Faculty of Engineering & Technology

Study and Evaluation Scheme

of

Bachelor of Technology: 4Years

B.Tech- Civil Engineering

II, III & IV Year

(Applicable w.e.f Academic Session 2018-19 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

Course B.Tech Civil Engineering- 3

Exam- semester examination –December -2017   For the admission session -: B16

No.	Paper Code	Subject Name	Credit	Type
1	02MS301	Engineering Mathematics-3	4	Theory
2	02CE308	Fluid Mechanics	4	Theory
3	02ME304	Strength of Materials	4	Theory
4	02CE305	Building Material	4	Theory
5	02GE303	Engineering Geology	4	Theory
6	02CE302	Surveying -I	4	Theory
7	02CE357	Building Material- Lab	1	Practical
8	02CE355	Strength of Materials- Lab	1	Practical
9	02CE356	Fluid Mechanics- Lab	1	Practical
10	02CE354	Engineering Geology-Lab	1	Practical
11	02CE352	Surveying -I -Lab	1	Practical

Course B.Tech Civil Engineering- 4

Exam- semester examination –June -2018   For the admission session -: B16

No.	Paper Code	Subject Name	credit	Type
1	02CE403	Geotechnical Engineering	4	Theory
2	02CE411	**Elective**	4	Theory
3	02CE407	Fluid Mechanics-II	4	Theory
4	02CE408	Theory of Structure-I	4	Theory
5	02CE409	Railway Bridge and Tunnel engineering	4	Theory
6	02CE410	Advance Surveying	4	Theory
8	02CE453	Geotechnical Engineering-Lab	1	Practical
9	02CE456	Fluid Mechanics-II -Lab	1	Practical
10	02CE455-A/B	**Elective -Lab**	1	Practical
11	02CE457	Advance surveying- Lab	1	Practical

Elective subject- 1. Concrete technology-   02CE411-A
                     2.Construction Equipments and Technique   02CE411-B

Course B.Tech Civil Engineering- 5

Exam- semester examination –December -2018   For the admission session -: B16

No.	Paper Code	Subject Name	Credit	Type
1	02CE506	Water Resource Engineering	4	Theory
2	02CE508	Highway Engineering	4	Theory
3	02CE509	Theory of Complex Structure	4	Theory
4	02CE512	Design of Concrete Structures	4	Theory
5	02CE513	Construction Technique	4	Theory
6		**Elective**	3	Theory
7	02CE558	Highway Engineering Lab	1	Practical
9	02CE561	Theory of Complex Structure -Lab	1	Practical
10	02CE562	Design of Concrete Structures -Lab	1	Practical

Elective subject - 1. Building Planning and Drawing   02CE514-A
                        2. Bridge Engineering   02CE514-B

Course B.Tech Civil Engineering- 6

Exam- semester examination –June -2019   For the admission session -: B16

No.	Paper Code	Subject Name	credit	Type
1	02CE605	Foundation Engineering	4	Theory
2	02CE601	Quantity Surveying and Costing	4	Theory
3	02CE611	Environmental Engineering -I	4	Theory
4	02CE606	Design of Steel Structure-I	4	Theory
5	02CE612	Design of Hydraulic Structure	4	Theory
6	**02CE613**	**Elective**	4	Theory
7	02CE657	Foundation Engineering-Lab	1	Practical
8	02CE658	Environmental Engineering –I- Lab	1	Practical
9	02CE654	Design of Steel Structure-I-Lab	1	Practical
10	02CE659	Quantity Surveying and Costing-Lab	1	Practical
11	02CE653	Industrial Training		Practical

Elective subject - 1. Pavement Design and Traffic Engineering-   02CE613-A
                        2. Environmental Impact Assessment   02CE613-B

Course B.Tech Civil Engineering- 7

Exam- semester examination –Dec -2019   For the admission session -: B16

No.	Paper Code	Subject Name	Credit	Type
1.	**02CE713**	**Elective**	4	Theory
2.	02CE708	Environmental Engineering-II	4	Theory
3.	02CE710	Construction Planning and Management	4	Theory
4.	02CE711	Design of Advanced Steel Structure	4	Theory
5.	02CE712	Remote sensing and GIS	4	Theory
6.	02CE753	Environmental Engineering-II-LAB	1	Practical
7.	02CE754	Remote Sensing and GIS-Lab	1	Practical
8.	02CE752	Seminar		

Elective subject - 1. Design of Advanced Concrete Structures   02CE713-A
                   2. Advanced Foundation Engineering   02CE713-B

Course B.Tech Civil Engineering- 8

Exam- Semester examination –June -2020   For the admission session -: B16

No.	Paper Code	Subject Name	Credit	Type
1	02CE853	Project work	12	----

AKS UNIVERSITY, SATNA
B.TECH.-III SEM
ENGINEERING MATHEMATICS-III

Unit – I: Function of Complex variable
Definition, derivatives of complex function, Analytic function.
- Cauchy-Riemann equations, in Cartesian form and polar form.
- Conjugate function, Harmonic function, Methods for finding the analytic function.
- Cauchy's integral theorem, Cauchy's integral formula for analytic function.
- Poles and singularities of analytic function, Residue theorem (without proof) and its application.

Unit – II: Numerical Techniques – I
Finite differences: Difference table [Forwarded Difference operator, Backward Difference operators and central Difference operator]
- Interpolation**:** Newton-Gregory forward and backward interpolation formula for equal intervals, Gauss's forward and backward interpolation formula for equal intervals, Gauss's central difference formula for equal intervals.
- Stirling's formula, Bessel's formula, Everett's formula for equal intervals.

