIT III**

**Development Plans, Plan Formulation and Evaluation:** Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones.

**UNIT IV**

**Planning And Design Of Urban Development Projects:** Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

**UNIT V**

**Legislation, Development And Management Of Urban System:** Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

**REFERENCES:**

1. Chennai Metropolitan Development Authority, Second Master Plan for Chennai, Government of Tamil Nadu, Chennai, 2008
2. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
3. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi, 2002
4. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005

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**(A56010) REMOTE SENSING & GIS**  
(PROFESSIONAL ELECTIVE-IV)

Prerequisite: Surveying

**Course Objectives:**

- To understand the principles involved and applications of RS & GIS
- To interpret images
- To analyse spatial & attribute data
- To know the spatial analysis method

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Use the RS & GIS applications in various aspects
- Analyse the energy interaction in the atmosphere and earth surface features
- Interpret the images for preparation of thematic maps
- Analyse spatial & attribute data for solving spatial problems
- Know the GIS spatial analysis method.

**UNIT I**

**Introduction to Photogrammetry:** Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, determinations.

Remote Sensing – I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

**UNIT II**

**Remote Sensing:** Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

**UNIT III**

**Geographic Information System (GIS):** Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

**UNIT IV**

**GIS Spatial Analysis:** Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data. Water Resources Applications-I: Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood

and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.

#### **UNIT V**

**RS & GIS applications:** Transportation Watershed management, Geology, Emergency Management, Agriculture, Land use and Land cover Mapping.

#### **TEXT BOOKS:**

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

#### **REFERENCES:**

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. GIS by Kang – tsung chang, TMH Publications & Co.,
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & So

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**(A56011) LOGICAL REASONING & QUANTITATIVE APTITUDE**  
(MANDATORY COURSE)

Prerequisite: nil

**Course Objectives:**

- To impart the knowledge of logical reasoning and aptitude
- To understand the number system and data sufficiency
- To sharpen the brains of students about the general aptitude

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Develop knowledge of general aptitude and logical reasoning
- Improve the knowledge of arithmetical reasoning data sufficiency
- Sharpen the brain in puzzle tests and jumbled problems

**UNIT I**

**Series Completion :** Number Series, Alphabet Series, Alpha – Numeric Series

**Analogy:** Completing the Analogous Pair, Simple Analogy, Choosing the Analogous Pair, Double Analogy, Word Analogy and Number Analogy. Classification / Odd One Out: Word Classification, Number Classification, Letter Classification.

**Coding – Decoding:** Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled coding.

**UNIT II**

**Blood Relations:** Deciphering Jumbled up Descriptions, Relation Puzzle.

Direction sense test – Number, Ranking & Time Sequence Test – Arithmetical Reasoning– Mathematical Operations.

**Number System :** Test for Divisibility, Test of prime number, Division and Remainder – HCF and LCM of Numbers – Fractions.

**Ratio and Proportion:** Properties of Ratio, Comparison of Ratios, Useful Simple Results on Proportion – Partnership and Share – Mixtures.

**UNIT III**

**Data Sufficiency:** Problems in which a question on any topic such as Coding – Decoding, Blood Relations, Directions, Arithmetical Reasoning, etc.

**Puzzle Test:** Classification Type Questions, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on given conditions, Family – Based Puzzles, Jumbled Problems.

Assertions and Reason – Logical Venn Diagrams – Alpha Numeric Sequence Puzzle. Cubes and Dice – Analytical Reasoning.

**UNIT IV**



**Logical Deduction:** Logic, Statement – Arguments, Statement – Assumptions, Statement – Conclusions, Deriving Conclusions from Passages.

Clocks & Calendar.

**Simple Interest :** Effect of change of P, R and T on Simple Interest – Compound Interest: Conversion Period, Difference between Compound Interest and Simple Interest – Time and Work – Time and Distance.

## **UNIT V**

**Mensuration:** Area of Plane Figures, Volume and Surface Area of solid figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

## **TEXT BOOKS:**

1. Verbal and Non Verbal Reasoning by R.S.Agarwal.
2. Quantitative Aptitude by R.S.Agarwal.
3. Quantitative Aptitude by Abhijit Guha.

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## (A56201) TRANSPORTATION ENGINEERING LAB

Prerequisite: Transportation Engineering

### Course Objectives:

- To impart the knowledge on road aggregates, bitumen and bitumen mixes
- To provide the knowledge of methods of tests conducted on various road materials.

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Understand the limiting properties of various road materials used in pavement design.
- Have the knowledge of consultancy potential.

## LIST OF EXPERIMENTS

### I. TESTS ON ROAD AGGREGATES

1. Aggregate crushing value
2. Aggregate impact value
3. Specific gravity and water absorption
4. Los Angeles abrasion test
5. Shape tests: (a) Elongation index, (b) Flakiness index and (c) Angularity number

### II. TESTS ON BITUMEN

1. Penetration tests
2. Softening point tests
3. Ductility tests
4. Viscosity grading
5. Bitumen extraction tests

### III. TESTS ON BITUMEN MIXES

1. Marshal stability test

### IV. FIELD STUDIES (any one)

1. Traffic volume studies.
2. Spot speed studies.
3. Parking studies.

Note: Students are expected to perform minimum of ten experiments

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## (A56202) GEOSPATIAL TOOLS LAB

Prerequisite: Surveying

### LIST EXPERIMENTS:

1. Determination of area using total station
2. Contouring using total station
3. Determination of remote height using total station
4. Distance, gradient, diff, height between two inaccessible points using total station
5. Preparation of base map using topo sheet and find out the changes in satellite image using Arc GIS
6. Georeferencing of topo sheet using ArcGIS
7. Georeferencing of satellite image using Arc GIS
8. Digitization of point, line and polygon features using ArcGIS
9. Creation of data base and analysis using ArcGIS
10. Collection of point data using GPS
11. Collection of line data using GPS
12. Collection of polygon data using GPS

Note: Students are expected to perform minimum of ten experiments

### List of major equipment:

7. Total station
8. GPS instruments
9. Arc GIS software

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**(A57001) ESTIMATING AND COSTING**

Prerequisite: -nil-

**Course Objectives:**

- To study the material and cost estimation of buildings
- To study the estimation of roads covering culverts and bridges
- To study the rate analysis
- To bring about an exposure to field problems associated with roads/bridge marking and Estimation of roadwork quantities

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- The student will have an idea about rate analysis and costing for different stages of work
- Will have knowledge on various methods of valuations and estimating cost depreciations.
- Will be able to estimate labour required stage wise
- Will have complete knowledge on various types of contracts and tenders.

