SPPU B.E./B.Tech CIVIL Sem 4 syllabus

Concrete Technology

Unit I: Introduction to Concrete and Ingredients of Concrete. a) Cementand Aggregate– Manufacture, chemical composition, hydration, physical and mechanical properties, classification, types and application of cement, tests on cement, Classification of aggregate, physical and mechanical properties of aggregate, deleterious materials in aggregate, alkali-aggregate reaction, Fineness and gradation of aggregates using sieve analysis, tests on aggregates.

b) Water and Admixtures –Quality of water for use in concrete, role of admixture, classification and types of admixtures like accelerators, retarders, plasticizers, super plasticizers, mineral admixtures-fly ash, silica fume, ground granulated blast furnace slag.

Unit II: Production, Properties and Testing of Fresh Concrete a) Production and Properties of Fresh Concrete: Nominal mixes, Water-cement ratio, Process of manufacturing fresh concrete-batching, mixing, transportation, compaction, curing of concrete, curing methods, influence of temperature, maturity rule, workability and factors affecting workability, cohesion and segregation.

b) Tests on fresh concrete – Workability by slump cone, compaction factor, Vee-Bee consistometer and flow table apparatus, Effect of admixture on workability of concreteand optimum dosage of admixture by Marsh cone test.

Unit III: Properties and Testing of Hardened Concrete a) Hardened concrete – Strength of concrete, factors affecting strength, micro-cracking and stress-strain relationship, relation between tensile and compression strength, impact strength, abrasion resistance, creep and shrinkage.

b) Testing of hardened concrete –Destructive tests -compression strength, flexural strength, indirect tensile strength, core test. Nondestructive tests: rebound hammer, ultrasonic pulse velocity, pullout test and impact echo test.

Unit IV: Concrete Mix Design and Methods of Mix Design
a)Concrete Mix Design– Concept and objectives of concrete mix design, factors affecting the mix design, quality control, variability of laboratory test result, acceptance criteria, Grade designation and IS requirements as per IS 456 (Exposure conditions, minimum & maximum cement content and maximum W/C ratio

b) Methods of Mix Design: IS code method and DOE method (with and without mineral admixture), Use of spreadsheet/programming/ software for concrete mix design.

Unit V: Concreting Equipments, Techniques and Special concretes
a) Concreting Equipments and Techniques–Batching plants, concrete mixers, hauling, pumps, concrete vibrators and compaction equipments. Special concreting techniques- ready mix concrete,

under water concreting, roller compacted concrete, cold and hot weather concreting. b) Special concretes – Light weight concrete and its types, foam concrete, no fines concrete, self compacting concrete, high density concrete, fiber reinforced concrete,geo-polymer concrete and Ferrocement technique.

Unit VI: Deterioration and Repairs in Concrete (06 Hours) a) Deterioration –Durability, factors affecting the durability of concrete, Permeability, sulphate attack, acid attack, chloride attack, corrosion of reinforcement, carbonation of concrete b) Repairs – Symptoms and diagnosis of distress, evaluation of cracks, selection of repair procedure, repair of defects using various types and techniques – shotcrete and grouting. Introduction to retrofitting of concrete structures by fiber reinforced polymer (FRP), polymer impregnated concrete. Corrosion monitoring and preventive measures.

Geotechnical Engineering

201008 : Geotechnical Engineering

Unit I: Introduction and Index Properties a) Introduction to Geotechnical Engineering and its applications to Civil Engineering. (Types of soil structure, major soil deposits of India), Field identification of soils. {Introduction to soil exploration: objective and purpose.} b) Three phase soil systemweight – volume relationships, Index properties of soil: Methods of determination and their significance. [IS and Unified Soil classification systems.]

Unit II: Permeability and Seepage. a) Soil water, permeability definition and necessity of its study, Darcy's law, factors affectingpermeability. (Laboratory measurement of permeability: Constant head method and Falling head method as per IS 2720.) {Field test for determination of permeability- Pumping in test and Pumping out test as per IS 5529 Part-I.}Permeability of stratified soil deposits. b) Seepage and Seepage Pressure, quick sand phenomenon, critical hydraulic gradient, General flow equation for 2-D flow (Laplace equation).[Flow Net, properties and application]Flow Net construction for flow under sheet pile and earthen dam.