Unit – III: Numerical Techniques – II
- Numerical Differentiation : Newton's forward difference formula and Newton's backward difference formula for derivative, Gauss's forward difference formula for derivative, Newton's divide difference formula for derivative.
- Lagrange's interpolation formula for unequal intervals and Newton's divided difference interpolation for unequal intervals.
- Numerical integration: Trapezoidal rule, Simpson's one third rule, Simpson's three-eight rules, and Weddle's rule.
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.Unit – IV Numerical Techniques –III
Numerical solution of algebraic and Transdantal equations: Bisection method, Secant method, Regular-falsi method, Newton-Raphson method and Graeffe's root squaring method.
- Numerical solution of ordinary differential equations: Taylor's series method, Euler's method, Euler's modified method, Picard's method, Runge- Kutta method.
- Solution of simultaneous algebraic equation: Gauss- Seidal method, Gauss elimination method, Guass-jordan method.

Unit – V Probability Distribution
- Binomial Distribution: Hypothesis, characteristics, mean, variance and standard deviation and moments.
- Poisson distribution: Hypothesis, characteristics, condition for Poisson distribution, mean, variance and standard deviation.
- Normal Distribution: Standard normal distribution, properties of normal curve.
- Curve fitting: Method of least squares, Fitting of straight lines, and parabola of second degree.
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Text Books:
1. D.C. Agrawal, Engineering Mathematics-III, Sai prakasan
2. H.K.Das, Basic Engineering Mathematics-III, S.Chand & company Ltd.
3. D. K. Jain., Engineering Mathematics-III
4. Sonendra Gupta, Engineering Mathematics-III, Dhanpat Rai Publishing   Company(P) Ltd.

Reference Books:-
1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.

2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
3. Chandrika Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya,1996.
4. B.V.Ramana,Higher Engineering mathematics,Tata Mcgraw-Hills Publishing Company Limited.

FLUID MECHANICS

Unit-I: **Kinematics of Flow :** Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets- their utility & method of drawing flow nets.

Unit-II: Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications.

Unit-III: Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturimeter, weirs and notches).

Unit-IV: Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws.

Unit-V: Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates.
Turbulent flow: velocity distribution in turbulent flow, laminar and turbulent boundary layers and laminar sub-layer, hydro-dynamically smooth and rough boundaries.

Text Book:
1) Dr. D S Kumar, S. K. Kataria & Sons, New Delhi; Fluid Mechanics & Fluid Power Engg
2) Dr R.K Bansal. Fluid Mechanics and Hydraulic Machines.

References Books:
1) Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2) Som and Biswas; Fluid Mechnics and machinery; TMH
3) Cengal; Fluid Mechanics; TMH
4) White ; Fluid Mechanics ; TMH
5) Essential of Engg Hyd. By JNIK DAKE; Afrikan Network & Sc Instt. (ANSTI)
6) A Text Book of fluid Mech. for Engg. Student by Franiss JRD
7) R Mohanty; Fluid Mechanics By; PHI
8) Fluid Mechanics; Gupta Pearson.

List of Experiments:

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Venturimeter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of metacentric height
8. Determination of Friction Factor of a pipe

<div align="center">**STRENGTH OF MATERIALS**</div>

UNIT- I: Introduction

Basic of stress & strain, Elastic constant, Stress-strain diagram, Hooke's law, Stresses in the components subjected to multi-axial forces, Temperature stresses, Statically indeterminate system.

UNIT-II: Bending of Beam

Bending of beams with symmetric section, boundary condition, Pure bending, Bending equation, traverse shear stress distribution in circular, hollow circular, I & T section.

UNIT – III: Deflection of Beams

Relation between slope deflection and radius of curvature, solution of beam deflection, problem by Macaulay's method, Direct integration method, Method of super position, Moment Area Method.

UNIT –IV: Torsion

Deformation in circular shaft due to torsion, Basic assumption, Torsion equation, Stresses in elastic range, Angular deflection, hollow and stepped circular shaft. Spring: Closed and open coil helical spring subjected to axial load, spring in parallel & series.

UNIT – V: Principle Stresses and Strain

Transformation of plane stresses, Principle stresses, Maximum shear stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principle strains, Maximum shear strain. Combined Loading: Components subjected to bending, torsion & axial loads

Text Books:
1. Elements of strength of material – Timoshenko & young- EWP press
2. Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications.
3-Strength of Material-RS Khurmi,Chand (S) & Company India Limited

Refrence Books:
1. Strength of material – Rider–ELBS
2. Introduction to Solid Mechanics – I.H.Shames–PHI
3. Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
4. Strength of Materials – Dr. Sadhu Singh – Khanna publication.

List of Experiments:

1. To study the Universal Testing Machine.
2. To Perform the tensile test of Mild steel on UTM and to draw Stress-Strain Curve.
3. To Determine the strength of Wood on UTM (1) Along the grain (2) Across the grain.
4. To determine Shear Strength of Mild Steel on UTM.
5. To Study the Brinell Hardness Machine and to determine the Brinell Hardness of the given material.
6. To study the impact testing machine and test specimen of Izods and charpy.
7. To study the fatigue testing machine and to discuss the procedure to find out endurance limit of given material.
8. To study the spring testing machine.
9. To study the Buckling of Coulmn.

BUILDING MATERIALS

UNIT I :
Classification of Materials, economics of Building Materials. **Building stones** – Characteristics, Testing, Preservation, Common Building stones. **Bricks –** Conventional and Fly ash Bricks, Testing, Efflorescence. **Cement –** Physical properties, composition, manufacture, setting of cement, types of cement, field and laboratory tests, uses. **Mortar –** Bulking of sand, Tests for sand, properties of good mortar, preparation of mortar, uses of mortar.

UNIT II:
Timber – Classification of timber, Engineering properties of timber, Defects in timber, Factors affecting strength of timber, seasoning and preservation of timber. Wood based eco-friendly timber products.

UNIT III :
Paints, varnishes and distempers - Common constituents, types and desirable properties, Cement paints. Ferrous metals. Characteristics of reinforcing steel. Principles of cold working. Reinforcing steel – physical and magnetic properties, chemical composition, uses. Brief discussion on properties and uses of Aluminum and lead.