**UNIT I**

Working out the detailed estimate for the following:

- i) Flat roof building (load bearing, RCC & Steel framed structure)
- ii) Bituminous and C.C. Road work including earthwork
- iii) Single pipe culvert and single cell rectangular box culvert.
- iv) Septic tank
- v) Irrigation canal work including earthwork

**UNIT II**

Estimation of steel quantities for the following R.C. Works

- i) Slabs, Beams and Columns
- ii) Footings - Rectangular, isolated and combined
- iii) Stair Case
- iv) Overhead rectangular water tank

**UNIT III**

Preparation of analysis of rates and theoretical requirements of materials as per the standard data of APDSS for the following:

- i) Major items of works of a building
- ii) All items of work of bituminous and concrete road works

**UNIT IV**

As per APDSS

- i) General and detailed specification of works
- ii) Departmental procedure for construction work
- iii) Types of estimates

## **UNIT V**

- i) Types of contracts, essentials of contract, condition of contract and recent developments.
- ii) Tender - Tender from, Tender documents, Tender notice, e-tender work order.
- iii) Earnest money, Security deposit and new developments
- iv) Measurement book and Muster roll. Concept of PPP projects, BOT and BOOT projects

### **TEXT BOOKS:**

1. B.N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers.
2. M. Chakraborti, 'Estimation, Costing, Specifications and Valuation in Civil Engineering', M. Chakraborti Publishers

### **REFERENCE BOOKS:**

1. Relevant Indian Standard Specifications.
2. World Bank Approved Contract Documents.
3. FIDIC Contract Conditions.
4. Acts Related to Minimum Wages, Workman's Compensation, Contract, and Arbitration.
5. Standard schedule of rates and standard data book by public works department.
6. G.S. Birdie, Textbook of Estimating and Costing in Civil Engineering, 2014.
7. IS 1200-1992 "Methods of Measurements of Building and Civil Engineering Works"
8. Joy P K, Handbook of Construction Management, Macmillan
9. B.S. Patil , Building & Engineering Contracts

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### (A57002) IRRIGATION ENGINEERING

Prerequisite: Water Resource Engineering

#### Course Objectives:

- To enable the students understand the purpose and functions of the various irrigation structures.
- To understand various theories involved and design principles of irrigation structures.

#### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Understand the various types storage reservoirs, dams, canals and diversion head works.
- Know the causes of failure of water storage structures
- Design the simple irrigation structure.

#### UNIT I

**Storage Works-Reservoirs:** Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation – Life of Reservoir.. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

#### UNIT II

**Gravity dams:** Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

#### UNIT III

**Earth dams:** types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.

**Spillways:** types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

#### UNIT IV

**Diversion Head works:** Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations,-Silt Ejectors and Silt Excluders Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

#### UNIT V

**Canal Falls:** types of falls and their location, design principles of notch fall and Sarada type fall, canal regulation works, principles of design of distributory and head regulators, canal

cross regulators -canal outlets, types of canal modules, proportionality, sensitivity and flexibility

**Cross Drainage Works:** types, selection of site, design principles of aqueduct, siphon aqueduct and super passage, design of type-II aqueduct (under tunnel)

**TEXT BOOKS:**

1. S.K. Garg, 'Irrigation Engineering and Hydraulic Structures', Khanna Publishers.
2. B. C. Punmia, B. Pande and B. Lal, 'Irrigation and Water Power Engineering', Standard Book House
3. P. N. Modi, 'Irrigation, Water Resources and Water Power', Khanna Publishers
4. K. R. Arora, 'Irrigation, Water Power and Water Resources Engineering', Standard Publishers.

**REFERENCES:**

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
3. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers
4. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI

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### (A57003) ADVANCED STRUCTURAL DESIGN

Prerequisite: Design of RC Structures & Design of Steel Structures

#### Course Objectives:

- To understand the theory and design of retaining walls, combined footings and water tanks.
- To provide the knowledge of design of roof trusses
- To provide the knowledge of plastic analysis

#### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Know the theory and design of retaining walls, combined footings and RC water tanks
- Design a long span roof trusses by applying various loads
- Know the plastic behaviour of steel structures

#### UNIT I

**Retaining Walls:** Introduction, types, design of RCC cantilever and counter fort retaining walls.

#### UNIT II

**Combined Footings:** Introduction, design of rectangular footing, strap footing, trapezoidal footing and raft.

#### UNIT III

**Design of RCC water tanks:** Circular water tank with roof slab/dome resting on ground, underground and over head by IS code method (Working Stress Method) - rectangular water tank with one-way roof slab resting on ground, underground and over head by IS code method (Working Stress Method).

#### UNIT IV

**Design of Roof Trusses:** Types of roof trusses - loads on trusses - estimation of wind loads as per IS 875 - purling design - truss design - design of joints and end bearings.

#### UNIT V

**Plastic analysis:** Introduction - idealized stress – strain diagrams - shape factor for various sections – moment curvature relationship – ultimate moment - plastic hinge - collapse mechanism for beams – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

#### TEXT BOOKS:

1. A.K.Jain, Reinforced Concrete Design (Limit state design), 6/e, Nem Chand and Bros, Roorkee, 2007.
2. N. Subramanian, Design of Reinforced Concrete Structures, 1/e, Oxford University Press, 2013.
3. P.C. Varghese, Advanced Reinforced Concrete Design, Prentice Hall of India, 2009.



4. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.
5. **Codes:** Relevant IS: codes.

