# NAGPUR UNIVERSITY

## Scheme of Teaching & Examination of B.E. (Civil Engineering)

### III Semester

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hours/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<tbody>
<tr>
<td>3CE01</td>
<td>Mathematics-III</td>
<td>3 1 -</td>
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<td>80 20</td>
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<tr>
<td>3CE02</td>
<td>Strength of Materials</td>
<td>3 1 2</td>
<td>6</td>
<td>80 20</td>
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<td>3ST02</td>
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<tr>
<td>3CE03</td>
<td>Fluid Mechanics – I</td>
<td>3 1 2</td>
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<td>3CE04</td>
<td>Geotechnical Engg. – I</td>
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<td>3CE05</td>
<td>Engineering Geology</td>
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<tr>
<td>3CE06</td>
<td>Computer Programming</td>
<td>3 1 -</td>
<td>4</td>
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**Total Credits: 18 + (6+8)/2=25**

### IV Semester

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hours/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<tbody>
<tr>
<td>4CE01</td>
<td>Structural Analysis-I</td>
<td>3 1 -</td>
<td>4</td>
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<tr>
<td>4CE02</td>
<td>Building Construction &amp; Material</td>
<td>3 1 -</td>
<td>4</td>
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<tr>
<td>4CE03</td>
<td>Environmental Engg-I</td>
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<td>6</td>
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<tr>
<td>4CE04</td>
<td>Concrete Technology</td>
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<td>6</td>
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<tr>
<td>4CE05</td>
<td>Surveying-I</td>
<td>3 1 4</td>
<td>8</td>
<td>80 20</td>
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<tr>
<td>4CE06</td>
<td>Hydrology and Water Resources</td>
<td>3 1 -</td>
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<tr>
<td>4CE07</td>
<td>Computer Aided Drafting</td>
<td>3 3 -</td>
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<td>4ST07</td>
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</table>

**Total Credits: 18 + (6+11)/2=26.5**

**Total Marks: 550 + 200 = 750**

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Note: CAD practical shall contain minimum five sketches drawn with AUTOCAD/MSWORD or any other package related with Civil Engineering. Grades A, B and C may be assigned depending upon the report.
**NAGPUR UNIVERSITY**  
Scheme of Teaching & Examination of B.E. (Civil Engineering)

### V Semester

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hours/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<tr>
<td>SCE01</td>
<td>Steel Structures</td>
<td>3 1 2 6</td>
<td>80</td>
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<tr>
<td>SCE02</td>
<td>Environmental Engg.-II</td>
<td>3 1 2 6</td>
<td>80</td>
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<td>25 25 50 25</td>
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<tr>
<td>SCE03</td>
<td>Surveying -II</td>
<td>3 1 2 6</td>
<td>80</td>
<td>100 40</td>
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<td>SCE04</td>
<td>Transportation Engineering-I</td>
<td>3 1 2 6</td>
<td>80</td>
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<td>SCE05</td>
<td>Building Design and Drawing</td>
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<tr>
<td>SCE06</td>
<td>Project Management</td>
<td>3 1 2 6</td>
<td>80</td>
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<tr>
<td>SCE07</td>
<td>Site Visits</td>
<td>3 1 2 6</td>
<td>80</td>
<td>100 40</td>
<td>25 25 50 25</td>
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</tbody>
</table>

Total Credits: 16 + (5+13)/2 =25

Total Marks: 600 + 200 = 800

Note: Site visits shall contain minimum five site visits supported by reports to Internal Examiners for evaluations purpose. Grade A, B, and C may be assigned depending upon the report.

### VI Semester

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hours/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<td>Structural Analysis-II</td>
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<td>RCC Structures</td>
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<td>Geotechnical Engg.-II</td>
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<td>80</td>
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<td>25 25 50 25</td>
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<td>Fluid Mechanics-II</td>
<td>3 1 2 6</td>
<td>80</td>
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<td>6CE05</td>
<td>Computer Application in Civil Engineering</td>
<td>3 1 2 6</td>
<td>80</td>
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</table>

Total Credits: 15 + (5+13)/2=34.0

Total Marks: 500 + 200 = 700

Note: 1. Professional Training of 3 to 4 weeks duration inbetween VI and VII semester (in summer).