UNIT IV:
Asphalt, Bitumen and Tar – Terminology, specifications and uses.. **Gypsum –** Properties, Building Products and their uses. **Pozzolana** – Fly ash and Surkhi (Properties and uses).

Use of material like glass, rubber, tar, emulsion, bitumen, glass wool, Use of J bolts U hooks, Bituminous materials- their content & origin Asphalt, tar, bitumen - their specific uses

UNIT V :
Chemistry of Plastics - manufacturing process, classification, advantages of plastics, Mechanical properties and their uses.

Glass – Ingredients, properties, types and uses in construction. Insulating Materials - Thermal and sound insulating materials, desirable properties and types.

Reference Books :

1. S.K. Duggal : Building Materials, New Age International.
2. P.C. Varghese : Building Materials PHI.
3. Rangwala : Engineering Materials (Material Science).
4. Birdie and Ahuja

List of Experiments:

1. **Cement**

      (i)   Normal Consistency of cement.
      (ii)   Initial & final setting time of cement.
      (iii)   Compressive strength of cement.
      (iv)   Fineness of cement by Le-chatalier's apparatus.
      (v)   Soundness of cement.
      (vi)   Tensile strength of cement.

2. **Coarse Aggregates**

      (i)   Crushing value of aggregates.
      (ii)   Impact value of aggregates.
      (iii)   Water absorption of aggregates.
      (iv)   Sieve analysis of Aggregates.
      (v)   Grading of aggregates.

3. **Fine Aggregates**

      (i)   Sieve analysis of sand.
      (ii)   Bulking of sand.

4. **Bricks**

      (i)   Water absorption.
      (ii)   Dimensional Tolerance.
      (iii)   Compressive strength.
      (iv)   Efflorescence.

ENGINEERING GEOLOGY

UNIT-I: Introduction to Geology
Mineralogy Minerals – definition, formation and occurrences. Identification – physical, chemical and optical. Classification of minerals.
Crystallography Scope, crystal systems. Polymorphism and isomorphism

UNIT-II: Structural Geology
Concept of Deformation; Primary and Secondary Planer & Linear Structure of Rocks; Topography and its Representation. Altitude of strata- Dip and strike; Outcrop patterns; Width of Outcrop and Thickness of beds; Structural Contours; Geological Maps; Study of Unconformity; Stratified rocks and their structures. Attitude of strata. Outcrop and in crop

UNIT-III: Folds, Faults and Joints
Folds: Genesis, classification, identification in field, impact on landscape, mineral deposits, Faults: mechanism of faulting, classification, impact of faulting on topography. Joints: Definition and characteristics, classification, occurrence of joints in igneous, sedimentary and metamorphic rocks. Engineering considerations and treatments.

UNIT-IV: Prospecting and Exploration
Geological guides for prospecting of mineral deposits. Introduction to different methods of prospecting for mineral deposits – geological, geophysical, geochemical, geo-botanical, aerial photography and remote sensing. Exploratory drilling methods. Trenching and pitting. Sampling grids. Drill hole logging. Reserve Estimation Selection of methods, merits and demerits, applicability.

UNIT V: Applied Geology
Introduction to applied geology and its use in civil engg., properties of rocks, selection of sites for roads, bridges, dams, reservoirs and tunnels. Prevention of engineering structures from seismic shocks, stability of hill sides, water bearing strata, artesian wells, Use of remote-sensing techniques in selection of above sites.

Text Books:
1. Engineering And General Geology : Parbin Singh
2. Physical And Engineering Geology : S.K. Garg
3. Rutley's Elements of Mineralogy : H.H. Read
4. Principles Of Petrolog y : G.W. Tyrell

Reference Books:
1. Structural Geology : M.P. Billings
2. Geological Maps : G.W. Chiplonkar
3. A Text Book of Geology : P.K. Mukherjee
4. Applied Geology : S. Banger
5. Applied Geology : D.V. Reddy
6. Engineering Geology : D.V. Reddy
7. Geology of India (Vol I&II) : R. Vaidyanadhan & M. Ramakrishnan

List of Experiments:

1. Study of Physical properties of minerals

2. Identification of rocks forming silicate and ore minerals

3. Recognition of rocks

4. Use of clinometers compass and Burton compass for measurement dip and strike of formations.

 5. Geological cross sections and study of geological maps.

6. Study of models of geological structures and out crops patterns of different types of rocks and land forms

SURVEYING

UNIT-I: Introduction to Surveying
Overview of Surveying, branches of surveying, principles of Surveying. Instruments Used for various measurements, Electronic Distance Measurement (EDM), Various EDM Instruments, Survey Maps, Conventional Symbols of Objects in the Map,

UNIT-II: Chain Surveying
Methods and terminologies of linear measurements, linear measurements using chain surveying, various operations in carrying out the chain surveying, various accessories for chaining, different type of chains and tapes, testing of chains. **Running Survey Lines:** Ranging, chaining and laying offsets, linear Measurements with chain on level ground /on sloping ground, **Errors in chaining:** Errors in Measurements with Incorrect Chain Length, Linear Measurements with Tape on Smooth Level or Sloping Ground / on Rough Ground, Tape Corrections, Setting out Right Angle on / From a Chain Line, Offsets – Limiting Length of Offset, Effect of Error in Laying out Direction, Effect of Error in Direction and Length Both. **Obstacles in Chain Survey:** Obstacles to Ranging, Obstacles to Chaining, Obstacles to Ranging and Chaining both. Numerical Problems.

UNIT-III: Compass & Plane Table survey
Overview and terminologies, Principle of Compass, Types of Compass, Compass Surveying, Traversing, Traversing with Chain and Compass, Designation of Bearings, Calculation of Included Angle from Bearings, Calculation of Bearing From Included Angles Errors and Precautions in Compass Surveying, Local attraction, Correction to Measured Bearing for Local Attraction, Adjustment of Closing Error. Magnetic Declination, Dip, Introduction Plane Table Surveying, Methods of Plane Table Surveying- Radiation Method and Intersection Method. Introduction to Theodolite. Numerical Problems.

