

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL
Department of Civil Engineering
Bachelor of Engineering

SEMESTER III/ YEAR II

BE 31 Maths III

Learning Hrs:60

Objective:

- To develop logical understanding of the subject.
- To develop the knowledge, skills and attitudes necessary to solve problem pertaining to Civil Engineering.
- To make aware students about the importance and symbiosis between Mathematics and Engineering.

Course Content

Module 1: Numerical Methods – 1: Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

(Hours:8)

Module 2: Numerical Methods– 2 Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.

(Hours:8)

Module 3: Numerical Methods – 3: Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and CrankNicholson methods), Finite difference explicit method for wave equation.

(Hours:8)

Module 4: Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

(Hours:8)

Module 5: Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Statistics

(Hours:8)

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Module 6: Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression - Rank correlation.

(Hours:6)

Module 7: Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

(Hours:8)

Module 8: Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances -Chi-square test for goodness of fit and independence of attributes.

(Hours:6)

Outcome

- Apply basic knowledge of maths to solve real-world problems.
- Able to generate solutions to unfamiliar problems

Suggested learning resources:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002. 9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd

Semester III/ Year II

BE 32 Biology

Learning Hrs:60

Objective:

- To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.
- To develop understanding about Biology and its different parts

Course Content

Module 1:INTRODUCTION

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

(Hours:7)

Module 2:CLASSIFICATION

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitata- aquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegans, A. Thaliana, M. musculus.

(Hours:7)

Module 3:GENETICS

Purpose: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and

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dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

(Hours:7)

Module 4: BIMOLECULAR

Purpose: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

(Hours:7)

Module 5: ENZYMES

Purpose: To convey that without catalysis life would not have existed on earth. Enzymologist:

How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions?

Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

(Hours:7)

Module 6: INFORMATION TRANSFER

Purpose: The molecular basis of coding and decoding genetic information is universal

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA

structure- from single stranded to double helix to nucleosomes. Concept of genetic

code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

(Hours:7)

Module 7: MACROMOLECULAR ANALYSIS

Purpose: How to analyse biological processes at the reductionist level. Proteins- structure and

function. Hierarchy in protein structure. Primary, secondary, tertiary and quaternary

structure. Proteins as enzymes, transporters, receptors and structural elements.

(Hours:6)

Module 8: METABOLISM

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus

endergonic and exergonic reactions. Concept of K_{eq} and its relation to standard free

energy. Spontaneity. ATP as an energy currency. This should include the breakdown of

glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and

H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

(Hours:6)

Module 9: Microbiology

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Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

(Hours:6)

Outcome

- Ability has been developed to describe how biological observations of 18th Century that lead to major discoveries.
- Understanding is developed about Biology and its different parts

Suggested learning resources:

- Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
- Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
- Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
- Molecular Genetics (Second edition), Stent, G. S.; and Calendar, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
- Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Semester III/ Year II

CE31 Strength of Materials and Solid Mechanics

Learning Hrs:60

Objective:

- To provide the concepts and principles of strength of materials and Solid Mechanics.
- To give an ability to calculate Forces/stresses on objects and its effect under external loadings.
- To give an ability to apply this knowledge on engineering applications and design problems.

Course Content

Module 1: Introduction to Engineering Mechanics, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space - Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy Friction, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 2: Basic Structural Analysis, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines; Centroid and Centre of Gravity, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. Module- Gradual, sudden, impact and shock loadings - simple applications.

(Hours:12)

Module 2:: Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, 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. Strain Energy - Resilience Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

(Hours:12)

Module 3: Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams. BM and SF diagrams for cantilevers simply supported and fixed beams

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with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

(Hours:12)

Module 4: 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, Angle and Channel sections - Design of simple beam sections.

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

Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

(Hours:12)

Module 5: Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

(Hours:12)

Outcome:

- This course imparts ability to students to apply this knowledge on engineering applications and design problems.

List of Experiments/Practicals:

- Tension test
- Bending tests on simply supported beam and Cantilever beam.
- Compression test on concrete
- Impact test
- Shear test
- Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation,
- Determination of torsion and deflection,
- Measurement of forces on supports in statically determinate beam,
- Determination of shear forces in beams,
- Determination of bending moments in beams,
- Measurement of deflections in statically determinate beam,

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- Measurement of strain in a bar
- Bend test steel bar;
- Yield/tensile strength of steel bar;

Suggested learning resources:

- Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
- Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
- Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
- Mechanics of Materials - Ferdinand P. Beer, E. Russel Johnston Jr., John T. Dewolf - TMH 2002.
- Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
- Nash; Strength of Materials (Schaum), TMH.
- Rattan SS; strength of Materials; TMH
- Negi; Strength of materials; TMH
- Sadhu Singh; Strength of Materials, ,
- Ramamrutham; Strength of Materials, ,
- Subramaniam; Strength of Materials; R; Oxford
- National Building Code of India, Part-IV
- Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
- Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
- Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
- Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
- Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Semester III/ Year II

CE32 Introduction to Civil Engineering, Societal & Global Impact

Learning Hrs:60

Objective:

- To provide the concepts Civil engineering and its use in society on local and global level

Course Content

Module 1: Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers. Basics of Professionalism: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

(Hours:12)

Module 2: Overview Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-a-vis other industries, five year plan outlays for construction; current budgets for infrastructure works; Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction; Structural Engineering: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies.

(Hours:12)

Module 3: Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability; Built environment - Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems;

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Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts
Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures;
Innovations and methodologies for ensuring Sustainability.

(Hours:12)

Module 4: Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and non-stationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Civil Engineering Projects - Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment (projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development;

(Hours:12)

Module 5: Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ETAB, REVIT, AUTOCAD,...GEOSTUDIO, , MSP, PRIMAVERA)

(Hours:12)

Outcome:

- This course develops understanding toward Civil Engineering and its use to society.

Suggested learning resources:

List of Experiments/Practicals:

Introduction to following Software

SAP, STAAD, ETAB, REVIT, AUTOCAD,...GEOSTUDIO, MS PROJECT, MSP, PRIMAVERA

Suggested learning resources:

- ZigaTurk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht

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- Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
- NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
- Chen. W. F. and Liew, J. Y. R.. (Eds.). The Civil Engineering Handbook. Second Edition. CRC Press (Taylor and Francis)
- Dalai. K. R.. Essentials of Civil Engineering. Charotar Publishing House Gopi. S.. Basic Civil Engineering. Pearson Publishers Kandy. A. A.. Elements of Civil Engineering. Charotar Publishing house Mamlouk. M. S. and Zaniwski. J. P.. Materials for Civil and Construction Engineering. Pearson Publishers.
- McKay. W. B. and McKay. J. K.. Building Construction Volumes 1 to 4. Pearson India Education Services
- User Manual SAP, STAAD, ETAB, REVIT, AUTOCAD,...GEOSTUDIO, , MSP, PRIMAVERA

Semester III/ Year II
CE33 Materials, Testing & Evaluation

Learning Hrs:60

Objective:

- To provide the concepts importance, need and principles of Material testing.
- To develop vision and understanding toward Quality construction.

Course Content

Module 1: Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these.

(Hours:12)

Module 2: Introduction to Material Testing covering, What is the "Material Engineering"?; Mechanical behavior and mechanical characteristics; Elasticity - principle and characteristics; Plastic deformation of metals; Tensile test - standards for different material (brittle, quasi-brittle, elastic and so on) True stress - strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction.

(Hours:12)

Module 3: Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals;

(Hours:12)

Module 4: Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures;

(Hours:12)

Module 5: Fracture mechanics - background; Fracture toughness - different materials; Fatigue of material; , Creep - fundamentals and characteristics; Brittle fracture of steel - temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing - different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.

(Hours:12)

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Outcome:

- This course imparts ability to students to check quality of material and develop understanding toward understanding Material testing Report

List of Experiments/Practicals:

- Gradation of coarse and fine aggregates
- Different corresponding tests and need/application of these tests in design and quality control
- Tensile Strength of materials & concrete composites
- Compressive strength test on aggregates
- Concrete I - Early Age Properties
- Concrete II - Compression and Indirect Tension
- Compression - Directionality
- Soil Classification
- Consolidation and Strength Tests
- Tension III - Heat Treatment
- Torsion test
- Hardness tests (Brinell's and Rockwell)
- Tests on closely coiled and open coiled springs
- Theories of Failure and Corroboration with Experiments
- Tests on unmodified bitumen and modified binders with polymers
- Bituminous Mix Design and Tests on bituminous mixes - Marshall method
- Concrete Mix Design as per BIS

Suggested learning resources:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.), R. Butterworth-Heinemann
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)
7. Related papers published in international journals

Semester III/ Year II
BE33 JAVA Programing

Learning Hrs :

Objective:

- To provide the concepts and Understanding toward JAVA language
- To give an ability to apply this knowledge on engineering applications and design problems

Course Content

Module 1: Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.