Note: 2. Technical Writing shall contain minimum one report writing about any topic with MS WORLD or any other package related with Civil Engineering. Grades A, B, and C may be assigned depending upon the report.
# VII Semester

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hour/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<tr>
<td>7CE01</td>
<td>Structural Analysis-III</td>
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<td>Practical 25 CA Total 50 Min for Passing 25</td>
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<td>Advanced Concrete Structures</td>
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<td>Irrigation Engineering</td>
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<td>Maintenance &amp; Rehabilitation of Civil Engineering Structures</td>
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<td>7CE06</td>
<td>Elective - I</td>
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<td>Industrial Case Study</td>
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<td>Total Credits: 18 + (5+13)/2 = 25</td>
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Total Marks: 500 + 300 = 800

# VIII Semester

<table>
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<tr>
<th>Sub Code</th>
<th>Name of Subject</th>
<th>Teaching Scheme (Clock hour/week)</th>
<th>Assessment of Marks for Theory</th>
<th>Assessment of Marks for Practical</th>
<th>Duration of Paper in Hrs.</th>
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<tbody>
<tr>
<td>8CE01</td>
<td>Estimating &amp; Costing</td>
<td>L 1 T 4 P/D 8</td>
<td>Total 80 Paper 20 CA 100 Total 40 Min for Passing 25</td>
<td>Practical 50 CA Total 100 Min for Passing 50</td>
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<td>Total Credits: 13 + (4+13)/2 = 21</td>
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Total Marks: 400 + 300 = 700

Total Credits: 25+26.5+25+24+25+21+146.5
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)
UNIT – VI: INTRODUCTION TO OPTIMIZATION TECHNIQUES (08Hrs)
Linear programming problem: Formulation, Graphical method, Simplex method.

Text Books

3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville,
4. Calculus of variation by Forrey

Reference Books

2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3. Mathematics for Engineers by Chandrika Prasad
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:

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Title</th>
<th>Publication</th>
</tr>
</thead>
</table>

Reference: Sr.No  Title  Publication

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<th>Sr.No</th>
<th>Title</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strength of materials by Singer</td>
<td>Haper and Row</td>
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BECVE 303 TENVIRONMENTAL 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 equation and 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, CPHEOO, IS 10500). Water born diseases

Water treatment: Objective of treatment, unit operations and processes, household & 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.

II. Only demonstration of COD, BOD.

III. Design of WTP using software.

IV. Brief Report on WTP Visit.

Text book

Sr. No. Title Publication

1. Water supply & Sanitary Engineering by B.C. PunmiaLaxmi Publication
2. Water supply and Sanitary Engineering by Birdie G.S. DhanpatRai Publication

Reference book

Sr. No. Title Publication

1 CPHEOO manual, New Delh, Ministry of Urban Development G.O.I.
2 Water supply and sewage by M.J.Mcghee Mc. Graw Hill
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)


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 groundwater, water table and water table contour maps, Aquifer, Aquitard, Aquiclud and aquifers, 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
5. Basic Geotechnical Earthquake Engineering: Kamalesh Kumar
6. Rock Mechanics for Engineers: B.P. Verma

Laboratory Work
   a) Igneous Rocks
   b) Sedimentary Rocks
   c) Metamorphic Rocks
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


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


Unit - III

Strength of concrete-


Unit – IV


Unit – V


Unit – VI


Cracks in concrete: Causes, types, prevention, repairs of cracks – materials and methods

Non Destructive test
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.
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.
11. Concrete mix design Road note 4 method, I.S. Method and ACI Method.
12. To determine Compressive strength of concrete cube.

Text Book
Sr.No Title Publication
1 Concrete Technology by GambhirMc. Graw Hill
2 Concrete Technology by A.M. Neville Pearson Education

Reference Sr.No Title Publication
1 Properties of Concrete by A.M. Neville Pearson Education
BECVE 306 THYDROLOGY 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

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.


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


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
Sr.No Title Publication
1 Hydrology & Water Resources Engg by Reddy Laxmi Pub.
1 Hydrology by Subramanyam Mc. Graw Hill

Reference
Sr.No Title Publication
IV Semester

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 continues beams by theorem of three moments, effects of sinking of support.

Unit – II
Rolling loads on simply supports 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. Castiglinos theorems. Maxwells reciprocal theorem. Bettis theorem.

Unit – IV
Bucking of columns and beams. Eulers and Rankines 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 & continues beams portal frames. Frame with inclined legs upto 3 degree of freedom.
Approximate method: Analysis of multi-stored frame, portal,cantilever and substitute frame methods.(max. three bay three storey).