UNIT-IV: Levelling & Contouring
 Overview and terminologies, Leveling Instruments-Different Types of Levels, Leveling Staff. Temporary and Permanent Adjustments of a Level. Leveling: Classification Based on Purpose of Leveling –Simple leveling, Differential or Compound or Continuous Leveling, Fly Leveling, Profile or Longitudinal Leveling, Cross-Section Leveling, Reciprocal Leveling, Precise Leveling, Booking and Reducing Levels. Height of Collimation
or Height of Instruments Method. Rise and Fall Method, Errors and Precautions in leveling, Problems or Difficulties in Leveling, Numerical Problems. Introduction of contour types and uses of contours

UNIT-V: Mapping & Sensing
Introduction, Areas: Areas from Field Measurements –Area Consisting of Irregular Boundary, Area from Plan –Graphical Method, Measurement of Area by Planimeter Errors & Precautions in Computation of Area. Volumes: Measurement of Volume. –from Cross Sections, from Spot Levels , from Contours, Area of Sections, Introduction to GIS, GPS, remote sensing and Digital Terrain Models (DTMS), applications of Remote Sensing, general

Introduction of total station &(DGPS)

List of Experiments/ Field work (Expandable):

1. Chain Surveying
2. Compass Surveying
3. Plane Table Surveying
4. Profile leveling, contouring & cross sectioning
5. Determination of tachometric constants & uses of tachometer in various field works
6. Curve setting by different methods.
7. Theodolite traversing

AKS UNIVERSITY, SATNA
B.TECH -IV SEM
FLUID MECHANICS-II

Unit-I: Uniform flow in open channels : Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections.

Unit-II: Non-uniform flow in open channels : Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow, hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.
Forces on immersed bodies: drag on a sphere, a flat plate, a cylinder, Magnus effect.

Unit-III: Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes, **Pipe Network :** Water Hammer
Turbulent flow : Laminar and turbulent boundary layers and laminar sub-layer, Boundary layer thickness, hydro-dynamically smooth and rough boundaries, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes.

Unit-IV: Turbines : Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine- their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves.
Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.

Unit-V: Centrifugal pumps : Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves.
Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

List of Experiments
1. Study the performance characteristics of Pelton Wheel
2. Study the performance characteristics of Francis Turbine
3. Study the performance charactristics of Kaplan Turbine
4. Calibration of multistage (Two) Pump & Study of characteristic of variable speed pump
5. To study the performance & details of operation of Hydraulic Ram
6. Study of the characteristic of the Reciprocating pump

Suggested Books & Study Material:

1. Fluid Mechanics - Modi& Seth - Standard Book house, Delhi

2. Open Channel Flow by Rangaraju - Tata McGraw - Hill Publishing Comp. Ltd., New Delhi

3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi

4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705-B, NaiSarak, Delhi-6

5. Relevant IS codes.

6. Dr. D S Kumar, S. K. Kataria& Sons, New Delhi; Fluid Mechanics & Fluid Power Engg.

GEOTECHNICAL ENGINEERING - I

Unit – I: Basic Definitions & Index Properties
Definition and scope of soil mechanics, Historical development.Formation of soils.Soil composition. Minerals, Influence of clay minerals on engineering behaviour. Soil structure. Three phase system. Index properties and their determination. Consistency limits.

Unit – II: Soil Water and Classification of soils
Soil water, Permaeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, uses of a flownet, Effective, neutral and total stresses. Classification systems based on particle size andconsistency limits.

Unit – III: Consolidation
Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation.Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of preconsolidation pressure, settlement analysis. Calculation of total settlement.

Unit – IV: Stress Distribution in Soils and Shear Strength of Soils
Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. Newmark's influence chart. Contact pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

Unit – V: Lateral Earth Pressure
Active, passive and earth pressure at rest.Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wall friction.Arching in soils.Reinforced earth retaining walls.

List of Experiments:
1. Determination of Hygroscopic water content
2. Particle - size analysis
3. Determination of Specific gravity of soil particles
4. Determination of plastic limit
5. Determination of liquid limit
6. Determination of shrinkage limit
7. Permeability tests
8. Direct shear test
9. Consolidation test

Text Book:
1. Punamia B.C.;Fundamentals Soil Mechanics; Laxmi Publication,New Delhi.
2. Arora, K.R. 2000. Soil Mechanics and Foundation Engineering. Standard Publishers and Distributors, New Delhi.

Reference Books:
1. Capper, P.L. and Cassie, W.F. 1961.The Mechanics of Engineering soils. Asia Publishing House
2. Verma, B.P. 1996. Problems in Soil Mechanics and Foundation Engineering.Khanna Publishers,

THEORY OF SIMPLE STRUCTURES

Unit-I: Virtual work and Energy Principles
Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

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

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

Unit-IV: Rolling loads and Influence Lines
Maximum SF and BM curves for various types of Rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches.

Unit-V: Rolling loads and Influence Lines
Maximum SF and BM curves for various types of Rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches.

Text Book:
1)Theory of Structures B.C.Punmia, Ashok Jain, Arun Jain

Reference Book:
1)Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
2) Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
3) Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
4) Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
5) Norris C.H., Wilbur J.B. and Utkys. Elementry Structural Analysis, McGraw Hill International, Tokyo

RAILWAY, BRIDGE AND TUNNEL ENGINEERING

Unit I: Introduction
Brief history of railways, Role of railways in transportation, its advantages, Comparison of railways and highway transportation, Classification of Indian railways, Classification of railway line based on speed criteria, Railway terminology
Permanent Way: Permanent way and its components, Requirements of ideal permanent way, Gauges in railway track, Selection of gauges, Uniformity of gauges, Necessity of adopting different gauges, Demerits of adopting different gauges, Railway track cross-sections, Cross section in cutting and filling, Single line double line drainage in railway tracks and yards, Coning of wheels.