Module 2: Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector.

Collections Algorithms: Algorithms sorts, Algorithms shuffle, Algorithms reverse, fill, copy, max and Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class PriorityQueue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

Module 3: Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle.

Module 4: Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips.

Module 5: Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.
Outcome:

- This course imparts ability to students to apply this knowledge on engineering applications .

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List of Experiments/Practicals/Program:

- Installation of J2SDK
- Write a program to show Concept of CLASS in JAVA
- Write a program to show Type Casting in JAVA
- Write a program to show How Exception Handling is in JAVA
- Write Programs to show Inheritance and Polymorphism.
- Write a program to show Interfacing between two classes
- Write a program to Add a Class to a Package
- Write a program to demonstrate AWT.
- Write a Program to show Data Base Connectivity Using JAVA
- 10. Write a Program to show "HELLO JAVA" in Explorer using Applet
- 11. Write a Program to show Connectivity using JDBC
- Write a program to demonstrate multithreading using Java.
- Write a program to demonstrate applet lifecycle.

Suggested learning resources:

- Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
- E. Balaguruswamy, "Programming In Java"; TMH Publications
- The Complete Reference: Herbert Schildt, TMH
- Peter Norton, "Peter Norton Guide To Java Programming", Techmedia.
- Merlin Hughes, et al; Java Network Programming, Manning Publications/Prentice Hall

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Semester III/ Year II

CATEGORY: - PDFS

SUBJECT CODE: -BE-34

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-I

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. In this regard, an effort is made to improve the knowledge with respect to basic in English, mathematics, aptitude and reasoning.

UNIT-I

Conversational English:

Grammar mainly Tenses, 100 small sentences of daily use tense wise, Letter Writing, Standard Format for CV writing. **[12 hrs]**

UNIT-II

Basic Mathematics:

Arithmetic, Algebra, Unit Conversions.

Arithmetic

Number system, Decimals, Fractions, Simplification, HCF and LCM. Ratio and proportion, percentage, partnership, Average, profit and Losses, Simple Interest and Compound Interest, Mensuration, Time and work, Time and Distance, Data Interpretation, Trigonometry Basics, etc.

Algebra

Basics Algebraic Formulae, Linear Equations, quadratics Eqations, Logarithms, Functions, Permutation and Combination, Binomial Theorem, Series (AP, GP, HP). Unit conversion SI, FPS, MKS, CGS

(12 -HOURS)

UNIT-III

Aptitude / Reasoning

Quantitative Aptitude and Logical Reasoning- Level-1

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Problem solving on.

Number System, problems on Ages, Number Theory, Algebra, Clocks and Calendars.

Alphabet Test, Series Completion, Coding- Decoding, Logical Sequence, Insert missing figures. **(12 -HOURS)**

OUTCOME

The students have gained confidence after improving their English, Math, and Aptitude and reasoning abilities.

Semester IV/ Year II

CE41 Surveying

Learning Hrs :60

Objective:

- To provide the concepts and Understanding toward Land measurement
- To give an ability to apply this knowledge on engineering applications and design problems

Course Content

Module 1: Introduction to Surveying Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes. Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations.

(Hours:12)

Module 2: Sensor Installation and Operation covering to: i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty
Triangulation and Trilateration (6 Hours): Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections. Curves Elements of simple and compound curves - Method of setting out- Elements of Reverse curve - Transition curve - length of curve - Elements of transition curve - Vertical curves.

(Hours:12)

Module 3: Modern Field Survey Systems (8 Hours): Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station - Parts of a Total Station - Accessories -Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

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(Hours:12)

Module 4: Photogrammetry Surveying (8 Hours): Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotters instruments, mosaics, map substitutes.

Remote Sensing Introduction -Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

(Hours:12)

Module 5: Data Analysis and Interpretation covering a) Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinator, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range).

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

List of Experiments/Practicals:

- Instrumentation of typical civil engineering members/structures/structural elements
- Use of different sensors, strain gauges, inclinometers,
- Performance characteristics
- Errors during the measurement process
- Calibration of measuring sensors and instruments
- Measurement, noise and signal processing
- Analog Signal processing
- Digital Signal Processing
- Demonstration & use of sensor technologies

Suggested learning resources

- Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
- David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
- S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
- IlyaGertsbakh (2010), Measurement Theory for Engineers, Springer

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- Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
- Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
- Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
- Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
- Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
- Arora, K.R., Surveying, Vol-I, II and III, Standard

Semester IV/ Year II

CE42 Engineering Geology and Geo Technical Engineering

Learning Hrs : 60

Objective:

- To provide the concepts and Understanding of structure of earth
- To understand and demonstrate this knowledge on engineering applications and design problems

Course Content

Module 1: Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, SEM, XRD., Rock forming minerals, megascopic identification of common primary & secondary minerals.

Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Phenomenon and different materials ejected by volcanoes. Classification of rocks its mode of formation, physical and Chemical characteristics .

(Hours:12)

Module 2: Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits.

Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

(Hours:12)

Module 3: Introduction-Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, Module weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, Module weight- percent air voids, saturation- moisture content,

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moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method. Module weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method. On completion of this module, the students must be able to:

Understand the different types of soil based on their formation mechanism;

Understand the various phase diagrams and derive various phase relationships of the soil;

Perform various laboratory experiments to determine moisture content, specific gravity;

Perform field experiments to estimate the field density of the soil mass.

Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. On completion of this module, the student must be able to:

Determine the permeability of soils through various laboratory and field tests; • Analytically calculate the effective permeability of anisotropic soil mass;

Determine the seepage quantities and pore water pressures below the ground;

Graphically plot the equipotential lines and flow lines in a seepage flow.

(Hours:12)

Module 4: Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity.

Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits.

Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system.

Identification: field identification of soils, general characteristics of soil in different groups.

On completion of this module, the students must be able to:

Understand the behaviour of soils based on their moisture contents;

Perform laboratory experiments to estimate various Atterberg limits and evaluate index properties of soils;

Classify any soils based on their particle size distribution and index properties;

(Hours:12)

Module 5: Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition. On completion of this module, the student must be able to:

Understand the physical significance of effective stress and its relation with pore pressure; Plot various stress distribution diagrams along the depth of the soil mass;

Understand the effect of capillary action and seepage flow direction on the effective stress at a point in the soil mass.

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Stresses in soils - Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Contact pressure under rigid and flexible area, computation of displacements from elastic theory. On completion of this module, the student must be able to:

Analytically compute the vertical stress in a semi-infinite soil mass due to various loading conditions; Plot isobars due various loading conditions.

Shear Strength - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. unconfined compression test, vane shear test.

(Hours:12)

Outcome:

- Acquire knowledge on the geometry, Material and type of structures present in earth.
- This course imparts skill to students to apply this knowledge on engineering applications.

List of Experiments/Practicals:

1. Determination of moisture content
2. Determination of specific gravity
3. Field density test
4. Grain size analysis
 - a. sieve analysis
 - b. hydrometer analysis
5. Determination of consistency limits
6. Density index/relative density test
7. Permeability test
 - a. constant head method
 - b. falling head method
8. Proctor test
9. Vane shear test
10. Direct shear test
11. Unconfined compression test
12. Undrained triaxial test
13. Consolidated test
14. Identification of different type of rocks

Suggested learning resources:

- Soil Mechanics & Foundation Engineering, Arora K. R, Standard Publications
- Soil Mechanics & Foundations, Punmia B. C, Laxmi Publications

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- Soil Mechanics & Foundation Engineering, Murthy V. N. S, Dhanpat Rai
- Soil Mechanics & Foundation Engineering, Alamsingh, CBS Publishers & Distributors
- Basic & Applied Soil Mechanics, New Age International Publishers
- P.K. Mukerjee, "A Text Book of Geology", World Press Pvt., Ltd. Kolkatta.
- Parbin Singh, "Text Book of Engineering and General Geology", Published by S.K. Kataria and Sons, New Dehli.

Semester IV/ Year II
CE43 Building Drawing and Design

Learning Hrs :60

Objective:

- To provide the concepts and Understanding of Building Drawing and design
- To Develop skill to Understand and express need of its design for practical execution
- Develop understanding towards use of different codes - local, national and international, for execution of Buildings.