Unit – VI
Introduction to flexibility method upto two DOF, Column Analogy Method.
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.
10. Determination of material fringe value.
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
--- | --- | ---
5. | Experimental Stress Analysis by Rally & Dally | Mc. Graw Hill

Reference
Sr.No | Title | Publication
--- | --- | ---
1 | Structural Analysis by C.S.Reddy | Mc. Graw Hill
2 | Structural Analysis by R.C. Hibbler | Pearson Education
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:
- Students would be able to determine the index and engineering properties of the soil.
- Students would be able to determine the suitability of foundation for a particular type of soil.
- Students will be able to classify the soils.
- 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.

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.

Unit VI
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 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.
   10. Direct shear Test.
   11. Triaxial shear test (Demonstration).

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
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.
4. To educate students on the various components of Pavements.
5. 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: Requiremnts, Engineering Surveys.

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

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.

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

1. Sub grade Soil: CBR test
2. Sub grade Soil: AASHO Classification
6. Aggregates: shape test (Elongation Index, Flakiness index and Soundness test)
14. Short Field Visit

**Text book**

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<tr>
<td>1</td>
<td>Highway Engineering: Khanna and Justo.</td>
<td>Nem Chand</td>
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<td>2</td>
<td>Bridge Engineering by S. P. Bindra.</td>
<td>Dhanpat Rai Publication</td>
</tr>
<tr>
<td>4</td>
<td>Principles and practices of Highway Engineering by S. K. Sharma</td>
<td>Khanna Publication</td>
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<td>Pavement Design: Yoder and Witzak</td>
<td>Wiley</td>
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<td>2</td>
<td>Traffic Engineering: L.R.Kadiyali</td>
<td>Khanna Publishers</td>
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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:
- The students would be able to do temporary and permanent adjustments.
- The students would be able to measure distances and angles.
- The students would be able to orient and draw the various maps.
- The students would be able to calculate areas and volumes of the Civil Engg. work.
- 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 & Trignometrical Levelling
a) Adjustment of auto level: principle axes of auto level, relationship, testing and adjustment of bubble axis and line of collimation.
b) Trignometrical Levelling: Indirect levelling, elevation of point with base of an object accessible inaccessible in the same vertical plane.
c) Contours : Definition, 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.

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

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

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 knogging. 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. Precest construction: Introduction to method and materials. Precast elements likes poles, cover, jallies, steps corbets, truss element etc.

Unit-III:

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 distempering new materials & Techniques.

**Text book**

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<tbody>
<tr>
<td>1</td>
<td>Building Construction by Rangwala</td>
<td>Charotar Pub. House</td>
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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
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<tr>
<td>1</td>
<td>The complete reference C by Schildt</td>
<td>Mc. Graw Hill</td>
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<td>2</td>
<td>Programming with C by Balagurusamy</td>
<td>Mc. Graw Hill</td>
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<tr>
<td>1</td>
<td>Programming with C by Ramkumar</td>
<td>Mc. Graw Hill</td>
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<tr>
<td>2</td>
<td>Programming with C by Gottfried</td>
<td>Mc. Graw Hill</td>
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UNIT I

1. Steel as a structural material, various grades of structural steel, properties, various rolled steel sections (including cold formed sections, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875 etc. (8)

2. Design of axially loaded members: (a) Tension members, (b) Compression members. (9)

3. Design of roof truss: LDad assessment for DL, LL and WL. (6)

UNIT II

4. Design of simple and builtup beams: Laterally restrained and unrestrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. (10)

UNIT III

5. Design of welded plate girder, concept of gantry girder. (8)

6. Design of single rolled steel section column subjected to axial load and biaxial moment including base design. (8)

7. Design of axially loaded built up columns. Laced and battened (Column bases slab base gusseted base moment resistant bases) (9)

UNIT IV

8. Structural Fasteners:

A) Behaviour of bolted and welded connections (types, Designations, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolted and welded connections. Moment resistant bolted and welded connection. (bending and torsion) (6)

B) Design of connection: Beam to beam, beam to column: framed connection. (9)

Term Work

Minimum two design assignments based on above topics along with the detailed structural drawings on A2 size sheets.