Unit II: Railway Track
Ballast, Functions of ballast, requirement of good ballast, different materials used as ballast, size and section of ballast, scissors method of packing ballast, renewal of ballast and quantity required, Sleepers, Functions of sleepers, requirements of good sleeper, types of sleepers, their advantages and disadvantages, comparison, of wooden metal and concrete sleepers, spacing of sleepers and sleeper density, adzing of sleepers, bridge sleepers, stacking of sleepers, Rails, Functions of rails, requirement of rails, types of rail sections, DH BH and FF rails, their standard nomenclature, and comparison, length of rails wear of rails, their causes and remedial measures, rail failures, welding of rail joints, purpose of welding, methods of welding and its advantages, length of welded rails, creep of rails, indications of creep, theories of creep, effects of creep, measurement of creep, prevention of creep.

Unit III: Rail Fixtures and Fastenings
Purpose and types of fixtures and fastenings, fishplates, Spikes, Chairs for BH and DH rails, keys, Bearing joints and staggered joints.
Geometrics: Necessity of geometric design of a railway track, Gradient and grade compensation, Types of Gradient, Grade compensation on curves, Extra clearance on curves, Super elevation or cant, Objects of providing super elevation, Relationship between super elevation, gauge, speed, radius of curve and average speed, Limits of super elevation, Cant deficiency, Negative cant, Types of curves, Transition curves, Curve indicator, Check rails-purpose and necessity of providing check rails on curves.
Points and Crossings: Necessity of points and crossings, Functions, Components of turnouts- Left hand turnout , right hand turnout, Working of turnout, Points or switches, Type of switches, Crossings- types of crossings and crossing number, crossing used in Indian railways.
Modern Developments In Railways: Introduction, Modernization of tracks, Track electrification, Speed trends, Container transport services

Unit IV: Bridges
Difference between bridge and culvert, Components of a bridge, Various terminologies used in bridges, Main classification of bridges, Requirements of an ideal bridge, Identification of bridge, Selection of bridge site, Characteristics of an ideal bridge site, Bridge alignment and collection of bridge design data, Determination of flood discharge water way, Economic span, Scour depth, Afflux standard valves of clearance and free board as per IRC
Substructure and Super Structure: Types of bridge super structure, Bridge floorings and their selection, Bridge piers, Abutments, Wing walls, Approaches, Bridge bearings and joints in bridges

Construction and Maintenance of Bridges: Erection of steel girder and truss bridges, Erecting of RCC bridges and suspension bridges, Maintenance method

Unit-V: Tunnels

1. Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts

2, Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

Reference Books :

1. Text book of railway engineering by R.B.Deshpandey United Book corp. pons
2. Railway engineering by N.K.Vaswani Roorkee publishing house
3. Text book of railways by R.C.Rangwale Charter publishing house, Anand. W.R.
4. Text book of railway engineering by S.C.Saxena & SP Arora Dhanpal Rai an Sons
5. Indian railway track design, construction, maintenance and modernization by M.M.Agrawal Manglik prakeshan 159, Bomani Road, Saharanpur.
6. Permanent way manual by Indian Railway Board
7. Railway Bridge and Tunnel Engg. By Shivanand Kamde Deepak Prakashan, Gwalior
8. Bridge Engineering by By Algia
9. Railway, Bridges & Tunnels by Dr. S.C. Saxena

ADVANCED SURVEY

Unit -I: Survey Adjustment and Theory of Errors.
Modern equipments for surveying: Digital levels and theodolites, Electronic Distance measurement (EDM), Total Station.

Unit-II: Errors
Introduction: kinds of errors. Definitions, law of accidental error,, determination of probable errors , determination of most probable errors.

Unit-III: Curves
Types of curves used in road and railway alignments. Notations of simple circular curve. Designation of curve by radius and degree of curves.

GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment

Unit -IV: Trigonometrically leveling
Introduction: base of object accessible, base of object inaccessible when instrument in same vertical plane and different vertical plane, determination of height of elevated object above ground when it's base & top are visible but not accessible.

Remote Sensing: Principle, components, classification, remote sensing data acquisition process

Unit-V: Traverse surveying
Introduction: methods of computing area, balancing angles, latitudes and departures, errors of closure, methods of closure errors.

Photogrammetry: Principle, definitions and classifications of terrestrial and aerial photogrammetric

Suggested Books:

1. Surveying and Leveling-Part-I & II by T.P. Kanetkar and S.V. Kulkarini, Pune Vidyarthi Griha Prakashan, Pune
2. Surveying: Problems Solving with theory and objective type questions by A.M. Chandra, New Age International Publishers N. Delhi.
3. Advance Surveying by A.M. Chandra, New Age International Publishers N. Delhi.
4. Surveying Vol. II by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd. New Delhi.

List of Experiments:
1. Survey by Total Station
2. Profile levelling by Auto Level
3. 1m survey by theodolite

ELECTIVE SUBJECT: CONCRETE TECHNOLOGY

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

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

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

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

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

References Books:

1. Varshney RS; Concrete Technology; Oxford & IBH publishing co.
2. Gambhir ML; Concrete Technology – TMH
3. Sinha SN; Reinforced Concrete Technology; TMH
4. New Building Materials Published by B.M.T.P.C., New Delhi
5. Hand books on Materials & Technology - Published by BMTPC & HUDCO
6. Mohan Rai & M.P. Jai Singh; Advances in Building Materials & Construction
7. Jackson N; Civil Engineering materials.
8. Properties of Concrete - A.M. Neville - Pearson Education

List of Experiments:
1. Fineness of Cement
2. Normal Consistency of Cement
3. Initial and Final Setting Times of Cement
4. Specific Gravity of Cement
5. Compressive Strength of Cement
6. Soundness of Cement
7. Fineness Modulus of Fine And Coarse Aggregate
8. Specific Gravity, Void Ratio, Porosity and Bulk Density of Coarse And Fine Aggregates
9. Bulking of Sand
10. Workability Tests on Fresh Concrete
11. Compaction Factor Test 12. Test for Compressive Strength of Cement Concrete

Unit-I: Hydrology
Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, raingaugenet works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

Unit-II: Floods and Ground water
Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control, confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention.Salt efflorescence-causes and effects. Reclamation of water logged and salt affected lands.

