

**Syllabus for**  
**Applied Mathematics- III (Civil Engineering)**  
**Scheme (Theory: 4 hrs, Tutorial: 1hr)**

**UNIT –I : FOURIER SERIES (06Hrs)**

Periodic functions and their Fourier expansions, Even and Odd functions, Change of interval, Half range expansion.

**UNIT - II: PARTIAL DIFFERENTIAL EQUATIONS(12Hrs)**

Partial Differential Equations of first order first degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Applications to simple problems of vibration of strings and beams, Elementary concept of double Fourier series and their application to simple problems of vibration of rectangular membrane.

**UNIT – III: CALCULUS OF VARIATIONS (08Hrs)**

Maxima and minima of functional, Euler's equation, Functionals dependent on First & Second orders derivatives. Rayleigh-Ritz method, Simple applications.

**UNIT –IV: MATRICES(12Hrs)**

Linear and Orthogonal transformations, Linear dependence of vectors, Characteristics equations, Eigen values and Eigen vectors. Reduction to diagonal form, statement and verification of Cayley Hamilton Theorem [without proof.] Sylvester's theorem, Quadratic form Transformation of co-ordinates ,Transformation of forces and couples, Association of matrices with linear differential equation of second order with constant coefficients.

**UNIT – V: NUMERICAL METHODS(14Hrs)**

Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence , Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordan method. Gauss Seidel method, Crouts method, Numerical solution of ordinary differential equation :Taylor's series method, Picard's method, Runge-Kutta 4<sup>th</sup> order method, Euler modified method. Milne's Predictor- Corrector method.

## **UNIT – VI: INTRODUCTION TO OPTIMIZATION TECHNIQUES (08Hrs)**

Linear programming problem: Formulation, Graphical method, Simplex method.

### Text Books

1. Higher Engineering Mathematics by B.S. Grewal, 40<sup>th</sup> Edition, Khanna Publication
2. Advanced Engineering Mathematics by Erwin Kreyszig, 8<sup>th</sup> Edition, Wiley India
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville,
4. Calculus of variation by Forrey

### Reference Books

1. A Text Book of applied Mathematics, Volume I &II , by P.N. Wartikar& J.N. Wartikar, Poona VidyarthiGrihaPrakashan
2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

## BECVE 302 T STRENGTH OF MATERIALS

### Objectives:

1. To make students learn and apply basic theories and concepts of equilibrium, shear force, bending moment in beams and frames, bending stress, shear stress, torsional stress and stress-strain laws to different materials for different conditions of loading.
2. To make students learn and understand the concept and theory of deflection of beams, frames, trusses.

### Outcomes:

- a. The students would be able to understand the behavior of materials under different stress and strain conditions.
- b. The students would be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading and calculate the deflection.

### Syllabus :

#### Unit – I

Mechanical properties and uniaxial problems.

Types of force distribution, concept of stress and strain, Stress strain behavior of ductile and brittle material in uniaxial state of stress, elastic, plastic and strain hardened zones stress-strain relations, Elastic constants, relation between elastic constant, Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading, temperature change etc., Thin wall pressure vessels cylindrical and spherical subjected to internal pressure.

#### Unit – II

Axial force, shear force and bending moment diagram

Concepts of free body diagrams, types of loads, Determination of axial forces, shear forces and bending moment at a section, axial force, shear force and bending moment in beams and simple frames, Differential relations between shear force and bending moment, Relation between load and shear force.

#### Unit – III : Stress in beams

Bending stresses in simple beams, Assumptions and derivation of simple bending theory relation between bending moment, bending stress and curvature of homogeneous and composite beams, Shear stresses in simple beams, Shear flow and shear stress distribution, shear stress in composite beams, combined effect of bending moment and axial force.

#### Unit – IV : Torsion

Torsion of circular section, assumptions and derivation of relations between torsional moment, shear stress and angle of twist, Torsional stress in solid and circular sections, **Introduction to Torsion in rectangular section**, Torsion in thin walled hollow section

#### Unit – V : Deflection of beams

Derivation of differential equation of moment curvature relation, Differential equation relating deflection and moment, shear and load, Deflection of simple beams by integration, **Introduction to Deflection of linearly varying beams by integration.**

**Unit –VI** : State of stress in two dimensions

State of stress in two dimensions, differential equation of equilibrium, Transformation of stresses, principal stresses, maximum shear stresses, Mohr's circle, Combined bending and torsion, Combined effect of torsion and shear, Shear flow in thin walled section, Concept of shear centre of thin wall sections, unsymmetrical bending.

**BECVE 302 P : STRENGTH OF MATERIALS**  
**(Any Eight practicals)**

1. To study various types of Strain Gauge apparatus.
2. To determine the Tensile Strength of Steel specimen.
3. To perform Hardness test on various metals. (Brinell's hardness test & Dynamic hardness test)
4. To perform standard Torsion test on metals.
5. To perform the Impact test on metal (Izod/ Charpy).
6. Compression test on Bricks and Stones.
7. To determine the spring constant of Closely Coiled Spring.
8. To perform shear test on different metals.
9. To perform fatigue test on mild steel bar.
10. To perform the bending test on wooden beam and find its Flexural Rigidity.