Unit III: Compaction and Stress Distribution. a) Compaction – Introduction, Comparison between compaction and consolidation. [Compaction tests- Standard Proctor test, Modified Proctor test]. Zero air void line. Factors affecting compaction. Effect of compaction on soil properties. (Field compaction methods and compaction equipment for different types of soil), Placement water content, Field compaction control- use of compaction test result. {Proctor needle in field compaction control.} b) Stress Distribution in Soils – Geostatic stress, Boussinesq's theory with assumptions for point load and circular load (with numerical), Pressure Distribution diagram on a horizontal and vertical plane, Pressure bulb and its significance. Westergaard's theory, equivalent point load method.Approximate stress distribution method.

Unit IV: Shear Strength of Soil. a) Introduction – Shear strength an Engineering Property. Mohr's stress circle, Mohr- Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. [Peak and Residual shear strength], {factors affecting shear strength.} (Stress-strain behaviour of sands and clays.) b) Measurement of Shear Strength – Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests. (Sensitivity and thixotropi of cohesive soils.)

Unit V: Earth Pressure. a) Earth Pressure – Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. [Rankine's Theory: Earth pressure on Retaining wall due to submerged backfill.] b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. (Coulomb's Wedge theory. Rebhann's and Culmann's graphical method of determination of earth pressure.)

Unit VI: Stability of Slopes. a) Stability of Slopes – Classification of slopes and their modes of failure, Stability of slope: i) Taylor's stability number, ii) Swedish slip circle method, iii) Friction circle method, iv) Bishop's method. (Infinite Slopes in cohesive and cohesion less soil,) {Landslides- Causes and remedial measures.}

Text Books:

1. Soil Mechanics and Foundation Engineering by Dr. B. C. Punmia, Laxmi Publications.
2. GeotechnicalEngineeringbyShashiK.Gulati&ManojDatta,TataMcGrawH
3. Geotechnical Engineering by T N Ramamurthy & T G Sitharam, S Chand Publications.

Reference Books:

1. GeotechnicalEngineeringbyC.Venkatramaiah,NewAgeInternationalPubl
2. Principles of Geotechnical Engineering by Braj M. Das, Cengage Learning.
3. Geotechnical Engineering by P.Purushothma Raj, Tata Mc GrawHill.
4. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education.
5. Basic and Applied Soil Mechanics by GopalRanjan and A. S. R. Rao, Newage International.
6. Physical and Geotechnical Properties of Soils by Joseph E. Bowles, International StudentsEdition.

Structural Analysis

201011: Structural Analysis

Unit I:Fundamentals of structure and analysis of redundant beams.

a)Types and classification of structures based on structural forms,

concept of indeterminacy, static and kinematics degree of indeterminacy.
b) Analysis of propped cantilever, fixed beam and continuous beams with indeterminacy up to second degree by strain energy method.

Unit II: Analysis of redundant pin jointed frames and multi-storied multi-bay 2-D rigid jointed frames.
a) Analysis of redundant trusses by unit load method for external loading, lack of fit, sinking of support and temperature changes (indeterminacy up to second degree).
b) Approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by Cantilever method and Portal method.

Unit III: Slope-Deflection Method.
a) Slope-deflection equations, equilibrium equation of Slope-deflection method, application of Slope deflection method to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

b) Sway analysis of rigid joint rectangular single bay single storey portal frames using Slope- deflection method. (Involving not more than three unknowns)

Unit IV: Moment Distribution Method.
a) Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.
b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method (Involving not more than three unknowns).

Unit V: Stiffness method.
a) Fundamental concepts of flexibility and stiffness, relation between them. Stiffness method of analysis- Structure approach only. Application to beams (Involving not more than three unknowns).
b) Application of Stiffness structure approach to rigid jointed rectangular portal frames (Involving not more than three unknowns).

Unit VI: Plastic Analysis of Structure.
True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage, concept of

plastic hinge and collapse mechanism, static and kinematic methods of analysis, upper bound, lower bound and uniqueness theorem. Plastic modulus of section, Plastic moment, shape factor. Plastic analysis of determinate and indeterminate beams, single bay single storied portal frame.