Unit-III: Irrigation water requirement and soil-water-crop relationship
Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit – IV: Canal irrigation
Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, linings-objectives, materials used, economics.Canal falls & cross drainage works, - description and design, head and cross regulators. escapes and outlets, canal transitions.

Unit – V: Well irrigation
Types of wells, well construction, yield tests, specific capacity level and specific yield, hydraulic design of open wells and tube wells, methods of raising well water, characteristics of pumps and their selection, interference of wells, well losses, advantages and disadvantages of well irrigation.

Suggested Books :-
1. Engg. Hydrology - J.NEMEC - Prentice Hall
2. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
3. Engg. Hydrology by K. Subhramanya - Tata McGraw Hills Publ. Co.
4. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
5. Engg. Hydrology by H.M. Raghunath

HIGHWAY ENGINEERING

UNIT-I: Introduction and Highway Material
Highway Development and Planning
Historical Development, road patterns, master plans, road development plans, PMGSY, engineering surveys, highway projects.
Highway Materials and Testing: Subgrade soil, sub base and base course materials, bituminous materials, testing of soil, stone aggregates and bitumen.

UNIT-II: Highway Geometric Design
Cross section elements, sight distances, horizontal and vertical alignment.

UNIT-III: Traffic Engineering
Traffic characteristics, road user & vehicular characteristics, traffic studies, accident studies, traffic operations, traffic control devices, intelligent transport systems, pollution due to traffic.

UNIT-IV: Design of Highway Pavements
Flexible pavements and their design, review of old methods, CBR method, IRC:37-2001, equivalent single wheel load factor, rigid pavements, stress in rigid pavement, IRC design method (IRC:58-2002).

UNIT-V: Highway Construction and Maintenance
Highway Construction: Construction of various layers, earthwork, WBM, GSB, WMM, various types of
bituminous layers, joints in rigid pavements
Highway Maintenance: Various type of failures, evaluation and remedial measures.

Text Books:
1) Highway Engineering-Gurucharan Singh

Reference Books:
1) Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand & Bros.2004
2) Khanna, S.K. and Justo, C.E.G., "Highway Material Testing Manual", Nem Chand & Bros
3) Kadiyali, L.R., "Traffic Engineering and Transportation Planning", Khanna Publishers.
4) Sharma, S.K., "Principles and Design of Highway Engineering", S. Chand & Co.
5) Highway Engineering by Gurucharan Singh
6) Principles of Pavement Design by E.J. Yoder & M.W. Witzech
7) Highway Engineering by O'Fleherty
8) Highway Engineering by S.K. Khanna& C.E.G. Justo
9) Airport Planning & Design by S.K. Khanna& M. G. arora
10) Foresch, Charles "Airport Planning"
11) Horonjeff Robert "The Planning & Design of Airports"

List of Experiments:
1. Aggregate Crushing Value Test
2. Determination of aggregate impact value
3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

THEORY OF COMPLEX STRUCTURE

Unit. I
Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani s method.

Unit. II
Plastic analysis of beams and frames.

Unit. III
Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

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

UNIT.V
Influence line diagram for indeterminate structure

Reference Books :-
1. Theory of structures, BC Punmia
2. Structural analysis, Bhavikatti
3. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Structural analysis, Ramamrutham
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi.

DESIGN OF CONCRETE STRUCTURES

Unit – I: Basic Principles of Structural Design & Beam Section
Assumptions, Various properties of concrete and reinforcing steel, characteristic strength, partial safety factors. Balanced, under-reinforced and over-reinforced sections, Depth of neutral axis, Deflection limits.

Unit-II: Design of Beams
Design of singly reinforced rectangular Beam, Doubly reinforced rectangular Beam, Cantilever Beam, Continuous Beam.

Unit –III: Design of Slabs
Design of one-way Slab, Continuous Slab, Cantilever Slab, Two-way slab.

Unit –IV: Columns & Footings
Effective length of columns, Design of axially loaded Short column (Rectangular and circular),   Design of Isolated column footing subjected to axial loads.

Unit –V: Staircases
Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase.

Suggested Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
 2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Plain & reinforced concrete - Rammuttham
6. Plain & reinforced concrete – B.C. Punnia 8. Structural Design & Drawing by N.K.Raju.

CONSTRUCTION TECHNIQUES

Unit-I: Foundation
Type of soils, bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage, foundations well foundation, causes of failure and remedial measures; under reamed piles, foundation, black cotton soil, timbering for trenches, dewatering of foundations. Hyperbolic parboiled footing, Brick arch foundation. Damp proof courses, Repairs Techniques for foundations.

Unit-II: Masonry and Walls
Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, Brick cavity walls, code provisions regarding load bearing and non load bearing walls., designed Brick masonry, precast stone masonry block, Hollow concrete block, plastering and pointing, white and color washing, distempering, dampness and its protection, Design of hollow block masonry walls.

Unit-III: Doors, Windows and Ventilators
Types of Doors based on material, size location, fittings, doors & windows. construction sunshades, sills and jambs, RCC doors/windows frames. Introduction of stair , Stairs types, rule of proportionality etc., repairs techniques for masonry, walls,

Unit IV: Floors and Roofs
Types, minimum thickness, construction, floor finishes, Flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling, roof coverings, Channel unit, cored unit, Waffle unit, Plank and Joist, Brick panel, L-Panel, Ferro cement roofing units, water proofing .Services : Water supply , Drainage & plumbing services , Electrification, Fire protection, thermal insulation, Air Conditioning, Acoustics & Sound insulation, Repairs to damaged & cracked buildings, techniques and materials for low cost housing., Repairs techniques for floors & roofs.