**Text Book:**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1.	Strenght of Materials by S.P. TimoShenko	Mc. Graw Hill
2	Mechanics of Materials by Ferdinand P. Beer, E. Russell John StonJr	Mc. Graw Hill

**Refrence :Sr.No**  
**Publication**

**Title**

1	<b>Strength of materials by Singer</b>	<b>Haper and Row</b>
---	--	----------------------

## **BECVE 303 ENVIRONMENTAL ENGINEERING – I**

### **Objectives:**

1. To prepare students to apply basic knowledge of environmental engineering in conventional civil engineering practice involving water supply engineering in particular.
2. The course will provide students knowledge regarding the sources, of water demands, population forecasting, and conveyance of water.
3. To prepare students to analyze, plan, and design of various phases of water supply systems.
4. To provide the students the knowledge regarding the various characteristics of water, estimation of the quantity of water.
5. The course will provide students with fundamentals of solid waste management

### **Outcomes:**

- a. The students would be able to understand the importance and necessity of water supply.
- b. The students would be able to determine the capacity of water supply scheme.
- c. The students would have the basic knowledge related to the conveyance systems and the appurtenances used.
- d. The students would have knowledge of characteristics of water, drinking water standards and necessity of treatment.
- e. The students would be able to design various units of conventional water treatment plant.
- f. The students would be equipped with the basic knowledge related to design of water supply system.
- g. The students should be able to understand of necessity of treatment, types of treatment processes and disposal methods for solid waste.

## **Syllabus :**

### **Unit – I**

Introduction: Importance and necessity of water supply scheme.

Water Demand: **All types of water demand**, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples.

Sources of water: Rain water, Ground water-springs, infiltration galleries, Dug wells, tube wells, Surface water-stream, lake, river, impounding reservoirs, ponds **& sea**.

Intake structures: Location, types river, lake, canal, reservoir etc.

### **Unit – II**

Conveyance of water: Types of pipes, joints, fittings, **valves & appurtenances**.

Hydraulic design aspects: Friction, Manning's, **DarcyWeishbach& Hazen Williams equationand problem**.

Rising main and pumps: **Concept of rising main**, Classification, working, merits and demerits, selection of pumps.

### **Unit – III**

Water quality: Physical, Chemical and bacteriological characteristics of water, **Health effects of various water characteristics**, Standards of drinking water. ( WHO 2011, CPHEEO, IS 10500). Water born diseases

Water treatment: Objective of treatment, unit operations and processes, **house hold & community based rural water treatment, decentralized water treatment**, flow sheet of conventional water treatment plant.

Aeration: Purpose, types of aerators, design of cascade aerator.

Coagulation and Flocculation: Definition, Principles, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices.

### **Unit – IV**

Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.

Clariflocculators: Principles and operation.

Filtration: Mechanism of filtration, types of filters-RSF, SSF, Pressure filters, elements of filters sand specification, operational problems in filtration, Design of SSF and RSF, **Membrane filtration technique of water treatment**.

### **Unit – V**

Disinfection: Purpose, Mechanism, criteria for good disinfectant, various disinfectants, their characteristics, disinfection by chlorination using different forms of chlorine. Types of chlorination.

Distribution systems: Requirements of a good distribution system, methods of distribution systems and layouts, Leakage and leak detector, **Study of fire hydrants**.

Storage reservoirs for treated water: Types, capacity of reservoir, mass curve.

### **Unit – VI**

Municipal solid waste management : Generation sources, composition, Methods of Collection, transportation, disposal, Recycle, Reuse.

Examples on simple hydraulic design of pipes, estimation of population and water quality, plain sedimentation tanks, cascade aerators, filters, pumps, dose of chlorine). Visit to Water treatment plant (compulsory).

## **BECVE 303 PRACTICAL ENVIRONMENTAL ENGINEERING – I**

### **Any TEN (Total)**

#### **I. Any Seven**

1. Determination of pH
2. Determination of Conductivity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
5. Determination of Turbidity
6. Determination of Acidity
7. Determination of Dissolved Oxygen
8. Determination of Membrane filtration technique.
9. Determination of Available Chlorine
10. Determination of Residual Chlorine
11. Jar Test
12. Bacteriological Plate count and MPN tests.
13. Determination of Alkalinity.

**II.** Only demonstration of COD, BOD.

**III.** Design of WTP using software.

**IV.** Brief Report on WTP Visit.

#### **Text book**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
1.	Water supply & Sanitary Engineering by B.C. Punmia	Laxmi Publication
2.	Water supply and Sanitary Engineering by Birdie G.S.	Dhanpat Rai Publication
3.	Environmental Engg. I by P. N. Modi,	Std. Publication
4.	Environmental Engg.( Water supply Engg )by S.K.Garg	Khanna Publication

#### **Reference book**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
1	CPHEEO manual, New Delh, Ministry of Urban Development	G.O.I.
2	Water supply and sewage by M.J.McGhee	Mc. Graw Hill
3	Environmental Pollution Control Engg. By C.S.Rao	Mc. Graw Hill

**B.E. III SEM (CIVIL ENGINEERING)**  
**SUBJECT: ENGINEERING GEOLOGY**

**UNIT-I: General Geology**

Definition and scope of Geology, Internal structure of the earth. Introduction to continental drift and plate tectonics. Volcanoes type and their products. Principles of stratigraphy, Geological Time Scale, Physiographic and tectonic divisions of India. Introduction to Indian stratigraphy. (4)

**Geomorphology:** Weathering and erosion, Geological action of Wind, River and Ground water and resulting land forms. Geomorphic forms and their consideration in civil engineering works. (3)

**UNIT-II: Mineralogy:**

Definition and classification of minerals, Physical properties of Minerals, introduction to common rock-forming minerals (3)