**REFERENCES:**

1. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India, 2013.
2. Ramchandra, 'Design of Steel Structures', Standard Publications
3. Design of steel structures by N. Subramanyam
4. Design of steel structures by Arya and Azmani

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**(A57004) STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING**  
(PROFESSIONAL ELECTIVE-V)

Prerequisite: Advanced Structural Analysis

**Course Objectives:**

- To provide a basic understanding of dynamic loading.
- Study the effect of earthquake loading on the behavior of structures.
- Understand the codal provisions to design the structures as Earthquake resistant.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the basic knowledge of SDOF and MDOF systems
- Know the sources and effects of earthquakes on structures
- Understand the concepts of earthquake resistant design of structures

**UNIT I**

**Single Degree of Freedom System:** Definition of degree of freedom – Idealization of structure as SDOF system – Formulation of equation of motion for various SDOF system – D’Alembert’s Principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

**UNIT II**

**Multi Degree of Freedom System:** Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

**UNIT III**

**Introduction to Earthquake Engineering:** Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake Phenomenon – Seism tectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

**UNIT IV**

**Earthquake Effects on Structures:** Effect of earthquake on different types of structures – Behavior of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

**UNIT V**

**Concepts of Earthquake Resistant Design:** Causes of damage – Planning considerations /Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

**TEXT BOOKS:**

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, Mc Graw Hill International Edition, 1995
2. Agarwal.P and Shrikhande.M.,Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

**REFERENCES:**

1. Mario Paz, Structural Dynamics – Theory and Computations, Third Edition, CBS publishers, 1990.
2. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 1994.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986
4. Humar.J.L, Dynamics of Structures, Prentice Hall Inc., 1990.
5. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2001.
6. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,

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**(A57005) RAILWAYS AND AIRPORT ENGINEERING**  
**(PROFESSIONAL ELECTIVE-V)**

Prerequisite: Transportation Engineering

**Course Objectives:**

- To provide the basic knowledge on importance and components railways and airways
- To provide the knowledge on the geometric features of railways
- To provide the knowledge on importance of airway systems and airport planning studies
- To provide the knowledge on airport configurations and its alliance

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Identify different components of railway track and select right materials for construction
- Compute the various geometric features of railways for a given set of requirements.
- Understand the importance of airway system and characteristics of aircrafts and involve in planning of airport facilities.
- The students will be able to understand the facilities at airports construct the same.

**RAILWAY ENGINEERING**

**UNIT I**

**Introduction:** Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways. Railway Track:

**Permanent way:** Gauges in Railway track, Railway track cross - sections; Coning of wheels.

**UNIT II**

**Rails & Rail Joints :** Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails. Requirements of an ideal joint; Types of rail joints; Welding of rails.

**Sleepers:** Functions of sleepers; Requirements of sleepers; Classification of Sleepers - Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers. Fish plates, failure of fish plates.

**Ballast:** Functions and requirements of ballast; Types of ballast; Renewal of ballast.

**AIRPORT ENGINEERING**

**UNIT III**

**Introduction:** Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

**UNIT IV**

**Airport Planning:** 1. Types of airport planning studies, 2. Forecasting in aviation and airport planning

## **UNIT V**

**Airport Configuration:** 1. Introduction of Airport configurations, 2. Analysis of wind, 3. Runway configurations, 4. Taxiway configurations, 5. Air traffic control facilities, 6. Air safety & regulation issues

## **TEXT BOOK**

- 1 Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
2. Railway Engineering by Rangwala, Charotar Publishing House.

## **REFERENCES**

1. Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra – Gal Gotia Publishers (1999).

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**(A57006) EARTH RETAINING STRUCTURES**  
**(PROFESSIONAL ELECTIVE-V)**

Prerequisite: Soil Mechanics & Foundation Engineering

**Course Objectives:**

- To provide the fundamentals and tools needed for the design and analysis of earth retention systems.
- To know the selection, design, and performance of earth retaining structures
- To impart the theory involving earth pressures and soil-reinforcement interaction.
- To provide the case histories as well as demonstrating the various earth retaining structures.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Quantify the lateral earth pressures associated with different earth systems.
- Evaluate the mechanical properties of geosynthetics used for soil reinforcement
- Identify the types, advantages, and disadvantages of the different earth retaining systems
- Complete the design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods.

**UNIT I**

**Introduction:** Types of earth retaining systems- Classification- Overview of fill wall systems- Overview of cut wall systems.

**Earth Pressure Theory:** Mohr's circle- At rest, active, and passive earth pressures- Influence of movement on earth pressures- Earth pressure from surcharge loads and due to compaction- Earth pressures from seismic forces.

**UNIT II**

**Retaining Walls:** Proportioning of retaining walls- application of lateral earth pressure to design- Stability of retaining walls, Check for overturning, sliding and bearing capacity.

**UNIT III**

Design of gravity retaining walls, and semi-gravity walls- Design of modular gravity walls- Design of sheet pile walls- Design of anchored walls- Retaining wall design by with metallic strip reinforcement- step by step procedure with metallic strip reinforcement- Retaining walls with geotextile reinforcement

**UNIT IV**

**Internal Stability:** Design of mechanically stabilized earth (MSE) walls - Design of segmental retaining walls- Design steps for reinforced steep slopes- Design of soil nail walls.

**UNIT V**

**Sheet Pile walls:** Construction Methods - cantilever Sheet pile walls - Cantilever sheet piling penetrating sandy soils - Cantilever sheet piling penetrating clay soils - anchored sheet piles.

Introduction to Prestressed anchors, Soil Nailing, Uplift anchors and Soil Retention Systems.

**TEXT BOOKS:**

1. Koerner, R.M. (2012). *Designing with Geosynthetics*. Sixth Edition. Prentice Hall.
2. Das, B.M. (2015). *Principles of Foundation Engineering*, Cengage Learning.

**REFERENCE BOOKS:**

1. Advanced Foundation Engineering by VNS Murthy, (2012), CBS Publishers and Distributors.
2. Bowles J.E, *Foundation Analysis and Design* (1996), Tata Mc Garw Hill Company.