Course Content

Module 1: Drawing of Building Elements - Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, stairs and staircase, trusses, flooring, roofs window and ventilator, lintels and arches, etc.

(Hours:12)

Module 2: Building Planning - Provisions of National Building Code, Building bye-laws, open area, set backs, FAR terminology, principle of architectural composition (i.e. Module y, contrast, etc.), principles of planning, orientation.

(Hours:12)

Module 3: Building Services - Introduction of Building Services like water supply and drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

(Hours:12)

Module 4: Design and Drawing of Building - Design and preparation of detailed drawings of various types of buildings like institutional buildings ,residential building, and commercial buildings, detailing of windows, doors, , ventilators and staircases etc.

(Hours:12)

Module 5: Perspective Drawing - energy efficient buildings, Elements of perspective drawing involving simple problems, one point and two point perspectives,.

(Hours:12)

Outcome:

- Plan, design, construct and maintain civil engineering structures and buildings.
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

1. Nidhi Gupta, Rohit Sahu & Kundan Meshram; Building Design and Drawing; Ardent Publication
2. Malik & Meo; Building Design and Drawing

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3. Shah, Kale & Patki; Building Design and Drawing; TMH
4. Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling

List of Experiments/Practicals(Expandable)

1. Sketches of various building components.
2. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
3. One drawing sheet each for services and interiors of buildings.
4. One drawing sheet containing detailed planning of one/two bed room residential building (common to all student)
5. One drawing sheet each of residential and institutional building (Each student perform different drawing).
6. Use of AutoCAD for preparation of drawings.

Semester IV/ Year II
CE44 Concrete Technology

Learning Hrs : 60

Objective:

- To define and understand concepts related involves types and property of concrete and different adhesive materials and its vital use for safe, economic development for the buildings.
- Develop understanding towards use of different codes related to concrete- local, national and international, for execution of Civil engineering structures.

Course Content

Module 1: Introduction Classification, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of materials as per Indian Standard Specifications.

(Hours:12)

Module 2: Properties of Fresh and Hardened Concrete : Introduction, Workability, Testing of concrete, Factors affecting, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects. Creep of concrete, Permeability, durability, thermal properties & micro-cracking of concrete.

(Hours:12)

Module 3: Design of Concrete Mix : Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials, design of plastic concrete mix, computer aided design of concrete mix.

(Hours:12)

Module 4: Production and Quality Control of Concrete: Production of crushed stone aggregate, batching equipments for production and concreting, curing at different temperatures, Concreting underwater, hot & cold weather condition, statistical quality control, field control, non-destructive testing, repair technology for concrete structures, Inspection & Testing of Concrete.

(Hours:12)

Module 5: Special Concretes : Ready mix concrete, Vacuum concrete, Ferrocement Light weight concrete, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, GModuleing, Rubble concrete, Resin concrete, Prestressed concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.

(Hours:12)

Outcome:

- Develop Understanding toward role of ingredients of concrete and apply this knowledge to mix design philosophy

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- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

1. Varshney RS; Concrete Technology; Oxford & IBH publishing co.
2. Gambhir ML; Concrete Technology – TMH
3. Sinha SN; Reinforced Concrete Technology; TMH
4. New Building Materials Published by B.M.T.P.C., New Delhi
5. Hand books on Materials & Technology - Published by BMTPC & HUDCO
6. Mohan Rai & M.P. Jai Singh; Advances in Building Materials & Construction

Semester IV/ Year II

CE45 Management I (Organizational Behavior)

Learning Hrs : 60

Objective:

- To understand human behavior and concepts Managerial skill to handle complex human tendency.
- Develop understanding Management theories for better productivity.

Course Content

Module 1: Understanding Organizational behaviour: Levels of analysis within OB – individual, group and organization; challenges and opportunities for OB; relationship of OB with other fields.

(Hours:12)

Module 2: Foundation of individual behaviour; learning theories; Perception: factors influencing Perception; Personality, Attitudes, Job satisfaction and Values.

(Hours:12)

Module 3: Motivation: concept and process; Motivation theories: Maslow, McGregor, Herzberg, Alderfor's, Vroom, Porter & Lawler and Equity theory; Motivating employee techniques; Group: nature, functions & development.

(Hours:12)

Module 4: Organisational Culture & Climate; Organisational conflicts Type, Causes and Management; Johari Window and Transactional Analysis; Emotional Intelligence; Knowledge Management; Power & Politics; Negotiation.

(Hours:12)

Module 5: Organisational Change: Forces for change; Resistance to change; Managing change; Stress; Concept, Sources of Stress, Consequences, Management of Stress; Burnout: Causes and Handling of Burnout; Managing diversity in organization.

(Hours:12)

Outcome:

- Develop Understanding toward human behavior and concepts Managerial skill to handle complex human tendency. for better productivity.
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Organisational Change: Forces for change; Resistance to change; Managing change; Stress; Concept, Sources of Stress, Consequences, Management of Stress; Burnout: Causes and Handling of Burnout; Managing diversity in organization.
- Baron, R.A. and Greenbeg. J (Behaviour in organization. Pearson India).

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- Luthans, F., “*Organizational Behaviour*”, 7thed. New York, McGraw Hill, 1995.
- Chandan, J., “*Organizational Behaviour*”, Vikas Publishing House Pvt. Ltd.
- UdaiPareek, “*Organizational Behaviour*”, Oxford University Press, 2004.
- Robbins, S.P., Judge, T. A and Sanghi, S. (2007). *Organisational Behaviour Dehil* : Pearson Education.
- Khandwalla, P. N. (1992). *Organization Design for excellence*, new Delhi: Tata McGraw Hill.
- Davis, K. *Human Behaviour at work*. New Delhi. Tata McGraw Hill.

Semester IV/ Year II

CE46 Computer Aided Drawings Lab

Learning Hrs/Week :

Objective:

- To impart knowledge to students toward use of Computer and allied technology Civil engineering drafting need..
- Develop skill of Civil engineering Drafting using Computers.

Course Content

To learn basics of perspective drawings and Computer Aided Drawings.

a) Measure the units of existing building (Load Bearing / Frame structure).

b) Draw line plan of measured existing building at serial no 3a to the suitable scale.

Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom)

a) Residential Bunglows(Minimum three plans)

b) Apartment (Minimum two plans)

Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).

Draw the following plans for a Framed Structure (One/Two BHK) from given line plan.

a. Developed plan, Elevation

b. Section for above developed plan.

c. Site plan for above drawings including area statement, schedule of opening and construction notes.

B. Full Imperial Size Sheet (A1)

1 Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing a) Developed plan and elevation

b) Section passing through Stair or WC. and Bath

c) Foundation plan and schedule of openings.

d) Site plan (1:200), area statement, construction notes.

2 Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing: a) Developed plan.

b) Elevation.

c) Section passing through Staircase.WC and Bath

d) Site plan (1:200) and area statement

e) Schedule of openings and Construction Notes.

3 Draw the above mentioned drawing at serial number (B-2) using CAD software and enclose the print out.

a) Developed plan

b) Elevation.

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- c) Section passing through Staircase, WC. and Bath
 - d) Foundation plan.
 - e) Site plan (1:200), area statement, Schedule of openings and construction notes.
- 4 Draw working drawing for above mentioned drawing at serial number (B-2) showing:
- a) Foundation plan to the scale 1:50
 - b) Detailed enlarged section of RCC column and footing with plinth filling.
 - c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.
 - d) Detailed enlarged section of RCC staircase and slab.
- 5 Draw two point perspective drawing of small objects - steps, monuments, pedestals (any one) scale 1:50
- a) Draw plan, elevation, eye level, picture plane and vanishing points
 - b) Draw perspective view.

Outcome:

- Apply/develop solutions using Computers to address need of Civil engineering Drafting.
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
- Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.
- M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.
- Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
- Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.
- Mantri, Sandip, A to Z Building Construction, SatyaPrakashan, New Delhi.
- Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd. New Delhi.
- Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

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Semester IV/ Year II

BE-41

Environment science

Learning Hrs/Week :

Objective:

- Become aware of the importance of soil, water and air for humans and other life forms on the Earth.
- Become aware of the species extinction and loss of biodiversity.
- Become aware of the various national and international efforts that are in place for conserving the environment

Course Content

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities.

(A) AWARENESS ACTIVITIES:

- i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- ii) Slogan making event
- iii) Poster making event
- iv) Cycle rally
- v) Lectures from experts

(B) ACTUAL ACTIVITIES:

- i) Plantation
- ii) Gifting a tree to see its full growth
- iii) Cleanliness drive
- iv) Drive for segregation of waste
- v) To live some big environmentalist for a week or so to understand his work
- vi) To work in kitchen garden for mess
- vii) To know about the different varieties of plants

viii) Shutting down the fans and ACs of the campus for an hour or so

Outcomes:

- The students will be aware of the importance of soil, water and air for humans and other life forms on the Earth..