Unit V: Construction Equipments
Factors affecting & selection of construction equipments , investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Reference Books :-
1. Sushil Kumar; Building Construction,
2.   B.C. Punmia; Building Construction ,.
3.   Building Construction, Metchell
4.   Construction Technology, Chudley R.
5. Highway Engineering by S.K. Khanna & C.E.G. Justo 6. Highway engineering by Gurucharan Singh

BUILDING PLANNING & DRAWING

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

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

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

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

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

References

1. Malik & Meo; Building Design and Drawing By

2. Shah, Kale & Patki; Building Design and Drawing; TMH

3. Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling

List of Experiments (Expandable)

1. Sketches of various building components.

2. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.

3. One drawing sheet each for services and interiors of buildings.

4. One drawing sheet containing detailed planning of one/two bed room residential building (common to all student)

5. One drawing sheet each of residential and institutional building (Each student perform different drawing).

6. Use of AutoCAD for preparation of drawings.

AKS UNIVERSITY, SATNA
B.TECH.-VI SEM
FOUNDATION ENGINEERING

Unit – I: **Shallow Foundations**

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

Unit – II: Deep Foundation

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

Unit – III: Soil Improvement Techniques

Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness. Soil stabilisation : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation and sabilisation by grouting. Geo-synthetics, types, functions, materials and uses.

Unit – IV: **Soil Exploration and Foundations on Expansive and Collapsible soils**

Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

Unit – V: Machine foundation

Introductions of machine foundation and its types, basics terms anddefinitions connected with the vibrating systems and foundations. Sheet piles/Bulkheads and Machine foundation Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications.

Reference Books :-

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publiscations Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.4. Geotech. Engg. by C.Venkatramaiah-New AGe International Publishers, Delhi 5. Found. Engg. by GALeonards McGraw Hill Book Co. Inc. 6. Relevant IS Code

List of Experiments
1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. Determination of field density by Core Cutter Method
4. Determination of field density by Sand Replacement Method
5. Determination of field density by Water Displacement Method
6. The corifiled Compression Test
7. Triaxial compression test
8. Lab. Vane Shear test
9. CBR Test
10. Demonstration of Plate Load Test SPT & DCPT

QUANTITY SURVEYING AND COSTING

Unit I: Introduction

Purpose and importance of estimator, Principal of estimate, Types of estimator, Methods of taking out quantity of items of work, unit of measurement for different item, mode of measurement, measurement sheet and abstract sheet, bill of quantity, preliminary estimate, plinth area & cubical content rate, original, revised & supplementary estimate for different projects.

Unit II: Rate analyses

Task for average artisan, various factors involved in the rate of an item, material and labour measurements for various trader, preparation for rate of important items of civil work like excavation, concreting, flooring, masonry, plastering, painting, RCC, etc. current schedule of rates.

Unit III: Detailed Estimate

Preparing detailed estimates of various types of buildings, centre line method & long wall/short wall method, preparing detailed estimate for earth work of road, canals, Estimate of culvert, bridges and water tanks, preparing estimate for services of building such as water supply, sanitary & electrification.

Unit IV: Cost of Work

Factors affecting cost of project, overhead charges, contingencies, and work charge establishment, charges for different services in building & indirect cost, cost analyses of projects, preparation of detailed project report (DPR). Detailed specification for item of civil work.

Unit V: Valuation

Purpose of valuation, Depreciation, Sinking fund, Scrap value, Yearly purchase, Type of values, gross and net income, Fixation of value to a building dual rate interest, method of valuation, Rent fixation of building.

References Books:
1. Quantity Surveying & Costing by B N Dutta
2. Estimating & Costing by Rangawala
3. Estimating & Costing for civil work by G S Birdi
4. Quantity Surveying & Costing by Chakraborty

List of Exercises
1. Prepare detailed estimate of three room single story building
2. Prepare detailed estimate of two rooms double story building
3. Prepare estimate for a road of 1 Km length
4. Prepare estimate of a culvert
5. Prepare valuation report of an existing building
6. Prepare rate analyses for five item of building construction
7. Prepare detailed specification for five item of building construction
8. Prepare DPR for a new project proposed in surrounding.

ENVIROMENTAL ENGINEERING -I

Unit – I
Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Unit –II
Rural water supply schemes, financing and management of water supply project, water pollution
control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing

Unit – III
Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Unit – IV
Water Treatment Methods-Theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

Unit – V
Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system. Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

Text Book:
1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi

Reference Books:
1) Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
2) Environmental Engineering - H.S. Peavy & D.R.Rowe - Mc Graw Hill Book Company,
3) Water Supply & Sanitary Engg. by S.K. Husain
4) Water & Waste Water Technology - G.M. Fair & J.C. Geyer
5) Relevant IS Codes

List of Experiments:

1. Measurement of turbidity
2. To determine the coagulant dose required to treat the given turbid water sample
3. To determine the conc. of chlorides in a given water samples
4. Determination of hardness of the given sample
5. Determination of residual chlorine by "Chloroscope"
6. Determination of Alkalinity in a water samples
7. Determination of Acidity in a water samples
8. Determination of Dissolved Oxygen (DO) in the water sample.

DESIGN OF STEEL STRUCTURES

Unit-I: Introduction
Structural & Mechanical properties of steel, various Indian Standard Sections, various loads and mechanism of load transfer, Design of bolted, welded and riveted connection, eccentric connection, HSFG bolt.

Unit–II: Tension & Compression members
Types of tension member, strength of tension member, design of simple & built-up tension member, Types of compression member, Slenderness rates, effective length, strength &design of compression member. Loads on roof truss, Live load, Dead load, Wind load, roof covering, wind pressure on truss, design of purling.

Unit-III: Columns
Simple & Built-up column, short & long column, suitability of sections for column, strength of given column, Design of simple & built-up short column, Design of single & double lacing, Design of battens. Column bases

Unit IV: Beams
Laterally supported & unsupported beam, web crippling, web buckling, design of simple & built-up beams, plate girder, design of gantry girder, design of beam-column connection.