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**(A57007) PAVEMENT ANALYSIS & DESIGN**  
(PROFESSIONAL ELECTIVE-VI)

Prerequisite: Transportation Engineering

**Course Objectives:**

- To provide the knowledge on various types of pavements used in construction with computation of material characteristics and layer concepts
- To provide knowledge on stresses induced in pavements and its importance
- To explain various types of pavement designs like flexible and rigid
- To provide the knowledge on highway construction and maintenance of different pavements

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Understand the types of pavements and the materials used effectively in the pavements
- Gives an idea to explore various highway construction materials, techniques and their maintenance
- Design the various pavements by using the available sources economically
- Have the knowledge on identification of causes pavement failures and remedial measures

**UNIT I**

Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept-tyre pressure – contact pressure, Material characteristics – Environmental and other factors. Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design.

**UNIT II**

Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction. Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.- AASHO Method of Flexible Pavement design

**UNIT III**

IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars. Highway Materials – Soil, Aggregate and Bitumen- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete- Requirements of Design Mix- Marshall's Method of Bituminous Mix design.

**UNIT IV**

Highway construction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization.



## **UNIT V**

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation- Benkelman Beam method- Strengthening of Existing Pavements- Overlays.

### **TEXT BOOKS:**

1. Highway Engineering – S.K.Khanna & C.J.Justo, Nemchand & Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).
3. Design of functional pavement Nai C Yang – Mc Graw Hill Publications

### **REFERENCES:**

1. Principles of Pavement Design by Yoder, E.J. & Witczak, M.W., John Wiley and Sons, USA.
2. Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey.

### **CODES:**

1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002

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**(A57008) SOIL DYNAMICS & MACHINE FOUNDATIONS**  
(PROFESSIONAL ELECTIVE-VI)

Prerequisite: Structural Dynamics & Foundation Engineering

**Course Objectives:**

- To impart the theory of vibration
- To provide the knowledge of design of foundations due to machine vibrations
- To provide the knowledge of mitigation of machine vibrations

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Know the dynamic properties of soil
- Design of foundation for common machineries
- Isolate vibrations due to the operations of machines

**UNIT I**

**Theory Of Vibration:** Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping. Principles of vibration measuring instruments.

**UNIT II**

**Waves And Wave Propagation:** Wave propagation in an elastic homogeneous isotropic medium-Rayleigh, shear and compression waves-waves in elastic half space.

**UNIT III**

**Dynamic Properties Of Soils:** Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression and shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil-codal provisions.

**UNIT IV**

**Design Procedures:** Design criteria – dynamic loads – simple design procedures for foundations of reciprocating, impact and rotary type machines - Codal provisions (Simple cases).

**UNIT V**

**Vibration Isolation:** Vibration isolation technique - foundation isolation - isolation by location-isolation by barriers active and passive isolation methods.

**TEXT BOOKS:**

1. Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications Pvt.Ltd. (Second Edition) 2006, (Reprint 2010), New Delhi-110002
2. Kameswara Rao, Dynamics Soil Tests and Applications”, Wheeler Publishing, New Delhi, 2003.
3. Das B M, ‘Principles of Soil Dynamics’, (2011), McGraw Hill Publishers.

**REFERENCES:**

1. Kamaswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
2. IS Code of Practice for Design and Construction of Machine Foundations, McGraw Hill,
3. Moore, P.J. "Analysis and Design of Foundation for Vibration", Oxford and IBH,

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**(A57009) CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT**  
(PROFESSIONAL ELECTIVE-VI)

Prerequisite: Building Materials, Construction and Planning, Design of RC Structures & Design of Steel Structures

**Course Objectives:**

- To impart the knowledge of construction technology, scheduling and methods
- To provide the knowledge of construction equipment, quality control, project planning and its scheduling

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- Handle the project work with proper planning and scheduling
- Know the methods of management to complete the project within the stipulated time
- Have the knowledge of equipment involved and technology used in the construction
- Use the innovative methods of construction of a project.

**UNIT I**

**Fundamentals of construction technology:** Construction activities – Process – Construction schedule – Construction records – Documents – Quality – Safety – Codes and regulations - Construction method – Earthwork – Piling – Concrete and concreting – Form work – Fabrication and erection.

**UNIT II**

**Mechanized construction:** Construction equipment – Equipment economics – Excavators – Rollers – Dozers – Scrapers – Handling equipment – Concrete equipment – Handling equipment – Cranes Draglines and Clamshalls.

**UNIT III**

**Quality control:** Assurance and safety – ISO-900 Quality systems – Principles on safety – Personnel, Fire and Safety – Environment protection – Concept of green building.

**UNIT IV**

**Contract management:** Project estimation – Project estimation – Contract document – Classification – Bidding – Procurement process. Construction planning – Project planning techniques – Planning of man power – Material, Equipment and Finance.

**UNIT V**

**Project scheduling:** PERT – CPM, Resource leveling, Construction claims, Dispute and Project closure – Source of claim – Claim management – Dispute resolution – Arbitration – Construction closure – Contract closure – Documentation.

**TEXT BOOK**

1. Construction Technology by Subir K Sarkar, Subhajit Saraswati / Oxford University Press
2. Construction Project Management – Theory and practice, Nirajjha Pearson Education

**REFERENCES:**

1. Construction planning, Equipment and Methods by Peurifacy. Schexnayder Shapira, TMH

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## (A57010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (OPEN ELECTIVE-I)

Prerequisite: -nil-

### Course Objectives:

- To explain the basic principles of managerial economics and accounting
- To provide the knowledge of current business environment underlying business decision making.

### Course Outcomes:

On completion of this course, the graduate should be able:

- To have the knowledge on various Finance and Economic concepts of business management and approaches.
- To understand and analyze the interconnections between the development of key functional areas of business organization and the management thought process.
- To be ethically conscious and socially responsible managers, capable of contributing to the development of the nation and quality of life.