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- Get acquainted with the various national and international efforts that are in place for conserving the environment

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SEMESTER IV/ YEAR II

CATEGORY: - PDFS

SUBJECT CODE: -BE-42

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-II

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Prepositions (550 small sentences of daily use related to day to day life **(18 -HOURS)**)

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning – Level II

Problem solving on,

Partnerships, Profit Loss and Discounts, Time and Distance.

Logical sequence of Figures, Cubes, Blood Relations, Data Sufficiency, Arrangement Problems.**(18 -HOURS)**

OUTCOME

Further improvement in English, Aptitude and reasoning ability is achieved.

Semester V/ Year III
CE51 THEORY OF STRUCTURES

Learning Hrs :60

Objective:

- To impart knowledge and understanding to students toward external forces on civil structures
- Develop skill to address effect and distribution of loads on Civil engineering structures.

Course Content

Module 1: Indeterminate Structures-I : Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by theorem of three moments, Effect of sinking and rotation of supports, Moment distribution method (without sway)
Analysis of beams and frames by slope Deflection method,

(Hours:12)

Module 2: Arches and Suspension Cables: Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and temperature effects.

(Hours:12)

Module 3: Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads. Rolling loads and Influence Lines: Maximum SF and BM curves for various types of Rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches. Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.

(Hours:12)

Module 4: Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads. Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

(Hours:12)

Module 5: Plastic analysis of beams and frames.

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

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications

List of Experiments/Practicals:

- Moment area theorem regarding the slopes and deflections of the beam

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- Deflection of a pin connected truss analytically & graphically and verify the same experimentally
- Elastic property of Deflected beam
- Elastically coupled beam analysis
- Study of tree hinged Arch
- study the behavior of struts and column
- Uniaxial tension test for steel
- Experiment on a 2 hinged arch for horizontal thrust and influence line for horizontal thrust.
- Experimental and analytical study of a 3 bar pin jointed truss.
- Experimental and analytical study of deflection and unsymmetrical bending of a cantilever beam.
- Beggdefometer- verification of Muller Breslau principle.
- Experimental and analytical study of an elastically coupled beam.
- Sway in portal frames- demonstration.
- To study the cable geometry and statics for different loading condition.

Suggested learning resources:

Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.

Wang C.K. Intermediate structural analysis, McGraw Hill, New York.

Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.

Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo

Reference Books:-

Wang C.K. Intermediate structural analysis, McGraw Hill, New York.

Kinney Sterling J. Indeterminate structural Analysis, Addison Wesley.

Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.

Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

Semester V/ Year III
CE52 Fluid Mechanics

Learning Hrs : 60

Objective:

- To impart knowledge and understanding to students toward property of fluid and impact of external forces on fluid
- To expose various pressure measuring devices, discharge measuring devices and metacentric height.
- Develop skill to address effect and distribution of loads by/on fluid.

Course Content

Module 1: Basic Concepts and Definitions - Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation - derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow - Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's n-Theorem.

(Hours:12)

Module 2: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity.

Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram.

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Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient n . Most economical section of channel. Computation of Uniform flow, Normal depth.

Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity - Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Direct integration method.

(Hours:12)

Module 3: Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem.

(Hours:12)

Module 4: Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulic Jump- Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. Dynamics of Fluid Flow-Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,

(Hours:12)

Module 5: Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem. Computational Fluid Dynamics: Basic equations of fluid dynamics, Grid generation, Introduction to in viscid incompressible flow, Boundary layer flow as applicable to C.F.D. Hydro informatics: Concept of hydro informatics -scope of internet and web based modeling in water resources engineering.

(Hours:12)

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Outcome:

- Able to use various pressure measuring devices, discharge measuring devices and metacentric height
- This course imparts skill to students to apply this knowledge on engineering applications

List of Experiments/Practicals:

- Measurement of viscosity
- Study of Pressure Measuring Devices
- Stability of Floating Body
- Verification of Bernoulli's Theorem
- Venturimeter & Orifice meter
- Impacts of jets
- Flow Visualisation - Ideal Flow
- Length of establishment of flow
- Velocity distribution in pipes
- Laminar Flow
- Velocity Distribution in Open channel flow
- Hydraulic Jump
- Flow through pipes
- Turbulent flow through pipes
- Laminar flow through pipes
- Major losses / Minor losses in pipe

Suggested learning resources:

- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, McGraw Hill.
- Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
- Open channel Flow, K. Subramanya, Tata McGraw Hill.
- Open Channel Hydraulics, VenTe Chow, Tata McGraw Hill.
- Burnside, CD., "Electromagnetic Distance Measurement" Beekman Publishers, 1971.

Semester V/ Year III

CE53 Transportation Engineering I

Learning Hrs :60

Objective:

- To impart knowledge and understanding principles of development and planning of Highway/Airports with its design needs
- To expose various measuring devices for study of traffic flow and capacity, traffic regulation and control
- Develop skill to develop different type of Pavement.

Course Content

Module 1: Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation.

(Hours:12)

Module 2: Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems

(Hours:12)

Module 3: Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems

(Hours:12)

Module 4: Pavement materials- Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.

(Hours:12)

Module 5: Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, wind rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements: taxi ways and runways, pattern of runway capacity.

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental landing system, precision approach radar, VOR enroute traffic control.

(Hours:12)

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Outcome:

- Able to use various measuring devices for study of traffic flow, regulation and control
- This course imparts skill to students to apply this knowledge on engineering applications

List of Experiments/Practicals:

- Specific Gravity Test for Bitumen
- Water absorption test
- Penetration test
- Ductility test
- Softening point of bitumen
- Flash and fire point test
- Viscosity test
- Bituminous mix design by marshall method
- California bearing ratio test
- Aggregate crushing strength test
- Abrasion test
- Impact test
- Shape test (flakiness & elongation index)

Suggested learning resources:

- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
- Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.
- ParthaChakraborty, ' Principles Of Transportation Engineering, PHI Learning,
- Fred L. Mannering, Scott S. Washburn, Walter P. Kilaeski, 'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
- Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
- Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

Semester V/ Year III

CE54- Professional Practice, Law & Ethics

Learning Hrs : 60

Objective:

- To impart knowledge and understanding towards Professional Practice with Ethics involved in it.
- To expose various Construction management techniques and control
- Develop understanding laws pertaining to civil engineering.

Course Content

Module 1 A: Professional Practice - Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

Module 1 B: Professional Ethics - Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

(Hours:12)

Module 2: General Principles of Contracts Management: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms;

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(Hours:12)

Module 3: Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration - meaning, scope and types - distinction between laws of 1940 and 1996; UNCITRAL model law - Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements - essential and kinds, validity, reference and interim measures by court; Arbitration tribunal - appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards - New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats

(Hours:12)

Module 4: Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

(Hours:12)

Module 5 : Law relating to Intellectual property: Introduction - meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright - computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet - Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent - application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents - law and policy considerations, Infringement and related remedies;

(Hours:12)

Outcome:

- Able to use various Construction management techniques and control under legal framework
- This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
- The National Building Code, BIS, 2017
- RERA Act, 2017

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- Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
- Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
- T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
- American Society of Civil Engineers (2011) ASCE Code of Ethics - Principles Study and Application
- Ethics in Engineering- M.W.Martin&R.Schinzinger, McGraw-Hill
- Engineering Ethics, National Institute for Engineering Ethics, USA
- www.ieindia.org
- Engineering ethics: concepts and cases - C. E. Harris, M.S. Pritchard, M.J.Rabins
- CONSTRUCTION CONTRACTS, <http://www.jnormanstark.com/contract.htm>
- Internet and Business Handbook, Chap 4, CONTRACTS LAW,
<http://www.laderapress.com/laderapress/contractslaw1.html>
- Contract&Agreements
- <http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm>

Semester V/ Year III

CE55-Hydrology & Water resource engineering

Learning Hrs : 60

Objective:

- The knowledge of hydrology is prerequisite for the irrigation engineering and also for design of hydraulic structure.
- To impart knowledge and understanding towards concepts of Water Resources Management.
- To expose various Water Resources Management techniques and control
- Develop understanding laws pertaining to Water Resources Management.

Course Content

Module 1: Introduction - hydro logic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data.

Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

(Hours:12)

Module 2: Abstractions from precipitation - evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff - runoff volume, SCS-CN method of estimating runoff volume, flow-duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, Module hydrograph surface water resources of India, environmental flows.

(Hours:12)

Module 3: Ground water and well hydrology - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests. Water withdrawals and uses - water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

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(Hours:12)

Module 4: Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

(Hours:12)

Module 5: Dams and spillways - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

(Hours:12)

Outcome:

- Able to understand needs, techniques and control pertaining to Water Resources Management.
- This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- K Subramanya Engineering Hydrology, Mc-Graw Hill.
- K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
- K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.
- G L Asawa, Irrigation Engineering, Wiley Eastern
- L W Mays, Water Resources Engineering, Wiley.
- J D Zimmerman, Irrigation, John Wiley & Sons
- C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

Semester V/ Year III
CE 56 Industrial training

Learning Hrs:

Objective:

- To bridge knowledge between practical and theoretical aspect of Civil engineering.

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications

Semester V/ Year III

BE 51

Essence of Indian Knowledge and Tradition

Learning Hrs:

Objective:

- To develop understanding toward Indian Knowledge and Tradition
- To develop understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system

COURSE CONTENTS

- Basic structure of Indian Knowledge System:
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies □

Outcomes:

- The students will be able to – Understand and appreciate structure of Indian Knowledge System and its rich tradition
- Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

REFERENCES

- Knowledge traditions and practices of India, CBSE Publication V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
- Swami Jitatmanand, Modern Physics and Vedantharatiya Vidya Bhavan
- Swami Jitatmanand, Holistic Science and Vedantharatiya Vidya Bhavan
- Fritzof Capra, Tao of Physics
- Fritzof Capra, The Wave of life
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay
- Foundation, Velliarnad, Arnakulam Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
- GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya,

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- VidyanidhiPrakashan, Delhi 2016
- RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi
Prakashan, Delhi 2016
- P B Sharma (English translation), ShodashangHridayan
- PEDAGOGY: Problem based learning, group discussions, collaborative mini projects.

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Semester V/ Year III

CATEGORY: - PDFS

SUBJECT CODE: -BE-52

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-III

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Active and Passive Voice, 250 sentences of daily use irrespective of any specific tenses. **(12 HOURS)**

UNIT-II

Conversational English:

100 sentences of daily use related to professional and formal environment Report Writing with necessary punctuations and with editor's eye, Thematic Apperception, Expression of Feelings 2-minutes Talk by the students, Smart Etiquettes and Tidiness . **(12 HOURS)**

UNIT-III

Aptitude/Reasoning

Quantitative Aptitude and Logical Reasoning – Level III

Problem solving on,

Average, Time work, percentage, Probability, Permutation and Combination.

Question- Statements, Theme Detection, Statement Assumptions, Statement Argument. **(12 HOURS)**

OUTCOME

Further improvement in reading, writing and vocal English is achieved.

Aptitude and reasoning aspect shows improvement.

Semester VI/ Year III

CE61 Transportation Engineering II

Learning Hrs : 60

Objective:

- To impart knowledge and understanding principles of development and planning of Railway/Tunnel/Bridges with its design needs
- To expose various measuring devices for study of Railway/Tunnel/Bridges
- Develop skill in the field of Railway/Tunnel/Bridges construction.

Course Content

Module 1: Tunnels: Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts , Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

(Hours:12)

Module 2: Bridge Site Investigation and Planning; Loading Standards & Component parts: Selection of site, alignment, Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges.

(Hours:12)

Module 3: Bridge Foundations, Construction, Testing and Strengthening of Bridges: Different types of foundation: piles and wells, sinking of wells, coffer-dams. Inspection and Data collection, strengthening of bridges, Bridge failure. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants.

(Hours:12)

Module 4: Introduction, Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractive effort. Rails: types, welding of rails, wear and tear of rails, rail creep. Sleepers: types and comparison, requirement of a good sleeper, sleeper density.

Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails. Ballast: various materials used as ballast, Requirement of good ballast, , quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

(Hours:12)

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Module 5: Geometric Design; Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

(Hours:12)

Outcome:

- Able to use various measuring devices for study of of Railway/Tunnel/Bridges
- This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- Chakraborty and Das; Principles of transportation engineering; PHI
- Rangwala SC; Railway Engineering; Charotar Publication House, Anand
- Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
- Ponnuswamy; Bridge Engineering; TMH
- Railway Engineering by Arora&Saxena - DhanpatRai& Sons

Semester VI/ Year III

CE62 RCC Design

Learning Hrs :60

Objective:

- To impart knowledge and understanding of development and planning of RCC Structure with its design needs.
- Develop skill to design RCC Structure accordance to latest version of IS:456 with SP-16 (Design aids).

Course Content

Module 1: Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

(Hours:12)

Module 2: Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Flat slabs, Circular slabs, Yield line theory.

(Hours:12)

Module 3: Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Earth Retaining Structures: Cantilever and counter fort types retaining walls.

(Hours:12)

Module 4: Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks. Silos and Bunkers.

(Hours:12)

Module 5: T-beam & Slab bridges- for highway loading (IRC Loads).

Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Design of Multistory Buildings - Sway and nonsway buildings, Shear walls and other bracing elements.

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NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids).

(Hours:12)

Outcome:

- Understanding development and planning of RCC Structure with its design needs.
- Skill is developed to design RCC Structure accordance to latest version of IS:456 with SP-16 (Design aids)
- This course imparts skill to students to apply this knowledge on engineering applications

List of Experiments/Practicals:

Sketch book :

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution & strain distribution diagrams R.C.C. section / detailing of reinforcement in joints / members. Design of R.C.C. structural components by LSM.

Introduction to RCC design software STRUUDS

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on any five of the following R.C.C. components members of a two-storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920.

- One-way simply supported slab.
- Two-way simply supported slab.
- Cantilever slab/chajja.
- T-Beam
- Column and column footing.
- Dog-legged staircase.
- Sump tank
- Over head water tank

FIELD VISITS -

- Visit to a construction site where the RCC work is in progress. Visit to a construction site where the irrigation work is in progress.
- Visit to a bridge site. Batching plant for cement concrete and bituminous road
- Visit to water treatment plant.
- Visit to a dam site Canal site
- . Visit for a power plant site .
- Visit for a construction site where multistoried mall /shopping complex

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Suggested learning resources:

- Plain & Reinforced Concrete Vol. I & II - O.P. Jain & Jay Krishna
- Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
- Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
- Plain & reinforced concrete - Rammuttham
- Plain & reinforced concrete - B.C. Punmia
- Structural Design & Drawing by N.K.Raju.
- R.C.C. by B.C. Punmia
- Essentials of Bridge engineering - D.J. Victor
- Bridge Engineering - Ponnuswamy

Semester VI/ Year III

CE63 Steel design

Learning Hrs :60

Objective:

- To impart knowledge and understanding of development and planning of Steel Structure with its design needs.
- Develop skill to design Steel Structure accordance to latest version of IS:800 with Steel table

Course Content

Module 1: Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections - Bolted and Welded connections.

(Hours:12)

Module 2: Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Effective length of columns, Design of columns-simple and compound, Lacing & battens. Design of footings for steel structures, Grillage foundation. Design of simple beams, Built-up beams, Plate girders and gantry girders.

(Hours:12)

Module 4: Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers. Chimneys: Guyed and self supporting steel stacks. Bunkers, Silos & Towers.

(Hours:12)

Module 4: Plate girder bridges (Riveted and welded)

Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

(Hours:12)

Module 5: Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

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

(Hours:12)

Outcome:

- Understanding development and planning of Steel Structure with its design needs.
- Skill is developed to design Steel Structure accordance to latest version of IS:800 with Steel table
- This course imparts skill to students to apply this knowledge on engineering applications

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List of Experiments/Practicals:

PRACTICAL: Term work shall consist of sketch book and design 30 report of steel roof truss for an industrial building. Sketch book shall consist of any five plates out of the below mentioned

1. Sketching of different types of riveted joints and welded joints. Typical sketches of sections of tension member, determination of net effective cross-sectional area of tension member for angle section.
2. Typical sketches of sections of compression member, lacing and battening.
3. Graphical solution of frames to find out the stress in the member. Type of trusses for different spans.
4. Working drawing of steel truss with the details of joint
5. Detailed drawing of slab base and gusseted base.
6. Important information of clauses of IS800-1984 and IS875 (Part-1,2& 3)

Suggested learning resources:

1. Design of steel structures by Arya&AzmaniNemchand& Bros, Roorkee
2. Design of steel structures by P.Dayaratnam
3. Design of steel structures Vol. I & II by Ramchandra
4. Design of steel structures by L.S. Negi
5. Design of steel structures by Ramammutham
6. Design of steel structures by Punmia
- 7.. Steel Str. by Arya&Ajmani
8. Design of steel structures - L.S. Negi

Semester VI/ Year III

CE64 Elective I

CE64 (A) Foundation Engineering

Learning Hrs : 60

Objective:

- To impart knowledge and understanding of development and planning of foundations for Civil engineering Structures with its design needs.
- Develop skill to design foundation accordance to geological feature and structural need.