**Petrology:** Rock cycle, **Igneous rocks:** Formation of Igneous rocks, textures and structures, forms and tabular classification of Igneous rocks. Common Igneous rocks and their uses. **Sedimentary rocks:** formation of sedimentary rocks, classification of sedimentary rocks. Common Sedimentary rocks and their uses. **Metamorphic rocks:** Definitions, agents of metamorphism, types of metamorphism, zones of metamorphism, Common Metamorphic rocks and their uses. (6)

**UNIT-III: Structural Geology:**

Introduction, outcrops, dip and strike of beds. Problems on dip, strike, thickness and three bore hole problems. **Folds:** parts of fold, classification, effects on outcrops, their identification in field, Importance of folds in civil engineering projects. **Joints:** definition, nomenclature and classification, Importance of joints in civil engineering projects. **Faults:** terminology, classification, mechanics of faulting, recognition of faults in the field, Importance of faults in civil engineering projects. **Unconformity:** Formation of unconformity, Types of unconformity. (10)

**UNIT-VI: Earthquake Engineering:**

Introduction, Terminology, Earthquake waves, Causes and effects, Intensity, MMI and MSK intensity scale and magnitude, magnitude scales, Liquefaction, location of epicenter, Tsunami, Seismograph and seismogram, Classification of earthquake, Earthquake zones of India, Aseismic structures. (3)

**Landslides and Subsidence:** Introduction, Terminology, Causes of landslides, classification of landslides, stable and unstable slopes, Control of landslides, causes of land subsidence, subsidence hazard mitigation. (3)



**UNIT-V: Geohydrology:**

Introduction, Hydrologic cycle, Origin of groundwater, Occurrence and distribution of ground water, water table and water table contour maps, Aquifer, Aquitard, Aquiclude and aquifuges, confined and unconfined aquifers, perched aquifer, Artesian and flowing wells, Importance of groundwater studies in Civil Engineering works. (3)

**Site Investigations:** Surface and sub-surface investigation: Geological mapping, Drilling, Bore hole logs, geophysical methods: Electrical Resistivity and Seismic methods. (3)

**UNIT-VI: Application of geology to civil engineering works:**

Engineering properties of rocks. Engineering classification of rocks based on compressive strength. RQD, Rocks as a construction material: Building stone, Road metal, Railway ballast. (3)

**Dams:** Parts and terminology, Classification of dams, geological problems at dam site, dam location on different rocks and their stability, Reservoirs study,(2)

**Tunnels:** Terminology, soft ground tunneling, rock tunneling and their stability. (2)

**Text Books**

1. Geology for Engineers: FGH Blyth
2. Engineering and General Geology: Parbin Singh
3. Engineering Geology: B.S. SathyaNarayanswami
4. Principles of Engineering Geology: K.M. Bangar
5. Basic Geotechnical Earthquake Engineering: Kamalesh Kumar
6. Rock Mechanics for Engineers: B.P. Verma

**Laboratory Work**

1. Megascopic study of common rock-forming Minerals.
  2. Megascopic study of common Rocks.
    - a) Igneous Rocks
    - b) Sedimentary Rocks
    - c) Metamorphic Rocks
  3. Geological Maps: Drawing of geological cross sections with civil engineering projects.
  4. Field visit to civil engineering construction sites with reference to geological studies.
-

## BECVE 305T CONCRETE TECHNOLOGY

### Objectives:

1. To prepare the students to understand constituents of concrete and their effect on quality of concrete.
2. The course will prepare students to apply basic rules for manufacture of plastic concrete and its mechanization.
3. To prepare students to apply various methods for testing of plastic and hard concrete.
4. To prepare students to analyse behavior of concrete structure under different environmental conditions.
5. The course will prepare students to analyse and design various basic concrete building components.

### Outcomes:

- a. The students would be able to check and recommend different constituent of concrete.
- b. The students would be able to control method of manufacture of concrete.
- c. The students would be able to test strength and quality of plastic and set concrete.
- d. The students would have the understanding of application admixture and its effect on properties of concrete.
- e. The students would be able to understand the effect of process of manufacturing on different properties of concrete.
- f. The students would be able to understand various environmental factors which affect durability of concrete, analyse cause of deterioration of concrete components and to suggest various preventive measures to it.
- g. The students would be able to test various strength of concrete by destructive and nondestructive testing methods.

### Syllabus:

#### Unit – I Cement

**Chemistry of Cement**, Main constituents of cement Hydration of cement, Water required, Physical properties and testing of cement, Soundness test. Hardening and compressive strength Grades and different types of cements. Ordinary Portland cement, Rapid Hardening Cement, B.B. Blast furnace slag cement, Low heat Portland cement, Portland pozzolones cement, Portland flyash cement, Sulphate resisting cement. **Field test**,

**Aggregates** : Sources of aggregates, classification and nomenclature. Coarse and fine aggregate, normal weight (light and heavy weight aggregates). Aggregate characteristics and their significance in strength, workability, placement and compaction of concrete. Sampling. Particle shape and texture, Bond of aggregate, size & grading of aggregate strength of aggregates Mechanical properties and test-Specific gravity, Bulk density, porosity absorption of aggregates, moisture content of aggregate, bulking of sand abrasion test, impact value. **Sieve analysis** Deleterious substances in aggregates, organic impurities class and other fine material etc.

**Water** : **Quality of water for concrete mixing, suitability.**

#### Unit – II

**Fresh concrete** : Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing. Workability Measurement – Slump cont test, compacting factor test, flow table, Vee-Bee consistometer, Factor affecting workability, setting time. **W/C Law** Significance of w/c ratio **cohesiveness**. Segregation, bleeding,

voids, permeability. Hot weather concreting. **Underwater concreting**, Conveyance of concrete, Placing of concrete. Compaction-vibrators. Curing of concrete Significance, methods of curing, Temperature effect on during & strength gain. IS code on curing. Maturity of concrete.