### UNIT I

**Introduction to Managerial Economics:** Definition, Nature and scope of Managerial Economics – Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

**Elasticity of Demand:** Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, methods of Demand Forecasting (Survey Methods, Statistical Methods, Expert Opinion Method, Test Marketing, Controlled Experiments, Judgmental Approach to Demand Forecasting)

### UNIT II

**Theory of Production and Cost Analysis:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economics of Scale.

**Cost Analysis:** Cost concepts, Opportunity Cost, Out of Pocket Costs vs. Imputed Costs. Break – Even Analysis (BEA) – Determination of Break – Even Point (simple problems) – Managerial Significance and limitations of BEA.

### UNIT III

**Introduction to Markets & Pricing Policies:**

**Market structures:** Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price – Output determination in case of Perfect Competition

**Objectives and Policies of Pricing – Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two – Part Pricing, Block Pricing, Peak Load Pricing, Cross Subsidization.

### UNIT IV

**Capital and Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working Capital requirements,

Nature and scope of Capital Budgeting, features of Capital Budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method, Profitability Index, Internal Rate of Return ( simple problems)

## **UNIT V**

**Introduction to Financial Accounting:** Double – Entry Book Keeping, Journal, Ledger, and Trial Balance – Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Financial Analysis through ratios:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios ( Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios ( Debt – Equity, Interest Coverage Ratio), and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Profit Ratio, P/E Ratio and EPS).

### **TEXT BOOKS:**

1. Aryasri, Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheshwari, Managerial Economics, Sultan Chand, 2009.

### **REFERENCES:**

1. Raghunatha Reddy & Narasimhachary, Managerial Economics & Financial Analysis, Scitech, 2009.
2. V. Rajasekarn & R. Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore, Managerial Economics in a Global Economy, 4<sup>th</sup> Edition, Cengage, 2009.
5. Subhash Sharma & M. P. Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S. N. Maheshwari & S. K. Maheshwari, Financial Accounting, Vikas 2008.
7. Truet and Truet, Managerial Economics; Analysis, Problems and Cases, Wiley, 2009.
8. Dwivedi, Managerial Economics, Vikas 2009.
9. M. Kasi Reddy, S.Saraswathi, Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert, Techniques of Financial Analysis, Jalco, 2007.

**Codes / Tables:** Present Value Tables need to be permitted into the Examination Hall.

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## (A57011) ENGINEERING ETHICS (OPEN ELECTIVE-I)

Prerequisite: -nil-

### Course Objectives:

- To explain the basic and moral values to the students and impart it in their daily activities.
- To make understand the global issues faced by the society

### Course Outcomes:

On completion of this course, the graduate should be able:

- To empower the self confidence in the students and also courage in taking the decision of his or her own.
- Will be able to address the global issues caused by the society

### UNIT I

**Introduction:** Morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, value timing, cooperation, commitment, empathy, self confidence, character, spirituality

### UNIT II

**Engineering Ethics:** Senses of Engineering Ethics, variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, models of professional roles, theories about right action, self interest, customs and religion, uses of ethical theories.

### UNIT III

**Engineering as Social Experimentation:** Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study.

### UNIT IV

**Safety, Responsibilities and Rights:** Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the Three Mile Island and Chernobyl case studies. Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, occupational crime, professional rights, employee rights, intellectual property rights (IPR), discrimination.

### UNIT V

**Global Issues:** Multinational corporations, environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute Material Management, Institution of Electronics and Telecommunication Engineers (IETE), India.

### TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, 'Ethics in Engineering', McGraw-Hill, 1996.
2. M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, 'Engineering Ethics', Prentice Hall of India, 2004.

**REFERENCES:**

1. Charles D. Fleddermann, Engineering Ethics, Prentice Hall, 2004.
2. Charles E Harris, Michael S. Protchard, Michael J Rabins, Engineering Ethics: Concepts and Cases, Wadsworth Thompson Learning, 2000.
3. John R. Boatright, Ethics and the Conduct of Business, Pearson Education, 2003.
4. Edmund G Seebauer, Robert L Barry, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, 2001.



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**(A57012) ADVANCED CONSTRUCTION MATERIALS**  
**(OPEN ELECTIVE-I)**

Prerequisite: Building Materials in Constructions & Concrete Technology

**Course Objectives:**

- To explain the basic and moral values to the students and impart it in their daily activities.
- To make understand the global issues faced by the society

**Course Outcomes:**

On completion of this course, the graduate should be able:

- To empower the self confidence in the students and also courage in taking the decision of his or her own.
- Will be able to address the global issues caused by the society

**UNIT I**

Light weight aggregate concrete - fiber reinforced concrete - High strength concrete.

**UNIT II**

Changes in concrete with time, Corrosion of rebars in concrete- control measures.

**UNIT III**

Different Industrial waste materials – their usage in concrete – study of properties.

**UNIT IV**

Effects of temperature on Concrete- high temperature - Ferro-cement – advantages and properties and strength.

**UNIT V**

Polymers - Fibre reinforced plastic in sandwich panels - Adhesives and sealants. Structural elastomeric bearings, Moisture barriers.

**Text books:**

1. Adam M. Neville, Properties of Concrete, 5th Edition, Longman Sc and Tech Publishers
2. Kumar Mehta. P. and Paulo J.M. Monteiro, Concrete Microstructure, Properties and Materials, McGraw Hill

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## (A57201) COMPUTER AIDED DESIGN LAB

Prerequisite: Building Materials, Construction and Planning, Structural Analysis & Design of RC Structures

### Course Objectives:

- To provide the knowledge of software involved in building drawing.
- To impart the knowledge of drawing the various views of buildings.
- To impart the knowledge of using the softwares to analyze and design of buildings

### Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- Draw the plan, section, elevations and other views of a structure by using AutoCAD software.
- Prepare the working drawing of building.
- Analyze the various structures by using the any softwares.
- Model, analyze and design the buildings by using the any softwares.