Practical Examined shall be based on the above Practical Work.
5CE02 : ENVIRONMENTAL ENGINEERING-II (3L +1T)

SECTION-A

Unit-I

1. General Aspects of Environmental Engineering - System of collection and conveyance of sewage - separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.) (8)

Unit - II

2. Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials Sewer Appurtences - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation. House plumbing systems sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance. (8)

Unit - III

3. Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant Preliminary and primary treatment - Screens, Grit chambers, Primary settling tank (including simple design) (8)

SECTION-B

Unit - IV


Unit - V

5. Rural sanitation - Pit privy, aqua privy, bio-gas recovery. Septic tank including soak pit, (including design problem) Sullage collection and disposal. (5)

6. Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and treatment processes (flow equalization, neutralization, adsorption, chemical and biological treatment etc.) (5)
Unit VI

7. Introduction to air pollution Sources of air pollution and its classification III •effects of air pollutants on man, animal & materials Meterological parameters Methods of air pollution control. (8)

Reference Books:

3. G.S.Birdie, "Water Supply & Sanitary Engineering"
6. C.S.Rao,"Enviromental Pollution Control Engineering,

5CE03: SURVEYING-II (3L+1T+2P)

SECTION-A

UNIT-I Techeometric Surveying

Classification , principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.

a) Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves. (4)
b) Compound Curves: Elements of compound Curves, setting out the curve. (1)
c) Reverse Curves: Elements of reverse Curves, setting out the curve. (1)
d) Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point. (2)

UNIT –III Transition Curves

Elements of transition curves, superelevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.

SECTION -B

UNIT IV Geodetic Surveying and Triangulation Adjustment (10)

a) Geodatic Surveying: Classification of triangulation survey, intervisibility of stations, field work, reduction to centre, base line measurement ,corrections. (7)
b) Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment( triangle only) (3).

UNIT V Photographic Surveying (8)
Basic definitions, terrestrial and aerial photography, tilt and height displacements, heights from parallax measurements, flight planning, study of phototheodolite and stereoscope.

**UNIT –VI Astronomy, remote Sensing, GIS & GPS.**

a. Astronomy: Elements of spherical trignometry, Napier’s rule of circular parts, celestial sphere, astronomical terms. (2)
b. Remote Sensing: Introduction, definitions, Remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics (3)
c. GIS & GPS: Components of geographical information system (GIS), advantages, function of GIS, Raster and vector data, advantages and disadvantages, global positioning system (GPS), Introduction, definitions, GPS receivers, antenna, advantages of GPS. (3)

**List of Practical’s**

1. Determine of constant of Tacheometer
2. Determination of elevation of points by Tacheometer Surveying.
3. Determination of elevation of points and horizontal distance between them by Tacheometric survey.
4. Determination of gradient of given length of road by Tacheometric survey.
5. Setting out of simple circular curve by offsets from chord produced method
7. Setting out of simple transition curve by tangential angle method.
8. Study of stereoscope.

**B) SURVEY CAMP:** On any of the following topics for minimum three days.

1. Road Project
2. Irrigation Project
3. Water Supply Project

**Reference Books:**

1) Surveying & Levelling by B.C. Punmia (Vol 2 & Vol 3)
2) Surveying & Levelling by Kanetkar & Kulkarni (Vol 2)
3) Remote sensing & G.I.S. by Dr.M.Anji Reddy
Highways:

Unit -I:

1. Development & Planning:
Road transport Characteristics, Classification of roads, development plants, network patterns, data collection & surveys, principles of alignment, evaluation of plan proposals. (5)

2. Traffic Engineering:
3E's of, traffic characteristics, Surveys, Intersection-types, layouts, design principles, Urban traffic, parking, lighting, Accidents, Traffic control Devicesmarking, Signs, Signals, Regulations Motor Vehicle Act & Rule. (5)

Unit - II:

3. Geometric Design:
Road, road user & road vehicle characteristics, Factors affecting design standards. Cross Section elements, stopping & overtaking sight distance overtaking zones. Horizontal alignment-Curves, design of super elevation, widening, 'transition curves, vertical alignments, Design of summit & Valley Curves, I.R.C. standards for Geometric Design, Geometries of Hill Roads. (7)

4. Pavement Design:
Types of pavements & characteristic, Design parameters, Axel & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & CBR method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, joints. (5)

Unit -III

5. Materials
Subgrade Soil - AASHO Classification, group Index, Subgrade soil Stabilization. CBR, aggregates Physical and mechanical properties & tests - Bituminous materials classification sources properties and tests. Cutback & Emulsions, IRCIIS Standards, Introduction to Geotextiles. (5)