### Unit - III

#### **Strength of concrete-**

Gain of strength, Wet ratio, Factor affecting compressive strength w/c ratio. Type of cement, air entrainment, aggregates, mixing water, Admixtures, curing conditions. Tensile and flexural strength. Relation between cracking in compression. Impact strength fatigue strength. Shear strength, Bond between concrete & reinforcement. Modulus of elasticity, Poisson's ratio.

**Testing of Hardness of Concrete:** Compression test-cube strength & cylinder strength their relation, effect of aspect ratio on strength. Flexural strength of concrete, Determination of tensile strength. Indirect tension test. Splitting test. Abrasion resistance. Accelerated curing test.

### Unit - IV

**Mix Design** – Process, Statistical relation between mean & characteristic strength, Variance, Standard deviation. Factor affecting mix properties. Grading of aggregate, aggregate/ cement ration etc. Degree of quality control. Design mix by Road note no. 4 (BS). **IS:10262:2009**.

**Additives and Admixtures:** Types of admixtures, Natural products-Diatomaceous earth By products-Pozzolones. Fly ash, silica fume, rice husk ash, , G.G. blast furnace slag. Admixtures-air entraining, water reducing, accelerators, retarders, plasticizers & Super plasticizers, permeability reducing, surface hardeners. **Corrosion inhibitors & water proofing agents.**

### Unit - V

**Special concrete :** Self compacting concrete, High performance concrete, fiber reinforced & polymer concrete, Ferro cement, Shotcrete pumped concrete, Free flow concrete.

**Shrinkage**-Early volume changes, drying shrinkage, mechanism of shrinkage. Factor affecting shrinkage. Influence of curing & storage conditions. Differential shrinkage. Carbonation shrinkage. Creep-Factors influencing. Relation between creep & time, nature of creep, effect of creep.

### Unit - VI

Durability of concrete-significance water as an agent of deterioration. Permeability of concrete, Efflorescence. Distress in concrete structures and its causes, causes of deterioration of concrete.

Cracks in concrete: Causes, types, prevention, repairs of cracks – materials and methods  
Non Destructive tests.

## **BECVE 305 PLIST OF EXPERIMENTS**

- 1.To determine the Normal consistency of cement .
2. To determine initial and final setting times of cement.
3. To determine soundness of cement.
- 4.To determine compressive strength and tensile strength of cement.
5. To determine particle shape , texture and elongation/ flakiness index of aggregate .
- 6.Sieve analysis and particle size distribution of aggregate.
7. To determine crushing value test, Impact value and Abrasion value of given aggregate.
8. To determine Bulk Density, Specific Gravity, Absorption & Moisture Content of Aggregate.
9. To determine Bulking and Percentage silt in sand.
10. To determine Workability - Slump test, Compaction factor of concrete.
11. Concrete mix design Road note 4 method, I.S. Method and ACI Method.
12. To determine Compressive strength of concrete cube.
- 13 To determine the quality of concrete by using Rebound hammer/ Ultrasonic Pulse Velocity Instrument.

### **Text Book**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Concrete Technology by GambhirMc. Graw Hill	
2	Concrete Technology by A.M. Neville	Pearson Education

### **RefrenceSr.NoTitle**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Properties of Concrete by A.M. Neville	Pearson Education

## BECVE 306 HYDROLOGY AND WATER RESOURCES

### Objectives:

1. To provide the students with the fundamentals of hydrology and hydrological cycle in water resource engineering.
2. To provide the students with the knowledge of interrelationship between various hydrological parameters and its effect on the design and analysis of hydrological structures.
3. To impart knowledge to the students to understand the importance of surface water and ground water resource management.
4. To provide the students knowledge of the processes and the methods of the determination of yield of a given basin.

### Outcomes:

- a. The students would demonstrate the capability to establish correlation between the various hydrological parameters.
- b. The students would have the knowledge of measurements of various parameters and its importance in water resource management.
- c. The students would be able to understand the hydrograph theory in the analysis of runoff and determination of design discharge for various hydrological projects.
- d. The students would be able to exhibit the various statistical methods used in hydrological analysis.
- e. The students would have the knowledge of importance of groundwater recharging and its methodology.

### Syllabus:

#### Unit – I

1. Introduction: definition, and its importance, development of hydrology and allied science, hydrological cycle, hydrological **equation** and brief description of its components, , importance of temperature, humidity and wind in hydrological study.
2. Precipitation: Definition ~~anticipation~~, artificial rains, types of precipitation- orthographic, conventional and cyclonic, factors affecting precipitation:  
Measure of precipitation: automatic and non-automatic rain gauges, selection of site, adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, missing records, intensity duration frequently and depth area duration **curves**.

#### Unit - II

3. Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement
4. Evaporation and transpiration: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and **empirical** formula, control of evaporation. Evapotranspiration and its measurement. Interception and its measurement.

#### Unit - III

5. Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.
6. Hydrographics: Definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph theory, S-curve and its use, instantaneous **Unit Hydrograph**.

#### **Unit - IV**

7. Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, , Analysis of time series, frequency analysis.
8. Floods: causes and effects, factors affecting peak flows and estimation of peak flows, basin flood, flood routing and flood forecasting

#### **Unit - V**

9. Geohydrology: Introduction, occurrence and distribution of ground water, , aquifer, aquiclude, **aquitard** and aquifuge., electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test (**Numericals**).