### a. List of Drawings

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different softwares
3. Practice exercises on AutoCAD software
4. Drawing of plans of buildings for (a) single storied buildings (b) multistoried buildings
5. Developing section and elevations for (a) single storied buildings (b) multistoried buildings
6. Detailing of building components like doors, windows roof trusses etc. using CAD software
7. Exercises on development of working drawings of buildings

**b. Analysis:** Analyze the following problems by using scientific calculator and compare the results obtained by any available software.

1. Analysis of continuous beam
2. Analysis of plane truss
3. Analysis of plane frame

**c. Analysis and design** by STAAD Pro or any other available software

1. Modeling, analysis and design of multi storied symmetrical building
2. Modeling, analysis and design of multi storied unsymmetrical building

Note: Students are expected to perform minimum of ten exercises by taking at least two problems from each category.

**TEXT BOOKS:**

1. Computer Aided Design Laboratory by M. N. Sesa Prakash & Dr. G. S. Servesh, Laxmi Publications, New Delhi.
2. Engineering Graphics by P. J. Sha, S. Chand Publications, New Delhi.

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(A57202) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Prerequisite: -nil-

## 1. Introduction

The introduction of the English Language Lab is considered essential at 3<sup>rd</sup> year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use good

English and perform the following:

- Gather ideas and information, to organize ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

## 2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing.

## 3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

1. **Vocabulary Building** – synonyms and antonyms, Word Roots, One-Word Substitutes, Prefixes and Suffixes, Study of Word Origin, Analogy, Idioms and Phrases.
2. **Reading Comprehension** – Reading for Facts, Guessing meanings from context, Scanning, Skimming, Inferring Meaning, and Critical Reading.
3. **Writing Skills** – Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose.
4. **Technical Writing**- Technical Report Writing, Research Abilities/Data Collection/Organizing Data/Tools/Analysis.
5. **Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Coherence.
6. **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/Seminars, Written Presentations through Projects/ PPTs/e-mails etc.
7. **Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Telephone and Video-Conferencing.

**4. Minimum Requirement:** The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement (Hardware component):** Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

**5. Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

**Suggested Software:**

- Clarity Pronunciation Power – part II □
- Oxford Advanced Learner’s Compass, 7<sup>th</sup> Edition □
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech.
- TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS) □
- The following software from ‘\_train2success.com’ □
  - i. Preparing for being Interviewed,
  - ii. Positive Thinking,
  - iii. Interviewing Skills,
  - iv. Telephone Skills,
  - v. Time Management
  - vi. Team Building,
  - vii. Decision making
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge □

**6. Books Recommended:**

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education.
3. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
10. English for Technical Communication for Engineering Students, Aysha Vish hwamohan, Tata Mc Graw-Hil 2009.
11. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron’s/DELTA/Cambridge University Press.
12. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

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**(A55203) INDUSTRY ORIENTED MINI PROJECT**

- Industry oriented mini project is a summer internship/training taken up by the students during their summer vacation after B. Tech. III year.
- Summer internship is planned to expose students to industrial practices.
- Students have to correlate the theory in classroom to the procedures adopted in construction.
- Students have to maintain a diary on the work carried out during their training at the industry and submit a detailed report of their experience within a month after joining for their B. Tech. IV year I semester and present a seminar.

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**(A58001) FINITE ELEMENT METHOD**  
**(OPEN ELECTIVE-II)**

Prerequisite: Advanced Structural Analysis

**Course Objectives:**

- To equip the students with the finite element analysis fundamentals.
- To enable the students to formulate the design problems into FEA.
- To introduce basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays and solution of the resulting algebraic systems.

**Course Outcomes:**

On successful completion of this course, it is expected that the students will be able to,

- To know and analyze the complex structures with proper idealization.
- To have a basic idea to work with software packages like ANSYS and SAP

**UNIT I**

**Introduction:** Concepts of FEM, steps involved, merits and demerits, matrix displacement method vs FEM, element definition: interpolation functions, stress-strain relationship, strain displacement relationship, stiffness matrix and load vector from the energy principles, Raleigh-Ritz method of functional approximation.

One dimensional problem: Stiffness matrix for a two-nodded and three-nodded bar elements and their shape functions, equivalent nodal force vector due to surface and body forces, analysis of 1D structures using 2-noded and 3-noded bar elements.

**UNIT-II**

**CST element – two dimensional problems:** Plane stress and plane strain problems, stiffness matrix of constraint strain triangle (CST) element, shape functions, equivalent nodal force vector, applications, introduction to linear strain triangle.

**UNIT III**

**Shape functions:** Shape functions for 1D elements in Cartesian coordinators of 2-noded and 3-noded elements, methods of constants, Lagrange polynomial, in natural coordinates.

Shape functions for 2D elements: rectangular elements of Lagrange family, Serendipity family, shape functions of triangular elements in area coordinator.

Introduction to shape functions of 3D element, Conditions which shape functions should satisfy.

**UNIT IV**

**Isoparametric elements and numerical integration:** isoparametric concept, isoparametric elements for 1D analysis, isoparametric elements for 2D analysis (Serendipity Family), stiffness matrix for linear isoparametric element, equivalent nodal force vector, numerical integration, applications, convergence and compatibility requirements, Validity of isoparametric elements.

## **UNIT V**

Two-nodded beam element stiffness matrix of a beam element from a cubic polynomial, Hermitian polynomials and their properties, equivalent nodal force vector.

### **TEXT BOOKS:**

1. Introduction to finite element method by P.N. Godbole, I.K. International Publishing House Pvt. Ltd., New Delhi.
2. Introduction to finite elements in engineering by T.R. Chandrupatla and A.D. Belegundu, Prentice Hall
3. The finite element method, O.C. Zienkiewicz, Tata McGraw-Hill Publishing Company, New Delhi.

### **REFERENCES:**

1. C.S. Krishna Murthy, Finite Element Analysis, Mc Graw Hill., 1997
2. C.S. Desai and J.F. Abel, Introduction to the Finite Method, Van Nostrand, 2002



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**IV Year B.Tech. CIVIL - II Sem**

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**(A58002) INTELLECTUAL PROPERTY RIGHTS**  
**(OPEN ELECTIVE-II)**

Prerequisite: -nil-

**Course Objectives:**

The aim of this course is to make students understand different types of Intellectual Property Rights and related Intellectual Property Laws to help in decision making.