6. Construction & Maintenance
IRC, MOST specifications for quality & quantity of materials, techniques, tools and plant, for the Earthwork, sub base, base and wearingl surfacing course of flexible pavements with gravel, WEM, stabilized Bituminous & Concrete as Construction material, Drainage, shoulders, rob-oriculture maintenance & repairs, Choice of construction. (5)
SECTION-B

Bridges
General:
Unit-IV

7. General:
Components, classification and identification, Data Collection site selection. Economic Span.(3)

8. Hydrology:
Estimation of flood, discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. (5)

Unit- V

9. Loads, Forces, Stresses:
IRC Specification & code of practices, Critical combinations. (4)

10. Sub-Structure:
(A) Types of foundations & their choice, estimation of BC of foundation strata, Open, Pile and well foundation, pneumatic Caissons, cofferdams. (6)
(B) Abutment, Piers & Wingwalls Their types general design principles (empirical), Choice. (2)

Unit-V

11. Super Structure:
Different structural forms culverts, causeways, minor and major bridges, suitability and choice precost post tensioned and segmental construction. launching, operation systems, Bearings, Architecture. (4)

12. Rating and Maintenance:
Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, Aesthetics. (4)

(A) Every student must carry minimum of 10(Ten)experiments from the following:
(a) Subgrade Soil: Classification, group index and rating CBR test(Vide 15:2720)
(b) Aggregates:Specific Gravity Water absorption flankiness index Impact, crushing and Abrasion value tests. Petrographic identification (Vide IS:2386)
(c) Bitumen: Penetration, Softening Point, flash point, Ductility, Stripping, Viscosity of Tar & Cutback.
(d) Students should be familiar with relevant BIS,IRC MOST specifications of various materials for different constructions.

(B) At least one field visit & its report in journal.
1. Introduction:
Unit - I
Importance of Building drawing as Engineer's Language in construction & costing.

Unit - II
2. Method of Drawing:
Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962.
(i) Free hand dimensioned sketches of various building elements. Importance in Civil Engineering.
(ii - a ) Developing working drawings to scale as per I.S. 962 from the given sketch design and general specifications for terraced and pitched roofs.
(ii - b ) Developing submission drawings to scale with location site and block plan complete.

Unit - I II
3. Designing of Buildings:
Introduction : Site requirements, requirements of owner and Building byelaws. Climate and design consideration, orientation, recommendations of CBRI, Roorki and general principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

Unit - IV
4. Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.
1 Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment)
2 Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One assignment A1 sheet)
3 Working drawing of multi storied Publici Educationall Health! Community! Industrial building including structural details and layout of services. (One assignment) .....  
4 Two point perspective of the single storied Residential building neglecting small building elements. ( Two assignment - pitched & terraced roof)
5 Minimum 30 free hand self explanatory dimensioned sketches of various building elements in sketch book.
6 Line plans of various types of buildings e.g. publici educational! industriall hospital! community on graph papers(04 assignments)
7 Submission drawing of 02 storied residential building framed structure including all details and statements as per the local bye laws.
8 One compulsory field exercise.
I. Engineering Economics:

Unit – I
2. Demand analysis : Law of demand, Elasticity of Demand, Demand Forecasting [4]

Unit – II
6. Various types of Markets and price determination under these market conditions, scope of Privatisation in India. [4]

SECTION -B

Unit – III
1. Introduction : Project Management, Types of Projects, Various phases of Project, Project proposal, Components of planning, Objectives of planning, factors effecting planning, organisational setup, establishment of premises and site organisation programme. [2]

Unit – IV
4. System approach, system formation, effectiveness and control, general principles of quality control measurements and achievements. [3]
5. Planning for safety: construction hazards, safety in construction, industry and at work site. National safety council, Safety organisation, accidents, its cost, cause, types and preventions, losses, during natural calamities, floods and fire, and methods to reduce them. [3]

Unit – V
7. Material Management: Functions, objectives, purchasing, procedures, records, stock taking, inventory control, ABC analysis, storing. [3]


9. Equipments of Major Projects: Excavating machines such as: Power shovels, Drag Line, Bulldozer, Scraper, Drilling and Blasting Equipments, Material Transporting and handling equipment such as Cranes, Hoists, conveyor belts, dumpers, cableways, rail system (Size, performance and limitations) [5]


SELECT REFERENCE BOOKS:-

1. Construction Management Peurifoy
2. CPM and PERT I. Srinath
3. Project Management- Roy Choudhary
4. Equipment Management - Mahesh Verma

**Question paper pattern :-**

**Section A:** Two questions (14 marks each) are to be solved out of three

**Section B:** Four questions (13 marks each) are to be solved out of six

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, watertanks, Roadworks, Railways, Watersupply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & levelling etc.