#### **Unit - VI**

10. Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting.
11. **Recent trends in Hydrology: Software use in Hydrology such as HYMOS, MIKE-II, HECRAS, HYDROCAD and SWAT**

#### **Assignments:**

1. Based on Watershed Management.
2. Based on Soft Computing for statistical Data Analysis.
3. Visit to Hydrological station.

#### **Text Book**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Hydrology & Water Resources Engg by ReddyLaxmi Pub.	
1	Hydrology by SubramanyamMc. Graw Hill	

#### **ReferenceSr.NoTitle**

<b>ReferenceSr.No</b>	<b>Title</b>	<b>Publication</b>
1	Hydrology & Water Resources Engg by S.K.GargKhanna Pub.	
2	Text book of Hydrology by P. Jaya Rami ReddyLaxmi Pub.	



## BECVE 401 T      STRUCTURAL ANALYSIS – I

### Objectives:

- 1 To make students understand the determinate and indeterminate structures, their method of analysis And construction of influence lines.
- 2 To make students understand the behavior of beams and frame using, Column Analogy Method, strain energy method, slope deflection method etc.

### Outcomes:

- a. The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, frames, trusses and columns under various loading conditions using different analysis methods.
- b. The student would be able to apply knowledge to determine forces in determinate and indeterminate structures by the force and matrix method.
- c. The students would be able to perform ILD analysis of determinate beams and trusses.

### Syllabus:

#### Unit – I

Introduction of Statically indeterminate Structures : Concept of Static indeterminacy,

Analysis of fixed and continuous beams by theorem of three moments, effects of sinking of support.

#### Unit – II

Rolling loads on simply supported beams with concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence lines for reactions, bending moments and shear forces in simply supported beam, cantilevers and beams with overhangs. Influence lines for forces in members of simple trusses and for BM and SF in panels of simple trusses.

#### Unit – III

Strain energy method as applied to the analysis of redundant frames and redundant truss up to two Degrees, Determination of deflection of trusses. Castigliano's theorems. Maxwell's reciprocal theorem. Betti's theorem.

#### Unit – IV

Buckling of columns and beams. Euler's and Rankine's formula.

Analysis of Two-Hinged arches. Three Hinged Arch, S.F. and normal thrust, parabolic arches.

#### Unit – V

Slope deflection method as applied to indeterminate beams & continuous beams portal frames. Frame with inclined legs upto 3 degree of freedom.

Approximate method: Analysis of multi-storied frame, portal, cantilever and substitute frame methods.(max. three bay three storey).

#### Unit – VI

Introduction to flexibility method upto two DOF, Column Analogy Method.



## BECVE 401 P      PRACTICALS: STRUCTURAL ANALYSIS – I

Minimum TEN of the following :

1. To find the slope and deflection of continuous beam.
2. To find the value of Flexural rigidity (EI) for a given beams and compare with theoretical value.
3. To determine the moment required to produce a given rotation at one end of a beam when the other end is i) Pinned ii) Fixed
4. To study the behavior of different types of struts and to calculate the Eulers Buckling load for each case.
5. To verify the Maxwell's reciprocal theorem for beam.
6. To measure the strain in the cantilever beam with the help of acoustic strain gauge.
7. Study of various types of strain gauges.
8. Plotting of influence lines by making use of Muller-Breslau principle.
9. Determination of deflection of trusses by Willot-Mohrs diagram.
10. Determination of material fringe value.
11. Determination of stress in beam by photoelastic method.
12. To find horizontal thrust and to draw the influence line for horizontal thrust for two hinge arch.
13. To calculate horizontal deflection at roller end in two hinged arch.
14. To measure the strain in the cantilever beam with the help of electrical resistance strain gauge.
15. To determine horizontal thrust for indeterminate portal frame
16. Study of Poloriscope

### Text Book

Sr.No	Title	Publication
1.	<b>Theory of Structure by S P Timoshenko</b>	Mc. Graw Hill
2.	Intermediate Structural Analysis by C K Wang	Mc. Graw Hill
3.	Plain and Reinforced concrete Structures, Vol.-II by Jain, Jai Krishna	Laxmi Publication
4.	Theory of Elasticity by S P Timoshenko	Mc. Graw Hill
5.	Experimental Stress Analysis by Rally & Dally	Mc. Graw Hill

### Refrence

Sr.No	Title	Publication
1	Structural Analysis by C.S.Reddy	Mc. Graw Hill
2	Structural Analysis by R.C. Hibbler	Pearson Education

## BECVE 402 T GEOTECHNICAL ENGINEERING-I

### Objectives:

1. To impart knowledge about origin and classification of soils.
2. To impart knowledge about index properties and their determination.
3. To impart knowledge about engineering properties and their determination.
4. To impart knowledge about stress distribution in soil mass.

### Outcomes:

- a. Students would be able to determine the index and engineering properties of the soil.
- b. Students would be able to determine the suitability of foundation for a particular type of soil.
- c. Students will be able to classify the soils.
- d. Students would be able to evaluate the stresses in the soil mass.

### Syllabus :

#### Unit I

1. Introduction : Formation of soil, residual & transported soil, major deposits found in India, **soils** generally used in practice such as sand, gravel, organic soil, clay, Betonies, , black cotton soil etc. **Introduction to clay mineralogy.**
2. Phases of soil: Various soil weight & volume inter-relationship. Density index, methods of determining in situ density.