Unit V: Plate Girder & Tower
Components of plate girder, End bearing stiffness, Intermediate & Horizontal stiffness, Types of tower, Loads on tower, component of tower, Lattice tower.

Note: All the designs should strictly as per latest version of IS: 800-2007

References Books:
1. Design of steel structure by limit state method by Subramanian
2. Design of Steel structure (limit state approach) by S K Duggal
3. Design of steel structure, by limit state method by S S Bhavikatti

DESIGN OF HYDRAULIC STRUCTURES

Unit – I: Gravity dams
Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

Unit – II: Earth Dams
Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

Unit – III: Rock fill dams & Regulating Structure
Types, merits and demerits, conditions favourable for their adoption. Design of canal regulating structures, Detailed design of Sarda Falls, design of cross drainage works, syphon aquaduct.

Unit – IV: Spillways
Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.

Unit – V: Energy Dissipatiors and Gates
Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles and details.

Reference Books: -
1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydraulic Structures by Varshney
3. Irrigation & Water Power Engg. by Punmia & Pandey

PAVEMENT DESIGN AND TRAFFIC EMGINEERING

Unit –I
Equivalent Single Wheel Load (ESWL) : Definition, calculation of ESWL, repetition of loads and their effects on the pavement structures.

Unit -II
Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

Unit -III
Rigid Pavements : Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

Unit -IV
Rigid pavement design : IRC method, Fatigue analysis, PCA chart method, joints, design and construction & types, AASHTO Method, Reliability analysis.

Unit -V
Evaluation and Strengthening of Existing Pavements : Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Reference Books :--
1. Principles of pavement design by E.J.Yoder & M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

Unit - I
Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

Unit -II
Characteristics and analysis of waste water, cycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

Unit -III
Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.

Unit - IV
Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

Unit - V
Advanced Waste Water treatment – Diatomaceorus earth filters, ultra filtration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physicochemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil.

Reference Books :-

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company,
 2. (P) Ltd. New Delhi
3. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
4. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
5. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi
6. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
7. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New

List of Experiment

1. To study the various standards for waste water
2. To study the sampling techniques for waste water
3. To determine the alkalinity in water sample
4. To determine the acidity in water sample
5. Determination of Dissolved Oxygen in the water and waste water sample
6. Determination of Biological Oxygen demand of a waste water sample
7. Determination of Chemical Oxygen demand of a waste water sample
8. Determination of various types of solids in the waste water sample
9. Determination of bacterial number by membrane filter Technique
10. Determination of bacterial colonies by standard plat count method

CONSTRUCTION PLANNING AND MANAGEMENT

Unit –I: Preliminary and Detailed Investigation Methods:

Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit –II: Construction Equipments

Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit –III: Tenders & Contracts

Different types of Tenders & Contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit –IV: Specifications & Public Works Accounts

Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Unit-V: Site Organization & Systems Approach to Planning

Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Reference Books :-
1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

ADVANCE STEEL STRUCTURAL DESIGN

Unit – I
Plate girder bridges (Riveted and welded)

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

Unit – III
Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Unit - IV
Bunkers, Silos

Unit-V
Towers

Reference Books :-
1. Design of Steel Structures – Ramammutham
2. Design of Steel Structures – Punia
3. Steel Str. by Ramchandra Vol II
4. Steel Str. by Arya & Ajmani
5. Design of steel structures – L.S. Negi

REMOTE SENSING AND GIS APPLICATION

Unit I
Remote Sensing: Definition, stage in remote sensing, modern remote sensing technology versus conventional aerial photography; Physics of Radiant Energy –Electromagnetic spectrum and its nature. Active and Passive remote sensing; Remote Sensing Platforms and Sensors.

Unit II
Introduction to Maps, Map Scales, Types of Maps, , Georeferencing, visual image interpretation, image interpretation, basic principles of image interpretation. elements of aerial photographic interpretation,. Future prospects of remote sensing in India.

Unit III
Introduction, Data Storage, Database Structure Models, Database Management system, Data input and editing: data stream, data input methods, GPS, GPS application.

Unit IV
Introduction to GIS, History of GIS, Early developments in GIS, Applications of GIS. GIS Data Model, Vector Data Structure, Raster Data structure, Geodatabase and metadata.

Unit V
Entering data in computer digitizer, scanner data compression. Applications of Remote Sensing for Earth Resources Management (Agriculture, Water resources & Ground survey).

Reference Books
1. Remote Sensing GIS Principles, By: B.C. Pand
2. Principles of Remote Sensing, By: A.N. Patel & Surendra Singh
3. Advances in Remote Sensing & GIS Analysis, By: Atkinson P.M.
4. Introduction to Remote Sensing, By: James B. Campbell
5. Manual of Remote Sensing Vol. I & II, By: Colwell R.N.
6. Remote Sensing : Principles and Interpretation, By: Sabins F.L.

Practical:
1. Familiarization with remote sensing and GIS hardware.
2. Use of instruments for aerial photo interpretation.
3. Introduction of image processing software & concept.
4. Digitization of physical features on a map/image using GIS software.
5. Geoferencing of Satellite image/map.
6. Study the various features of GIS software package.
7. Scanning and digitization of maps; data base query and map algebra.
8. GIS supported case studies in water resources management.
9. MAP Reading & Identification of signs & Symbols used in MAPS.
10. Preparation of Base map from Survey of India Toposheets.
11. Latitude & longitude measurement of 10 spots at AKSU campus by GPS device.
12. Data Model: Spatial Data(Location:Ponit,Line,Polygon)

ADVANCED CONCRETE STRUCTURAL DESIGN

Unit – I: Design of Multi-story Buildings
Sway and non-sway buildings, Shear walls and other bracing elements

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

Unit – III: Water Tanks
Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

Unit – IV: Silos and Bunkers
T-beam & Slab bridges- for highway loading (IRC Loads).

Unit – V: Prestressed Concrete
Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit

Suggested Books: -
1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge engineering – D.J. Victor
4. Bridge Engineering - Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.
7. Pre stresses concrete – T.Y. Lin