Minimum Five visits are expected. Students should submit a detailed report on the visit duly approved by the concerned teacher.

1. Name of Construction Site with address
2. Nature of construction work and various structural components
3. Nature of ownership, executing and supervising authority
4. Architect and Structural Engineer
5. Architectural concept and Design features
6. Commencement of the work and tentative completion
7. Present Status of work
8. Estimated cost of the work (Money spent till date)
9. Mode of availability of finance
10. Various types of manpower for the work
11. Various safety measures and amenities provided to manpower
12. Various construction equipments for the work
13. Various materials used for the work
14. CPM I PERT of the project
15. Type of inventory control
16. Resource planning implemented
17. Social benefits and implication
18. Safety measures during and posts construction
19. Post Construction Maintenance provisions
20. Effect on environmental aspect and sustainable development
21. Various of scaffolding, Formwork, lifting devices
22. Site of precast units for the work and its mode of transportation
23. Use of local available material like fly-ash, slag, silica-fumes, etc.
24. Clauses for delay I faulty construction
25. Clause for Arbitration
VI SEMESTER

6CE01 /6ST01 Structural Analysis- II
(3L+ IT + 2P)
SECTION-A

UNIT-I
1. Kani’s Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

UNIT-II
2. Approximate method of Structural analysis for multi-storey’ed frames with lateral loads (portal and Cantilever method), Approximate methods for vertical loads i.e. Substitute frame method etc. (Max three bay three storey)

UNIT-III
3. Column Analogy method, Applications to beams, Calculations of Stiffness factors and carry over factors for non-prismatic method, Analysis of non-prismatic fixed beams.

UNIT-IV
4. a) Introduction to Flexibility Method of structural analysis, influence coefficients, Choice of base determinate structure and redundant forces, compatibility equations. Hand solution of simple beam1 problems.
   b) Moment distribution applied to frames with sway(upto single storey two bay)

UNIT-V
5. Strain energy method applied to simple composite structures (Simple problems), Introduction to basic theory of elasticity, Concept of stress, strains, strain displacement relationship, equation of equilibrium, boundary conditions, generalized Hooks law, plane stress and plane strain problems.

UNIT-VI
6. Theory of photoelasticity applicable to beams. Study of various types of strain gauges, Analysis of strains by strain Guages.

PRACTICALS :
Minimum TEN of the following:
1. To find the slope & deflection of continuous beam.
2. To find the value of Flexural rigidity (EI) for a given beams & 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.
10. Determination of material fringe value.
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

References:
1. C.K. Wang , ‘Intermediate
3. Jain, Jai Krishna, ‘Plain and Reinforced Concrete Structure; Vol-II
5. Rally & Dally , ‘Experimental Stress Analysis.’

6C02/6ST03 RCC STRUCTURES SECTION A
3(L)+1(T)+2(D)

(Four question of 10 marks are to be answered out Six questions of 10 marks each to be set on Units I to IV)

Unit-I

1. Introduction to the Working Stress Method of ReC design. Basic concepts in design for flexure, assumptions, design constants. Analysis of the rectangular section. Balanced, under-reinforced and over-re~ced sections. Drawbacks and limitations of Working stress method. (3)


Unit -II

3. Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factQ§,./Stress strain relationship stress Ptock parameters, failure criteria, types and properties of reinforcement, lIn11t state of Serviceability a--it state of collapse. Other limit states. Review of IS - 456- 2000. (2)

4. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular s9Ction. Balanced failur::node, primary tension failure mode and primary compression failure mode.. -/- . (2)
5. Limit state of Collapse in Flexure: Analysis & Design of the Tee & L-beam section. (3)

6. Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves. (3)

Unit - IV

7. Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and axial force, Check for bond. (3)

8. Limit state of Serviceability:

(i) Causes and control of cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, Cracks due to loading, Needs for crackwidth control.