#### Unit II

Index Properties & Their Determination, Water content, specific gravity, sieve analysis, particle size distribution curve, sedimentation analysis, Differential and free swell value, Consistency of soil, Atterberge's limits . Classification of Soil : Particle size classification, Textual classification, Unified & I.S. classification system, **field identification of Expansive soil, Swelling pressure.**

#### Unit III

3. Permeability: Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability, Determination of coefficients of permeability by Laboratory and field methods, permeability of stratified soil.
4. Seepage : Seepage pressure, quick **sand** condition, characteristics & uses of flownets, Preliminary problems of discharge estimation **in** homogeneous soils, Effective, Neutral and total stresses in soil mass.

#### Unit IV

5. Stress Distribution : Stress distribution in soil Mass, Boussinesque **equation, point load and uniformly distributed load over rectangular & circular areas, Use of Newmarks charts.**

#### Unit V

6. Consolidation : Compression of laterally confined soil, Terzaghis 1-D consolidation theory (formation of Differential equation), Determination of coefficient of consolidation, Degree of consolidation. Determination of preconsolidation pressure, Settlement, Rate of settlement.
7. Compaction : **Mechanism** of compaction, factors affecting compaction, standard & modified proctor Tests, field compaction equipments, quality control, **Advance compaction Techniques, Nuclear density meter.**

#### Unit VI

8. Shear Strength : Introduction, Mohr Coulombs theory, **Drainage condition**, Measurement of shear strength by direct shear test, triaxial test, unconfined compression test, vane shear test, sensitivity.

These shall comprise of ten experiments and terms work to be presented in the form of journal for assessment of sessional and practical examination.

- A. List of Experiments : Any 10
1. Moisture content and Specific gravity of soil.
  2. Grain size Analysis – (Sieve Analysis).
  3. Consistency limit, plastic limit and liquid limit of soil.
  4. Hydrometer Analysis.
  5. Constant Head Permeability test of or Falling Head Permeability test.
  6. Consistency limit of soil ( shrinkage limit).
  7. Field Density by sand replacement method.
  8. Field Density by core cutter method.
  9. Unconfined compression test.
  10. Direct shear Test.
  11. Triaxial shear test (Demonstration).
  12. Proctors compaction Test and Proctor needle test.
- B. One field visit or one case study included in journal.
- C. Use of plasticity Chart or Newmarks Chart.

#### Text book

Sr. No.	Title	Publication
1	Soil Mechanics & Foundation Engg. by K.R. Arora	Std. Publisher
2	Soil Mechanics & Foundation Engg. by B.C.Punmia	Laxmi Publication
3	Basic & Applied Soil Mechanics by Gopal Rajan & Rao	Newage international Pub.
4	Geotechnical Engg. by P. Raj	Dorling Kindersley Pvt. Ltd
5	Geotechnical Earthquake Engg. by Steven L. Kramer	Prentice Hall

#### Reference book

Sr. No.	Title	Publication
1	Soil Mechanics & Foundation Engg by Modi	Std. Publisher
2	Soil Mechanics & Foundation Engg by V.N.S.Murthy	CBS Publisher

## **BECVE 403 T TRANSPORTATION ENGINEERING – I**

### **Objectives:**

1. To educate the students on the various components of Highway Engineering and Bridge engineering.
2. To expose the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Flexible and Rigid pavements design, Traffic Engineering, traffic safety analysis, transportation planning and Highway material testing.
3. To make them understand desirable properties and testing procedures of highway materials as per BIS standard and Indian Roads Construction (IRC) for various practices adopted for construction.
6. To educate students on the various components of Pavements.
7. It exposes the student to learn types of pavements, components and functions of pavements, types of highway vehicles and aircrafts, IRC loadings, equivalent axle loading and load factors, Flexible and Rigid design methods, etc.

### **Outcomes:**

- a. A person with broad vision and complete knowledge of design and construction practices in highway engineering and pavement.
- b. The student will be able to test highway materials and draw appropriate conclusion.
- c. The student will be able to maintain and propose measurement.
- d. The student will be able to undertake Traffic studies.

### **Syllabus:**

#### **Unit -I**

Highway Development & Planning: Principles of Highway planning, Road development in India Classification of roads, network patterns, Planning, Surveys.

Highway Alignment: Requirements, Engineering Surveys.

Highway Materials: Properties of sub grade and pavement component materials, Tests on sub grade soils, aggregates and bituminous materials. Application of Geosynthetics.

#### **Unit - II:**

Highway Geometric Design: Cross Section elements, carriageways, camber, stopping & overtaking sight distances Horizontal alignment- Curves, design of super elevation, widening, transition curves, vertical curves.

#### **Unit- III**

Pavement Design: Types of pavements & characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & IRC method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, joints

Highway Construction & Maintenance: Earthen/Gravel road, Water Bound Macadam, Wet Mix macadam, Bituminous pavement, Cement Concrete pavement. Pavement failures, Pavement evaluation, Maintenance and strengthening measures.

#### **Unit-IV**

Traffic Engineering: Traffic characteristics (Road User, Driver and Vehicular characteristics)

Traffic Studies (Volume studies, speed studies, parking studies and accident studies.)

Traffic Safety (Causes and types of accidents, Use of intelligent transportation system)

#### **Unit- V**

Bridge Engineering: Classification, identification and site selection.

Flood discharge, waterways, scour depth, economic span.

IRC classification of Loads, Forces, Stresses: IRC Specification & code of practices, Critical combinations.