Course Content

Module 1: Shallow Foundations: Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

(Hours:12)

Module 2: Deep Foundation: Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

(Hours:12)

Module 3: Soil Improvement Techniques: Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

Soil stabilisation : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation and sabilisation by grouting. Geo-synthetics, types, functions, materials and uses.

(Hours:12)

Module 4: Soil Exploration and Foundations on Expansive and Collapsible soils: Methods of soil exploration. Planning of exploration program for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

(Hours:12)

Module 5: Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications.

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Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

(Hours:12)

Outcome:

- Understanding development and planning of Foundations with its design needs.
- This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- Soil Mechanics & Foundation Engineering, Arora K. R, Standard Publications
- Soil Mechanics & Foundations, Punmia B. C, Laxmi Publications
- Soil Mechanics & Foundation Engineering, Murthy V. N. S, Dhanpat Rai
- Soil Mechanics & Foundation Engineering, Alamsingh, CBS Publishers & Distributors
- Basic & Applied Soil Mechanics, New Age International Publishers

Semester VI/ Year III

CE64 Elective I

CE64 (B) Construction Equipment & Automation

Learning Hrs : 60

Objective:

- To impart knowledge and understanding of Construction Equipment and automation in the field of Civil engineering.
- Develop skill to understand need and suitability of equipment in different construction work.

Course Content

Module 1: Excavating Equipments: Different types of Excavator such as Front shovel, hoes. Their selection, calculation of shovel production, height & cut of shovel, angle of swing effect on shovel production., calculation of hoe production, Type of loaders their bucket attachments, loader production rates , calculation of wheel loader production Compacting. **(Hours:12)**

Module 2: Stabilization Equipment : Compaction of soil and rock, types of compacting equipment, roller production estimating, Dynamic compaction, Soil stabilization- Lime stabilization and Cement stabilization. **(Hours:12)**

Module 3: Study of equipments with reference to available types and their types and their capacities, factors affecting their performance **(Hours:12)**

Module 4: Earthmoving Equipment: Tractors and attachments, dozers and rippers, scrapers , shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, rollers and compactors Pile driving equipments: Types, pile driving hammers, single acting and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory drivers **(Hours:12)**

Module 5: Pumping equipments: Reciprocating, diaphragm & centrifugal pumps, well point system. Concrete manufacture, transport, placing and compacting equipment, mixers, central batching and mixing plants, pavers, transit mixers, concrete pumps shotcrete Air Compressor Equipments for moving materials, builder's hoists, forklifts , cranes, belt-conveyors, cableways, ropeways. **(Hours:12)**

Outcome:

- Develop skill to deploy construction equipment as per need of construction.
- This course imparts skill to students to apply this knowledge on engineering applications.

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Suggested learning resources:

- Construction planning, Equipments and Methods. R. L. Peurify, TMH, 1996
- Constuction Equipment and its Planning and Applications, Mahesh Varma, Metropolitan Book Co. (P) Ltd., New Delhi, India.
- Construction Macinery and Equipment in India, (A compilation of articles Published in Civil Engineering and Construction Review), Publish by Civil Engineering and Construction Review New Delhi, 1991

Semester VI/ Year III

CE64 Elective I

CE64 (C) Repairs & Rehabilitation of Structures

Learning Hrs : 60

Objective:

- To impart knowledge and understanding of causes of Structure failure
- Develop skill to Repair and rehabilitation of Civil structure.

Course Content

Module 1: Maintenance and repair strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

(Hours:12)

Module 2: Strength and durability of concrete Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

(Hours:12)

Module 3: Special concretes Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

(Hours:12)

Module 4: Reqniques for repair and protection methods Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

(Hours:12)

Module 5: Repair, rehabilitation and retrofitting of structures Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods - Case studies.

(Hours:12)

Outcome:

- Develop skill to assess reason of Structural Failure.
- This course imparts skill to students to apply this knowledge on engineering applications

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Suggested learning resources:

- Repair and protection of concrete structures by Noel P. Mailvaganam, CRC Press, 1991.
- Concrete repair and maintenance Illustrated by Peter. H. Emmons, Galgotia publications Pvt. Ltd., 2001.
- “Earthquake resistant design of structures” by Pankajagarwal, Manish shrikande, PHI, 2006. Failures and repair of concrete structures by S. Champion, John Wiley and Sons, 1961.
- Diagnosis and treatment of structures in distress by R. N. Raikar Published by R & D Centre of Structural Designers and Consultants Pvt. Ltd, Mumbai.
- Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India.
- Handbook on seismic retrofit of buildings, A. Chakrabartiet. al., Narosa Publishing House, 2010.

Semester VI/ Year III

CE65 Open Elective I

CE65 (A) History of Science & Engineering

Learning Hrs : 60

Objective:

- To impart knowledge and understanding of evolution of Science and Engineering.

Course Content

Module 1: The History of science & technology introduction, beginning of science, technology & engineering, traveling through the ages, Science, Engineering & technology

Major: Introduction, function, emerging field.

(Hours:12)

Module 2: Profile of Engineers, scientist & technologist, Problem solving: Introduction, analytical and creative problem solving, analytical problem solving, personal problem solving styles, brainstorming strategies, critical thinking.

(Hours:12)

Module 3: Statistical profile of science & engineering profession: Statistical, overview, college enrolment trends of science and engineering students, college majors of recent science & engineering students. Job placement trends, diversity of profession distribution of scientist and engineers by type of employer.

(Hours:12)

Module 4: Succeeding in the classroom: Introduction, attitude, goal, key to effectiveness, test taking, learning style, accountability and overcoming challenges. Failure of science & technology.

(Hours:12)

Module 5: Biography of Isaac Newton, Einstein, Thomas Edison, Alfred Nobel, M. Visvesvaraya .

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Engineering your future by William C. Oaks, Oxford university press

Semester VI/ Year III

CE65 Open Elective I

CE65 (B) Economic Policies in India

Learning Hrs : 60

Objective:

- To impart knowledge and understanding of Economic Policies in India.

Course Content

Module 1: Basic features and problems of Indian Economy: - Nature of Indian Economy, demographic features and Human Resource Development (HDI), Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

(Hours:12)

Module 2: Sectoral composition of Indian Economy: - Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India, Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

(Hours:12)

Module 3: Economic Policies :- Economic Planning in India, Planning commission v/s NITI Aayog, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India.

(Hours:12)

Module 4: External sector in India: - India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

(Hours:12)

Module 5: Structural adjustment programme- a critical appraisal; overall impact on growth and distribution. Financial sector reforms- role of RBI and SEBI. New financial reforms for banking system, performance of financial institutions since reforms Fiscal deficit and sickness of state finances, policies and programme since reforms; expenditure reforms- existing concerns.

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Dutt Rudder and K.P.M Sunderam (2001): Indian Economy, S Chand & Co. Ltd. New Delhi.

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- Mishra S.K & V.K Puri (2001) “Indian Economy and –Its development experience”, Himalaya Publishing House.
- KapilaUma: Indian Economy: Policies and Performances, Academic Foundation
- Bardhan, P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.
- Jalan, B. (1996), India’s Economic Policy- Preparing for the Twenty First Century, Viking, New Delhi.

Semester VI/ Year III

CE65 Open Elective I

CE65 (C) Metro Systems and Engineering

Learning Hrs : 60

Objective:

- To impart understanding of Metro Systems in India.
- To develop knowledge of Engineering and Management practices pertaining to Metro Systems in India.

Module 1: GENERAL: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials

CIVIL ENGINEERING-Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction

(Hours:12)

Module 2: Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

(Hours:12)

Module 3: ELECTRONICS AND COMMUNICATION ENGINEERING- Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

(Hours:12)

Module 4: MECHANICAL & TV + AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators

(Hours:12)

Module 5: ELECTRICAL: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics.

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- E O Taylor, Utilization of Electrical Energy, University Press
- Wadhwa, C. L.; Utilization of Electric Power; New Age Publication
- Pratab, H.; Modern Electric Traction, Dhanpat Rai & Sons.
- Cotton, H., Principles of Illumination, Chapman & Hall.