(ii) Moment- curvature relationship, deflection control of beams and one way slabs. (no numerical calculations) (2)

(VI-03)
(Two questions of 20 marks are to be answered out of Three questions of 20 marks each to be set on Units V and VI)

Unit - V (with WSM)

9. Design of circular water tank with roof slab & dome resting on ground by Approximate methods/IS code method. (4)

10. Design of rectangular water tank with one-way roof slab resting on ground by approximate method/IS code method. (4)

12. Design of prestressed slab & rectangular beam. (2)

Unit- VI (with LSM)

13. Design of one-way, simply supported, single span and cantilever slabs, and continuous slab beam with IS coefficients. (4)

14. Design of rectangular pad & slopped footing for axial load. (3)

15. Design of Dog-legged and Open Well Staircases (4)
PRACTICAIS

Practical shall consist of minimum Four design assignments with detailed drawing on A-2 size sheets and detailed calculations in journal.

i) Circular water tank with roof slab/dome resting on ground.

ii) Rectangular water tank with one-way roof slab resting on ground.

iii) Single span prestressed concrete rectangular beam, slab.

iv) One-way slab, continuous slab.

v) Rectangular pad I slopped footing.

vi) Dog-legged / Open well staircase.

One field ~ and its report in the journal.

6CE03 : GEOTECHNICAL ENGINEERING-II (3L+1T)

SECTION-A

Unit-I:

GEOTECHNICAL EXPLORATION:

Importance and objectives of field exploration, principal methods of subsurface exploration, open pits & shafts, types of boring, number, location and depth of boring for different structures, type of soil samples & samplers. Principles of design of samplers, collection & shipment of samples, boring and sampling record. Standard penetration test, corrections to N-values & correlation for obtaining design soil parameters. (6)

Unit-II:

STABILITY OF SLOPES:

Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slip circle, slices method for homogeneous soil slopes with pore pressure consideration. Taylor's stability numbers & stability charts, methods of improving stability of slopes, types, selection and design of graded filters. (7)

Unit-III:

LATERAL EARTH PRESSURE:
Earth pressure at rest, active & passive pressure, General & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories for earth pressure. Effects of surcharge, submergence. Rebhan's criteria for active earth pressure. Graphical construction by Ponce let _ and Culman for simple cases of wall-soil system for active pressure condition. (8)

SECTION-B

UNIT-IV:

GROUND IMPROVEMENT:

Methods of soil stabilization use of admixtures (lime, cement, flyash) in stabilization. Basic concepts of reinforced earth, use of geosynthetic materials Salient features, function and applications of various geosynthetic materials. Vibroflotation, sand drain installation, pre-loading. (5)

UNIT-V

SHALLOW FOUNDATIONS:

Bearing capacity of soils: Terzaghi’s theory, its validity and limitations, bearing capacity factors, types of shear failure in foundation soil, effect of water table on bearing capacity, correction factors for shape and depth of footings. Bearing capacity estimation from N-value, factors affecting bearing capacity, presumptive bearing capacity.

Settlement of shallow foundation: causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. Proportioning the footings for equal settlement. Plate load test: Procedure, interpretation for bearing capacity and settlement prediction. (8)

UNIT-VI

PILE FOUNDATION:

Classification of piles, constructional features of cast-in-situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Load transfer mechanism of axially loaded piles. Pile capacity by static formula & dynamic formulae, pile load test and interpretation of data, group action in piles, spacing of piles in groups, group efficiency, overlapping of stresses. settlement of pile group by simple approach, negative skin friction and its effect on pile capacity, general feature of under reamed piles. (8)

2) Punmia Be: Soil Mechanics & Foundations
4) P Raj : Geotechnical Engineer
1. LAMINAR FLOW: (03)

Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen-Poiseuille equation.

2. BOUNDARY LAYER THEORY: (04)

Nominal thickness, displacement thickness, momentum thickness of the boundary layer; Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sublayer; Separation of boundary layer on plane and curved surfaces.

3. REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: (04)

In general definition of drag and lift; Flow past plates, cylinders and spheres; drag on sphere, cylinder and flat plate.

4. FLOW THROUGH PIPES: (10)

Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade’s experiment; Moody’s chart; Darcy-Weisbach & Hazen-William’s equation for frictional head loss; Hydraulic gradient and energy gradient:

Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross method of pipe networks; Waterhammer pressure head due to sudden closure of valve.

(A) GENERAL: (01)

Types of channel and their geometrical properties; Types of flow in open channel

(B) UNIFORM FLOW: (05)

Chezy’s and Manning’s equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope, normal critical slope; Specific force and its diagram; Conditions of critical flow.