#### **Unit-VI**

Sub-Structure: Types of foundations & their choice, Open, Pile and well foundation, pneumatic Caissons, cofferdams. Abutment, Piers & Wing walls, Their types general design principles (empirical.)

Super Structure: Different structural forms

Rating and Maintenance: Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, Aesthetics.

## **PRACTICAL : BECVE 403 P TRANSPORTATION ENGINEERING - I**

Every student must carry minimum of 10 (Ten) experiments from the following:

1. Sub grade Soil: CBR test
2. Sub grade Soil: AASHO Classification
3. Aggregates: crushing value test.
4. Aggregates: Los Angeles abrasion value test.
5. Aggregates: impact test.
6. Aggregates: shape test.(Elongation Index, Flakiness index and Soundness test)
7. Aggregates: Specific Gravity and Water absorption test.
8. Bitumen: Penetration Value.
9. Bitumen: Ductility Test.
10. Bitumen: Softening point test.
11. Bitumen: Flash and Fire point test.
12. Bitumen: Specific gravity.
13. Bitumen: Adhesion Test.
14. Short Field Visit

### **Text book**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
1.	Highway Engineering: Khanna and Justo.	Nem Chand
2.	Bridge Engineering by S. P. Bindra.	<b>Dhanpat Rai Publication</b>
3.	Bridge Engineering by S. C. Rangwala. Limited	Charotar Publishing House Pvt.
4.	Principles and practices of Highway Engineering by S. K. Sharma	<b>Khanna Publication</b>

### **Refrence book**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
1	. Pavement Design: Yoder and Witzak	Wiley
2	Traffic Engineering: L.R.Kadiyali	Khanna Publishers

## BECVE 404 T SURVEYING – I

### Objectives:

1. To make the students aware of various surveying instruments, operating principles and their suitability.
2. To make the students understand various calculation methods used for converting field data to required format for plotting.
3. To develop skills of handling instruments and plotting various maps.
4. To prepare the students read the various maps.

### Outcomes:

- a. The students would be able to do temporary and permanent adjustments.
- b. The students would be able to measure distances and angles.
- c. The students would be able to orient and draw the various maps.
- d. The students would be able to calculate areas and volumes of the Civil Engg. work.
- e. The student would be able to undertake various civil engineering surveys work.

### Syllabus:

#### UNIT - I: Chain and Compass Traversing

- a) Classification, Principle of Survey, tape survey, cross staff survey, construction, use and testing of optical square, line ranger.
- b) Compass Traversing: Prismatic and Surveyor's Compass, true and magnetic bearing, local attraction, and magnetic dip, inclination, compass traversing adjustment of traverse.

#### UNIT - II: Leveling and Contouring

- a) LEVELLING: different types of Levels, Study of Dumpy Level, temporary adjustment, principle of levelling, reduction of levels, classification of levelling, Profile Levelling, Longitudinal Section And Cross Sections, Reciprocal Levelling, Corrections for Curvature and Refraction, distance to the visible horizon.

#### UNIT – III: Adjustment of Dumpy Level & Trigonometrical Levelling

- a) Adjustment of **auto level**: principle axes of **auto level**, relationship, testing and adjustment of bubble axis and line of collimation.
- b) Trigonometrical Levelling: Indirect levelling, elevation of point with base of an object accessible inaccessible in the same vertical plane.
- c) Contours : Defination, characteristics, uses, methods of locating contours.

#### UNIT – IV: THEODOLITE TRAVERSING :

- a)Theodolite : Introduction, Type of Theodolite ; **Modern Theodolite** Temporary adjustment, Principle Axes and relationship , permanent adjustment, Measurement of Horizontal & vertical angles, Magnetic Bearings, prolonging a line, lining in.
- b) Traverse Computation: Consecutive and independent coordinates, adjustment of closed traverse, Gales traverse table, area calculation by coordinates.

#### UNIT- V: Plane Table Surveying & Computation of Area & Volume

- a) Plane Table Surveying: Equipments, Advantages and Disadvantages, Orientation, methods of plane tabling, two point and three point problems in plane tabling. **Telescopic Alidade.**
- b) Computation of area and volume: Trapezoidal and Simpsons Rule. **Digital planimeter, construction and use.**

**UNIT- VI:** Hydrographic Surveying, Underground Surveying and Surveying Equipments.

- a) Hydrographic Surveying: Shore Line Survey, River Survey, Soundings, equipments, methods of locating soundings, three point problems.
- b) Underground Surveying: Correlation of underground and surface survey, transferring the levels underground.
- c) Surveying Equipments: Optical Theodolite, EDM, GPS.

## **BECVE 404 P      PRACTICAL: SURVEYING – I**

(Minimum 15 practical should be performed out of the following:

1. Demonstration of metric chain.
2. Measurement of distance by ranging and tape.
3. Locating various objects by tape & cross staff survey.
4. Determination of area of given polygon by tape and cross staff survey.
5. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angles.
6. Locating given building by tape and compass traversing (One full size drawing sheet)
7. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall Method.
8. Fixing bench mark with respect to temporary bench mark with Auto level by fly levelling and check levelling.
9. L- Section and cross section of road (One full size drawing sheet each for L-section and cross section)
10. Measurement of horizontal angles using Theodolite by method of repetition-
11. Measurement of vertical angles with Theodolite.
12. Determination of horizontal distance between two inaccessible points with Theodolite.
13. Locating given building by Theodolite traversing (One full size drawing sheet)
14. Locating given building by plane table traversing (One full size drawing sheet)
15. Determination of elevation of point by trigonometric levelling.
16. To draw Contour map of given area (One full size drawing sheet)
17. **Determination of area of a irregular figure by using Planimeter**
18. **Study of Optical Theodolite, EDM, GPS.**
19. To give site Layout for given plan of building.