**Course Outcome:**

At the end of this course, students will be able to apply the appropriate ownership rules to Intellectual Property Rights.

**UNIT I**

Introduction to intellectual property: introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT II**

Trade Marks: Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT III**

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

**UNIT IV**

Trade Secrets: Trade secrete law, determination of trade secretes status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competitions: Misappropriation right of publicity, False advertising.

**UNIT V**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual prooperty, international- trade mark law, copy right law, international patent law, international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, cengage learning.
2. Intellectual property right- nleashmy the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.

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**(A58003) DATA BASE MANAGEMENT SYSTEMS**  
(OPEN ELECTIVE-II)

Prerequisite: Any Programming Language

**Course Objectives:**

- To provide a sound introduction to Database management systems, Databases and its applications,
- To familiarize the participant to give a good formal foundation on the relational model of data
- To present SQL and procedural interfaces to SQL comprehensively
- To give an introduction to systematic database design approaches conceptual design, logical design, schema refinement and physical design
- To introduce the concepts of transactions and transaction processing and the issues and techniques relating to concurrency and recovery manager.

**Course Outcomes:**

- Design Entity-Relationship Model for enterprise level databases.
- Develop the database and provide restricted access to different users of database and formulate the Complex SQL queries.
- Analyze various Relational Formal Query Languages and various Normal forms to carry out Schema refinement
- Use of suitable Indices and Hashing mechanisms for real time implementation.
- Ability to analyze various concurrency control protocols and working principles of recovery algorithms.

**UNIT-I**

**Introduction To Database System Concepts:** Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

**Introduction To The Relation Models And Database Design Using Er Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features,

**UNIT-II**

**Introduction To SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions Nested Sub queries, Modification of the Database.

**Intermediate And Advanced SQL:** Join Expressions, Views, Integrity Constraints, SQL Data Types, Authorization. Functions and Procedures, Triggers, Advanced Aggregation Features.

**UNIT-III**

**Formal Relational Query Languages:** The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

**Relational Database Design:** Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Decomposition Using Multi valued Dependencies, More Normal Forms.

#### **UNIT-IV**

**Indexing And Hashing:** Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

**Transactions:** Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.

#### **UNIT-V:**

**Concurrency Control:** Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multi version schemes.

**Recovery System:** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES, Remote Backup Systems.

#### **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6<sup>th</sup> Edition, Tata McGraw-Hill.
2. Raghurama Kirshna, Johannes Gehrke, "Database Management System" Tata McGraw Hill 3<sup>rd</sup> Edition.

#### **REFERENCE BOOKS:**

1. Database System Concepts - Peter Rob & Carlos Coronel Cengage Learning.
2. Fundamentals of Database Systems - RamezElmasri, Shamkanth B. Navrate , 7<sup>th</sup> Edition, Pearson Education.
3. Introduction to Database Systems - C.J. Date , Pearson Education

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## (A58004) ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE-III)

Prerequisite: -nil-

### Course Objectives:

The aim of this subject is to give an insight to the students about business start up and motivate them to set up their own unit and create employment for others.

### Course Outcomes:

- After the completion of the course the students will be able to recognize a business opportunity that fits the individual student.
- Improves the ability to provide a self-analysis in the context of an entrepreneurial career, to find an attractive market that can be reached economically.

### UNIT 1

Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving-Writing Business Plan, Evaluating Business Plans. Launching formalities.

### UNIT II

Financing and Managing the new venture: Sources of capital, Record keeping, recruitment, motivating and leading teams, financial entrepreneurship, internet advertising- New venture Expansion Strategies and issues.

### UNIT III

Institutional/financial support: Schemes and functions of Directorate of industries, District Industries Centres (DICs), Industrial Development Corporation (IDC), State Financial Corporation, (SFCS), Small Scale Industries Development Corporations (SSIDCS), Khadi and Village Industries Commission (KVIC), Technical Consultancy Organisation (TCO), Small Industries Service Institute (SISI), National small industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).

### UNIT IV

Production and Marketing Management: Thrust areas of production management, Selection of production Techniques, Plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

### UNIT V

Labour legislation, Salient Provisions of Health, Safety, and Welfare under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and Payment of Bonus Act.

**TEXT BOOKS:**

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 2009.
2. Dollinger: Entrepreneurship, Pearson, 2009.

**REFERENCE BOOKS:**

1. Vasant Desai. Dynamics of Entrepreneurial Development and Management, Himalaya Publishing Houses, 2009.
2. Harvard Business Review on Entrepreneurship, HBR Paper Back.
3. Robert J. Calvin: Entrepreneurial Management, TMH, 2009.
4. Gurmeet Naroola: The entrepreneurial Connection, TMH, 2009.
5. Bolton & Thompson: Entrepreneurs- Talent, Temperament and Techniques, Butterworth Heinemann, 2009.
6. Agarwal: Indian Economy, Wishwa Prakashan 2009.
7. Dutt & Sundaram: Indian Economy, S.Chand, 2009
8. B D Singh: Industrial Relations & Labour Laws, Excel, 2009
9. Aruna Kaulgud : Entrepreneurship Management by, Vikas Publishing house, 2009
10. Essential of entrepreneurship and small business management by Thomas W. Zimmerer & Norman M. Scarborough, PHI-2009.
11. ND Kapoor: Industrial law, Sultan Chand & Sons, 2009

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## (A58005) OPERATING SYSTEMS

(OPEN ELECTIVE-III)

Prerequisite: Any Programming Language

### Course Objectives:

- Understand operating system concepts
- Analyze process scheduling and synchronization concepts.
- Identify deadlock mechanisms
- Understand memory management approaches.
- Identify storage management and protection.