Semester VI/ Year III

CE66 Minor Project

Learning Hrs:

Objective:

- To impart understanding and develop skill toward practical project development

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

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Semester VI/ Year III

CATEGORY: - PDFS

SUBJECT CODE: -BE- 61

SUBJECT NAME: -PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

(LEVEL-IV)

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Emphasis to be made in reading, writing and vocal English, quantitative aptitude and logical reasoning to be stressed.

UNIT-I

Final Finishing:

Final Preparation of CV. Final Compilation of Database of Students with Necessary Mapping, Mock Interviews, Group Discussions. **(18 HOURS)**

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning- Level IV

Problem solving on.

Ratio and Proportions, Solutions and Mixtures, Sets, Simple Interest and Compound Interest, Simple and Quadratic Equations. **(18 HOURS)**

OUTCOME

Attainment of confidence the students to be able to face interviews, group discussion and presentation ability. Knowledge on basic mathematical ability attained. Hence forth a student become competent to face the challenges of the world after attainments of knowledge at college level

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Semester VII/ Year IV

CE71

Environmental Engineering

Learning Hrs : 60

Objective:

- To impart understanding of issues regarding Environment and its management.
- To develop knowledge of Engineering and Management practices pertaining to Environmental Engineering

Course Content

Module 1: Water: -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes

(Hours:12)

Module 2: Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage - quality requirements for various purposes.

(Hours:12)

Module 3: Building Plumbing-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used..

(Hours:12)

Module 4: Air - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations

Noise- Basic concept, measurement and various control methods..

(Hours:12)

Module 5: waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and

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disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods-Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities..

(Hours:12)

Outcome:

- Develop ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

List of Experiments/Practicals:

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Analysis of ions: copper, chloride and sulfate
5. Optimum coagulant dose
6. Chemical Oxygen Demand (COD)
7. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
8. Break point Chlorination
9. Bacteriological quality measurement: MPN,
10. Ambient Air quality monitoring (TSP, RSPM, SO_x, NO_x)
11. Ambient noise measurement

Suggested learning resources:

- Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
- Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
- Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
- MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
- Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
- Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
- Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

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- Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Semester VII/ Year IV

CE72

Engineering Economics, Estimation, Costing and Valuation

Learning Hrs : 60

Objective:

- To impart understanding of Engineering Economics, Estimation, Costing and Valuation.
- To impart knowledge of measurement system in Civil Engineering Structures.
- To develop Skill of Estimation, Costing and Valuation

Course Content

Module 1: Basic Principles and Methodology of Economics. Demand/Supply - elasticity - Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes.

Indian economy - Brief overview of post-independence period - plans. Post reform Growth, Structure of productive activity. Issues of Inclusion - Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment- Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors..

(Hours:12)

Module 2: Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control - Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis - NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting - Elementary techniques. Statements - Cash flow, Financial. Case Study Method..

(Hours:12)

Module 3 : Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.

Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity. .

(Hours:12)

Module 4: Estimation / Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost

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sensitive index, market survey of basic materials. Use of Computers in quantity surveying (7 lectures).

(Hours:12)

Module 5: Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings..

(Hours:12)

Outcome:

- Develop ability To take out quantity of Civil Engineering Structures for Estimation, and Costing.
- Develop Skill of Valuation of Real State Property
- This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
- V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
- Misra, S.K. and Puri (2009), Indian Economy, Himalaya
- PareekSaroj (2003), Textbook of Business Economics, Sunrise Publishers
- M Chakravarty, Estimating, Costing Specifications & Valuation
- Joy P K, Handbook of Construction Management, Macmillan
- B.S. Patil, Building & Engineering Contracts
- Relevant Indian Standard Specifications.
- Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

Semester VII/ Year IV

CE73 Elective II

CE73(A) Physico-Chemical Processes for water and wastewater treatment.

Learning Hrs : 60

Objective:

- To impart understanding of Physico-Chemical Processes involved in water and wastewater treatment.
- To develop knowledge of types, operation and maintenance of water and wastewater treatment plants

Course Content

Module 1: Unit operations, unit processes. Aeration and gas transfer. Sedimentation, different types of settling, sedimentation tank design. Coagulation and flocculation, coagulation processes, stability of colloids, destabilization of colloids, destabilization in water and wastewater treatment, transport of colloidal particles, design aspects..

(Hours:12)

Module 2: Filtration: filtration processes, Hydraulics of flow through porous media, Rate control patterns and methods, Filter effluent quality parameters, mathematical model for deep granular filters, slow sand filtration, rapid sand filtration, pre-coat filtration, design aspects..

(Hours:12)

Module 3: Disinfection: Types of disinfectants, Kinetics of disinfection, chlorination and its theory, Design of Chlorinators..

(Hours:12)

Module 4: Precipitation: Hardness removal, Iron, Mn, and heavy metal removal; Adsorption, adsorption equilibria and adsorption isotherm, rates of adsorption, Sorption kinetics in batch reactors, continuous reactors, factors affecting adsorption. .

(Hours:12)

Module 5: Ion Exchange-exchange processes, materials and reactions, methods of operation, Application, design aspects. Membrane Processes, Reverse osmosis, Ultrafiltration, Electrolysis..

(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi

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- Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
- Water & Waste Water Technology by Mark J. Hammer - Prentice - Hall of India, New Delhi
- Environmental Engineering - H.S. Peavy & D.R. Rowe - McGraw Hill Book Company, New Delhi
- Water Supply & Sanitary Engg. by S.K. Husain
- Water & Waste Water Technology - G.M. Fair & J.C. Geyer
- Relevant IS Codes

Semester VII/ Year IV

CE73 Elective II

CE73(B) Sustainable Engineering & Technology

Learning Hrs : 60

Objective:

- To impart understanding concept and principle of Sustainability.
- To develop knowledge of implementing concept and principle of Sustainability in the field of engineering

Course Content

Module 1: Sustainability - Introduction. Need and concept of sustainability. Social-environmental and economic sustainability concepts. Sustainable development. Nexus between Technology and Sustainable development. Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM). Environmental legislations in India - Water Act.. Air Act..

(Hours:12)

Module 2: Environmental management standards. ISO 14000 series. Life Cycle Analysis (LCA) - Scope and Goal. Bio-mimicking. Environment Impact Assessment (EIA) - Procedures of EIA in India..

(Hours:12)

Module 3: Basic concepts of sustainable habitat. Green buildings, green materials for building construction, material selection for sustainable design, green building certification. Methods for increasing energy efficiency of buildings. Sustainable cities. Sustainable transport..

(Hours:12)

Module 4: Energy sources: Basic concepts-Conventional and non-conventional, solar energy. Fuel cells. Wind energy. Small hydro plants, bio-fuels. Energy derived from oceans. Geothermal energy..

(Hours:12)

Module 5: Green Engineering. Sustainable Urbanisation, industrialisation and poverty reduction: Social and technological change. Industrial Processes: Material selection. Pollution Prevention..

(Hours:12)

Outcome:

- Develop understanding towards concept and principle of Sustainability applicable to the field of Engineering
- This course imparts skill to students to apply this knowledge on engineering applications

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Suggested learning resources:

- Allen. D. T. and Shonnard. D. R.. Sustainability Engineering: Concepts, Design and Case Studies. Prentice Hall.
- Bradley. A.S: Adebayo.A.O.. Maria. P. Engineering applications in sustainable design and development. Cengage learning
- Environment Impact Assessment Guidelines. Notification of Government of India. 2006
- Mackenthun. K.M.. Basic Concepts in Environmental Management. Lewis Publication. London. 1998
- ECBC Code 2007. Bureau of Energy Efficiency. New Delhi Bureau of Energy Efficiency Publications-Rating System. TERI Publications - GRJHA Rating System
- Ni bin Chang. Systems Analysis for Sustainable Engineering: Theory and Applications. McGraw-Hill Professional
- Twidell. J. W. and Weir. A. D.. Renewable Energy Resources. English Language Book Society (ELBS).
- Purohit. S. S.. Green Technology - An approach for sustainable environment. Agrobios publication

Semester VII/ Year IV

CE73 Elective II

CE73(C) Construction Management

Learning Hrs : 60

Objective:

- To impart understanding of procedure involved in project Initiation, Planning and Design, Construction and Execution, Monitoring and Control, Completion..
- To develop knowledge of Communication and supervision pertaining to the project.