### **Text Book**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Surveying and Levelling by Kanetkar and Kulkarni (Vol.I)	Pune Vidhati grihan Prakashan
2	Surveying and Levelling by Dr. B.C. Punmia (Vol. I & II)	Laxmi Pub.

### **Refrence**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Advance Surveying - Total Station, GIS and Remote Sensing by Satheesh Gopi & R.Sathikumar & N. Madhu	Pearson Education



## BECVE 405 T BUILDING CONSTRUCTION & MATERIAL

### Objectives:

1. To prepare the students to understand components of buildings and their functions.
2. To prepare students to understand execution of various constructions activities and material.
3. To prepare students to analyse behaviour of structure under different environmental conditions.
4. To prepare students to identify & suggest rectification the various defects in civil engineering works.

### Outcomes:

- a. The students are able to identify components of a building.
- b. The students are able to differentiate and identify types of building materials.
- c. The students are able to select appropriate material for building construction.
- d. The students are able to plan various construction related activities and their quality control.

### Syllabus :

#### Unit-I :

Foundations: Necessity and types of R.C.C. foundations, **Detail of Deep foundation and precast foundation in general**, Details shallow foundations. Bearing capacity of soils and its assessment. Presumptive bearing capacity values from codes. Loads on foundations. Causes of failures of foundations and remedial measures, Foundation on black cotton soils Setting out foundation trenches, excavation timbering of foundation trenches. Load bearing and framed structures.

#### Unit-II

Brickwork :Qualities of good bricks, classification of bricks tests on bricks as per as codes. Terms used in brickwork, commonly used types of bonds in brickwork such as header, stretcher, English and Flemish bonds, principles of construction. Reinforced brickwork, brick knocking. Parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls. Masonry construction using cement concrete blocks and clay walls, load bearing and partition walls. Masonry construction using cement concrete blocks and clay blocks. Precast construction : Introduction to method and materials. Precast elements likes poles, cover, jallies, steps corbets, truss element etc.

#### Unit-III:

Stone Work : Stones, cutting and dressing, selection of stones types of stone masonry, principles of construction joints in masonry. Lifting heavy stones, common building stones in India. Arches and Lintels : Terminology in contraction, types chajjas and canopies, pre cast Lintels & Arches. Damp Proofing : Causes and effect of dampness. Various methods of damp proofing Damp proofing in plinth protection, New Techniques of Damp Proofing Damp Proofing in Plinth Protection, New Techniques of Damp proofing. Epoxy etc.

#### Unit-IV

Floors and Roofs : Floors : General principals, types and method of construction, floors finished quality, ~~testing floor tiles~~, synthetic & Ceramic Tiles. Roofs : Flat and pitches roofs, roof coverings, types AND their constructional features. Thermal Insulation

**Unit-V :**

Stairs : Types of stairs, functional design of stairs.

Doors and Windows : Purpose materials of construction and types.

**Unit-VI :**

Plastering and Pointing : Necessity, types and methods

Temporary Timbering : Centering and formwork shoring, underpinning and scaffolding.

Painting : White washing, colour washing and distemping new materials & Techniques.

**Text book**

<b>Sr. No.</b>	<b>Title</b>	<b>Publication</b>
1	Building Construction by Rangwala	Charotar Pub. House

**BECVE 406 P      COMPUTER APPLICATIONS IN CIVIL ENGINEERING**  
*(underline means newly added content while strikethrough words means deleted)*

**Objectives:**

1. To prepare student to understand basic computational technique and concept of developing flow chart and algorithm for engineering problems.
2. To make the students understand the techniques of handling huge practical data.
3. To prepare students to gain knowledge and necessary skills required to work as a team member or team leader in the development of large computer and software systems covering a broad range of engineering and scientific applications.
4. To prepare student to do advanced studies in computer applications.

**Outcomes:**

- a. The student would be able to analyze, identify and define computing requirement for engineering problems.
  - b. The student would be able to develop and execute computer program for solving mathematical and engineering problems.
  - c. The student would be able to deal with various types of solution errors occurred during cyclic computations.
  - d. The student would be able to develop tool for solving various engineering problems
  - e. The student would be able to work as an effective team member or team leader to accomplish common goal.
- The students would be able to debug the program for common errors.

**PRACTICAL: COMPUTER APPLICATIONS IN CIVIL ENGINEERING**

Minimum sixteen computer program development, minimum one from each of the following field using ~~FORTRAN 95~~/ C language. At least four programs in C language. It is recommended to have at least four programs based on numerical methods and two assignments in application software's such as spreadsheets, database management programs, etc.

1. Engineering mechanics
2. Strength of material
3. Transportation engineering
4. Geotechnical engineering
5. Hydraulic engineering
6. Irrigation and water resources engineering
7. Surveying
8. Estimating and costing
9. Structural analysis
10. Structural design
11. Environmental engineering
12. Matrix algebra, solution techniques
13. Numerical integration
14. Table generation from IS: 456
15. Earthquake force calculation

**Text Book**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	The complete reference C by Schildt	Mc. Graw Hill
2	Programming with C by Balagurusamy	Mc. Graw Hill

**Reference**

<b>Sr.No</b>	<b>Title</b>	<b>Publication</b>
1	Programming with C by Ramkumar	Mc. Graw Hill
2	Programming with C by Gottfried	Mc. Graw Hill