### Course Outcomes:

- Summarize operating system and process management concepts
- Apply process scheduling and synchronization related issues.
- Understand Deadlock prevention, avoidance, detection, recovery mechanisms.
- Analyze effectively memory management concepts
- Illustrate various protection and security measures.

### UNIT I

**Operating Systems Overview and Process Management:** Introduction-What operating system do, Operating system structure (uni-programmed and multi programmed), Operating system operations, Operating system services, System calls, Types of System calls, Operating system structure.

**Process Management:** Process concepts, Process scheduling, Operations on processes, Inter process communication.

### UNIT II

**Process Scheduling and Synchronization:** Multithreaded programming: Overview, Multithreading models.

**Process Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Thread scheduling.

**Process Coordination:** Synchronization – Background, The critical section problem, Peterson’s solution, Semaphore.

### UNIT III

**Deadlocks:** System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

### UNIT IV

**Memory Management:** Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual memory management - Demand paging, page-replacement.

### UNIT V

**File system, system protection and security:** Storage management – File concept, Access methods, Directory and disk structure.

**System protection-** Goals of protection, principles of protection.

**System Security:** Security problem, Program threats.

**TEXT BOOK:**

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 8<sup>th</sup> edition ,John Wiley, 2016.

**REFERENCE BOOKS:**

1. D.M. Dharmdhare, Operating Systems – A Concept based Approach, 2nd Edition. TMH.
2. Andrew S Tanenbaum, Modern Operating Systems, 3<sup>rd</sup> Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and shell programming, cengage Learning.

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**(A58006) COMPUTATIONAL METHODS IN CIVIL ENGINEERING**  
(OPEN ELECTIVE-III)

Prerequisite: Mathematic – I, II & III

**Course Objectives:**

- To explain the practical approach to the design problems in all areas of construction.
- To make understand engineering tools like MATLAB

**Course Outcomes:**

On completion of this course, the graduate should be able:

- Enhances the usage of engineering tools required for design problems.
- Will be able to solve the practical problems in field related to civil engineering.

**UNIT I**

8 hours

**Linear system of equations:** Problems in structural analysis – slope deflection method, formulation of simultaneous equations, solution of simultaneous equations using Gauss elimination method, solution of simultaneous equations by using iterative method – Gauss Seidal iterative method ( max 3 unknowns), developing computer programming for gauss- Seidal method, solution of problems using MATLAB.

**UNIT II**

10 hours

**Numerical Integration:** Determination of areas and volumes, calculation of volume of Earthwork using trapezoidal rule and Simpson's rule, measurement of discharge through rivers using Weddle's rule, development of computer programs for trapezoidal rule, Simpsons 1/3rd rule, Simpsons 3/8th rule, Boole's and Weddle's rules, development of computer programs for trapezoidal and Simpsons 1/3rd rule, solution of problems using MATLAB.

**UNIT III**

9 hours

**Interpolation:** Forward differences, backward differences, central differences, interpolation using difference techniques, forecasting of traffic demand, forecasting of water demand for a city and other applications of civil engineering problems, solution of problems using computer programming and MATLAB.

**UNIT IV**

10 hours

**Data Analysis:** Calculation of mean, variance, standard deviation, coefficient of variation of a sample, construction of histograms and determination of mean and standard deviation of cube strengths of concrete, determination of correlation coefficient of correlation such as cube strength vs cylinder strength of concrete and other civil engineering problems, solution of problems using MATLAB.

**UNIT V**

9 hours

**Finite Difference Method:** Introduction, application of finite difference method in the determination of deflections of beams, indeterminate beams (propped cantilever beam) determination of



- i) Deflections at the centre of simply beam subjected to UDL w per unit run over the entire span.
- ii) Deflections at the centre of simply beam subjected to concentrated load at the mid span.
- iii) Prop reaction and deflection at centre beam subjected to UDL over the entire span.
- iv) Prop reaction and deflection at centre of beam subjected to concentrated load at the centre.

**TEXT BOOKS:**

- 1. S.P. Venkateshan, Prasanna Swaminathan, Computational Methods in Engineering, 1/e, Academic Press - Published by Elsevier, ISBN 978-0-12- 416702-5, 2014.
- 2. S.S. Sastry, Introduction to Numerical Methods,4/e, Printice Hall of India Private Limited, New Delhi, 2006.

**REFERENCES:**

- 1. S.C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 3/e, McGraw-Hill Companies Inc, 2011.
- 2. S. Chapra, and R, Canale, Numerical Methods for Engineers, 6/e, McGraw-Hill Higher Education, 2009.

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**(A58203) COMPREHENSIVE VIVA**

Comprehensive viva is intended to train students to face interviews. Students are expected to prepare fundamentals in all core subjects of their branch for taking comprehensive viva.

1. It is an oral examination to test the subject knowledge of the student which he gained during the four years of his degree course.
2. Three faculty members will be involved in the panel of assessment to evaluate the student's performance. The session marks will be awarded based on his performance.
3. The faculty in-charge of the project work will coordinate in all aspects of the comprehension viva.
4. Students are to take the guidance, if required, from any faculty of the Department.

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**(A58202) TECHNICAL SEMINAR**

Student has to select a topic of his / her interest in consultation with the faculty in charge of seminar. He / She can collect information from the books, journals and internet and prepare a report. Make a power point presentation on the topics and present before a committee to evaluate the seminar. Seminar is separate for each student.

1. The Objective of technical seminar is to test the students skills on comprehension of any subject of his own interest related to civil engineering profession. It comprises of seminar and report submission.
2. The technical seminar will be conducted normally after the I- mid sessional examination of IV yr II-semester
3. Three faculty members will be involved in the panel of assessment to evaluate the student's performance. The sessional marks will be awarded based on the seminar and report.
4. The faculty in-charge of the project work will coordinate in all aspects of the technical seminar.
5. Students are to take the guidance, if required from their guide of project work.

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**(A58201) PROJECT WORK**

A graduate is expected to contribute to the industry in various specializations of civil engineering as soon as joining in the industry. Hence it is essential to have training in any one of the specialized areas by taking up a project work.