(A) APPLICATIONS OF SPECIFIC ENERGY, GRADUAL TRANSITIONS OF CHANNELS: (02)

(B) GRADUALLY VARIED FLOW: (05)

Dynamic equation for GVF; Classification and characteristics of surface profiles; Direct Step method of computing profile length.

(C) RAPIDLY VARIED FLOW: (03)
Defination of hydraulic jump; Equation of hydraulic jump in horizontal rectangular channel; Length & height of jump; Energy loss in jump; Classifications of jump.

6. HYDRAULIC MODELS: (05)

Difference between model and prototype; Similitude- type of similarities; Model lawss; Reynolds model law and Froude model law; Types of model- distorted, undistorted; Froude’s method of determining resistance to partially submerged objects like ship.

7. FLUID MECHANICS:

(A) Impact of Jet stationary and moving curved vanes. (02) (B) TURBINES: (03)

Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

UNIT-VI

8. Centrifugal and Reciprocating Pumps

(A) CENTRIFUGAL PUMP: (06)

Component parts; Working principle; Static and manometric heads; different efficiencies; Specific speed; Theoretical aspects of multistage pump, pump in parallel; Priming devices; Trouble & remedies; Main & operating characteristics curves. Selection on basis of operating characteristics.

(B) RECIPROCATING PUMPS: (03)

Components parts, Working principle, Work done of single ‘& double acting pumps; Negative slip, Air vessels - Working principle and necessity.

1. Study of flow around immersed bodies.

2. Determination of Darcy-Weisbach friction factor for given pipes.

3. Determination of Manning’s or Chezy’s constant for an open channel.

4. Developing specific energy diagram for a rectangular channel.

5. Study of GVF profiles.

6. Study of hydraulic jump in a horizontal rectangular channel.

7. Study and performance of Francis turbine.

8. Study and performance of Pelton Wheel turbine.

10. Study and performance of Reciprocating pump.

11. Design problem on pipe network analysis.

1. Hydraulics & Fluid Mechanics- Dr. Modi & Dr. Seth

2. Fluid Mechanics-Streeter & Wylie

3. Fluid Mechanics- Dr. A.K Jain

4. Fluid Mechanics through problems- Garde

5. Theory and applications of Fluid Mechanics- K. Subramanya

6. Foundation of Fluid Mechanics-Yuan


6CE05/6ST06                              COMPUTER APPLICATION IN CIVIL ENGINEERING     (3L+ IT+4P)

SECTION-A

UNIT-I Introduction

C-Fundamentals, CHARACTER SET data type constants and variables, Declaration of constants & variables, Expression, Statements, Symbolic constants.

Operator and Expression, Arithmetic operator Unary operator, Relational and Logical operator, Assignment operators, the conditional operator, Library functions.

Data Input & output Interactive programming preparing & running a complete simple program.

UNIT-IT Control Statements

Control statement, the WHILE statements, do-while, for nested loop, if-else, switch break, "": continue, goto statement, comma operator.

UNIT-ill Advance Topics

Functions, storage class, Arrays, Pointers, structures and Unions, Data files, File Handling, Link list.

UNIT-IV

UNIT-V

2. Solution of linear Algebraic Equations, Gauss elimination, Cholesky method), solution errors. Interactive Computer Program Development

UNIT-VI

3. Solution of non Linear Equations (Newton Raphson schemes), Initial & Two point boundary value problem, Euler's, Runge-kutta, Milne's etc, Interactive Computer Program Development

Practical: Minimum Sixteen Computer program development min. one from each of the following field using FORTRAN-95 / C language. Atleast two programs on mixed language i.e. using both FORTRAN95 and C and four programs in anyone language. It’is recommended to have atleast four programs based on Numericals methods in either Fortran or C and Two assignments in application software's such as spread sheets, database management programs etc.

1. Engineering Mechanics
2. Strength of Material
3. Transportation Engineering 4, Geotechnical Engineering
4. Hydraulic Engineering
5. Irrigation and Water Resource Engineering
6. Surveying
7. Estimating and Costing
8. Structural Analysis
9. Structural Design
10. Environmental Engineering
11. Matrix algebra, Solution Techniques
12. Numerical Integration
13. Table generation from IS:456
15. Earthquake force calculation on structures as per IS:1893

1. Schildt, 'The complete reference C'

2. Balagurusamy, 'Programming with C'

3. Ramkumar, 'Programming with C'

4. Gottfried, 'Programming with C'

5. Rajaraman, 'Programming with Fortran 90/95'


7. Lahey's Fortran Manual