Course Content

Unit - I Construction industry and management

Organization-objectives, principles of organization, types of organization:

government/public and private construction industry, Role of various personnel in construction organization

Agencies associated with construction work- owner, promoter, builder, designer, architects.

Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes..

(Hours:12)

Unit - II Site Layout

Principles governing site layout.

Factors affecting site layout.

Preparation of site layout.

Land acquisition procedures and providing compensation..

(Hours:12)

Unit- III Planning and scheduling

Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart.

Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events.

CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path,

Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration.

Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity

Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in).

(Hours:12)

Unit IV Construction Contracts and Specifications

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Types of Construction contracts

Contract documents, specifications, general special conditions

Contract Management, procedures involved in arbitration and settlement (Introduction only).

(Hours:12)

Unit- V Safety in Construction

Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures.

Labour Laws and Acts pertaining to Civil construction activities (Introduction only).

(Hours:12)

Outcome:

- Develop understanding of procedure involved in project Initiation, Planning and Design, Construction and Execution, Monitoring and Control, Completion..
- Impart skill of Communication and supervision pertaining to the project
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Pub-lishing, New Delhi
- Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International
- (P) Ltd. Publishers, New Delhi.
- Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
- Mantri, S., The A To Z of Practical Building Construction and its Management, SatyaPrakashan New Delhi
- Khanna, O.P. , Industrial Engineering and management, DhanpatRai New Delhi
- Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
- Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
- Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
- Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

Semester VII/ Year IV

CE74 Elective III

CE74(A) Modern Construction Engineering Materials

Learning Hrs : 60

Objective:

- To impart understanding of type and use of Modern Construction Engineering Materials.
- To develop knowledge of execution of Civil engineering Structure using Modern Construction Engineering Materials.

Course Content

Module 1: Introduction, properties and uses of modern building materials: fly ash bricks, soil - cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC) , glass reinforced gypsum. .

(Hours:12)

Module 2: Introduction , properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals ,paints ,tiles ,bricks, glass),metals, light - weight concrete, mass concrete, waste material based concrete.

(Hours:12)

Module 3: Introduction , properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, pre fabricated systems. .

(Hours:12)

Module 4: Introduction , properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete..

(Hours:12)

Module 5: Introduction , properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials(thermal, sound and electrical insulating materials).Concept of polymer floor finishes..

(Hours:12)

Outcome:

- Able to understand use of Modern Construction Materials .
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- Ghambhir M.L. "Concrete Technology" Tata McGraw Hill education private Limited.
- A.R. Santhakumar, Concrete Technology, Oxford University Press.
- Building Materials, P.C. Varghese, Prentice-Hall India.

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- Shetty, M. S., "Concrete Technology" S. Chand Publication.
- Krishnaraju .N., Advanced Concrete Technology, CBS Published.
- Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
- Nevile. A.M., Concrete Technology, Prentice Hall, Newyork.
- Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication pvt.ltd.
- Materials Science and Engineering, V. Raghavan, Prentice Hall.

Semester VII/ Year IV

CE74 Elective III

CE74(B) Environmental Impact Assessment

Learning Hrs : 60

Objective:

- To impart understanding of Human Activity on environment.
- To develop knowledge of Environment Impact of human activity and its management system

Course Content

Module 1: Concept of EIA : Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS).

(Hours:12)

Module 2: Methods of Impact Identification : Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method..

(Hours:12)

Module 3: Impact analysis : Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment..

(Hours:12)

Module 4: Preparation of written documentation : Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort..

(Hours:12)

Module 5: Public Participation in Environmental Decision making : Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation..

(Hours:12)

Outcome:

- Able to conduct experiments and analyze data pertaining to EIA.
- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- EIA - Notification,
2006 <http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>
- EIA – Draft Notification, 2020
http://environmentclearance.nic.in/writereaddata/Draft_EIA_2020.pdf
- STANDARD TERMS OF REFERENCE [TOR]
- <http://environmentclearance.nic.in/writereaddata/standardtorreference.pdf>

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- Environmental Impact Assessment Training Manual
<https://www.iisd.org/learning/eia/wp-content/uploads/2016/06/EIA-Manual.pdf>
- <http://www.fao.org/3/v8350e/v8350e00.htm#Contents>

Semester VII/ Year IV

CE74 Elective III

CE74(C) Geographic Information Systems and Science

Learning Hrs : 60

Objective:

- To impart understanding of Geographic Information Systems and Science.
- To develop knowledge and skill to implement Geographic Information Systems and Science in the field of civil engineering.

Course Content

Module 1: Introduction to GIS Basic concepts: Definition and history, Components of GIS, Recent trends and applications of GIS; Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Data inputting in GIS. Rectification, Transformation Methods; Root Mean Square (RMS) Error..

(Hours:12)

Module 2: Data Types and Data Models. Data Types; Spatial Data; Non-Spatial Data, Data Input; Existing GIS Data, Metadata; Conversion of Existing Data, Creating New Data, Data Models; Vector Data Model; Raster Data Model; Integration and Comparison of Vector and Raster Data Models..

(Hours:12)

Module 3: Spatial Data Editing Types of Digitizing Errors, Causes for Digitizing Errors; Topological Editing and Non-topological Editing; Other Editing Operations; Editing Using Topological Rules. Attribute Data and Data Exploration Attribute Data in GIS, Attribute Data Entry, Manipulation of Fields and Attribute Data, Data Exploration; Attribute Data Query, Raster Data Query, Map- Based Data Manipulation.

(Hours:12)

Module 4: Spatial Analysis Spatial Data: Definition, Analysis, Processes & Steps, Software and Tools, Geodatabase Model, Role of Databases in GIS, Creating, Editing and Managing, Classification scheme of Vector- Based and Raster- Based GIS Operation Raster- Based Techniques: Methods of reclassification, overlay analysis, Digital Terrain Analysis and Modeling- TIN and DEM, Surface representation and analysis, Slope and Aspect, Geographic Visualization Data Classification, Map Comparison..

(Hours:12)

Module 5: Geo Statistical Analysis Techniques: Introduction to Spatial Interpolation: Control Points, Global Method- Trend surface analysis, regression model, local methods- Thiessen polygons, density estimation, Inverse Distance weighted Interpolation, Kriging- Ordinary Kriging and Universal Kriging, GIS and decision support system, Introduction to AHP, basic principal of AHP. Principal and components of multiple criteria decision making..

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(Hours:12)

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Suggested learning resources:

- C.P.Lo and Albert K.W. Yeung (2006) "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India, New Delhi
- Burrough, Peter A. and Rachael McDonnell, (1998), 'Principles of Geographical Information Systems' Oxford University press, New York.
- Magwire, D.J. Goodchild, M.F. and Rhind, D.M., (2005), 'Geographical Information Systems: Principles and Applications', Longman Group, U.K.
- Burrough, P.A., 1986, Geographical Information System for land Resources System, Oxford Univ. Press, UK.
- Fotheringham, S.; Rogerson, P. (ed.), 1994. Spatial analysis and GIS. Taylor and Francis, London, UK.
- Laurini, Robert and Dierk Thompson, 1992, Fundamentals of Spatial Information Systems, Academic Press, ISBN 0-12-438380-7.
- Maguire, D.J.; Goodchild, M.F.; Rhind, D.W. 1991. Geographical information System, Longman, London, UK
- Siddiqui, M.A.; 2006, Introduction to Geographical Information System, Sharda Pustak Bhavan, Allahabad.
- Siddiqui, M.A.; 2011, Concepts and Techniques of Geoinformatics, Sharda Pustak Bhavan, Allahabad.

Semester VII/ Year IV
CE75 Major Project -I

Learning Hrs:

Objective:

- To impart understanding and develop skill toward practical project development

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.

Semester VII/ Year IV

CE76 STAAD Pro. Lab

Learning Hrs:

Objective:

- To impart understanding and develop skill of Design Structure through Computer software STAAD Pro.

Course Content

- + Introduction to STAAD Pro
- + Analysis of a RCC Beam
- + Analysis of a 2D Frame
- + Analysis and Design of a 3D Frame
- + Using Structure Wizard
- + Exploring the STAAD Pro Tools
- + Moment Releases and Member Offset
- + Modeling of The Building
- + Preliminary Design of Slab, Beam and Column

Outcome:

This course imparts skill to students to apply this knowledge on engineering applications

Suggested learning resources:

- https://www.udemy.com/course/staad_prov8i/

Semester VIII/ Year IV

CE81 Major Project -II

Learning Hrs:

Objective:

- To impart understanding and develop skill toward practical project development

Outcome:

- This course imparts skill to students to apply this knowledge on engineering applications.