Text Books:

1. Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company (P) Ltd.
2. Structural Analysis-I & II by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd.
3. Structural Analysis: A Matrix Approach by G.S.Pandit and S. P. Gupta, Tata McGraw Hill Education Pvt. Limited.

Reference Books:

1. Intermediate Structural Analysis by C. K. Wang, Tata McGraw Hill Education Pvt. Ltd.
2. Mechanics of Structures Vol. II (Theory and Analysis of Structures) by Dr. H. J. Shah and S.
B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
4. Structural Analysis by R. C. Hibbler, Pearson Education.
5. The Plastic Methods of Structural Analysis by B. G. Neal, Champman& Hall.
6. Structural Analysis by AslamKassimali, Cengage Learning India Private Limited
7. Matrix Analysis of Framed Structures by William Weaver Jr. and James M. Gere, Springer US.

Project Management

201012 Project Management

UNIT I Introduction to Project Management

Importance, Objectives & Functions of Management, Principles of Management, Categories of Project, Project Failure, Project--- Life Cycle Concept and Cost Components, Project Management Book of Knowledge {PMBOK} – Different Domain Areas, Project management Institute and Certified Project Management Professionals (PMP). Importance of Organizational Structure in Management- Authority / Responsibility Relation, Management By Objectives (MBO)

UNIT II Project Planning and Scheduling

WBS – Work Breakdown Structure, Gantt / Bar chart & its Limitations, Network Planning, Network analysis, C. P. M.- . Activity on Arrow (A.O.A.), Critical Path and Type of Floats, Precedence Network Analysis (A.O.N.), Types of Precedence Relationship, P. E. R.T. Analysis

UNIT III Project Resources and Site Planning
Objectives of Materials Management – Primary and Secondary Material Procurement Procedures - Material Requirement - Raising of Indents, Receipts, Inspection, Storage, Delivery, Record Keeping – Use of Excel Sheets, ERP Software, Inventory Control - ABC Analysis, EOQ, Introduction to Equipment Management – Fleet Management, Productivity Studies, Site Layout and Planning, Safety Norms – Measures and Precautions on Site, Implementation of Safety Programs

UNIT IV Project Monitoring and Control
Resource Allocation – Resource Smoothening and Leveling, Network Crashing – Time- Cost – Resource Optimization, Project Monitoring - Methods, Updating and Earned Value Analysis, Introduction to Use of Project Management Software's – MS Project / Primavera, Case study on Housing Project Scheduling for a Small Project with Minimum 25 Activities.

UNIT V Project Economics
Introduction to Project Economics - Definition, Principles, Importance in Construction Industry, Difference between Cost, Value, Price, Rent, Simple and Compound Interest, Profit, Cash flow Diagram, Annuities and its Types, Demand, Demand Schedule, Law of Demand, Demand Curve, Elasticity of Demand and Supply, Supply Schedule, Supply Curve, Elasticity of Supply Equilibrium, Equilibrium Price, Equilibrium Amount, Factors Affecting Price Determination, Law of Diminishing Marginal Utility, Law of Substitution, Concept of Cost of Capital, Time Value of Money, Sources of Project Finance.

UNIT VI Project Appraisal
Types of Appraisals such as Political, Social, Environmental, Techno-Legal, Financial and Economical, Criteria for Project Selection - Benefit - Cost Analysis, NPV, IRR, Pay-Back Period, Break Even Analysis [Fundamental and Application Component], Study of Project Feasibility Report and Detailed Project Report (DPR), Role of Project Management Consultants in Pre-Tender and Post-Tender.

Text Books:

1.Project planning and Control with PERT and CPM by DR. B.C. Punmia and K.K.Khadelwal Publisher: Firewall Media, Laxmi publication New Delhi.
2.Project management Principles and Techniques by B.B. Goel Publisher: Deep and Deep publisher

Reference Books:
1. Project Management—Khatua—Oxford University
2. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi.
3. Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
4. The Essentials of Project Management by Dennis Lock, Gower Publishing Ltd. UK.
5. Essentials for Decision Makers by Asok Mukherjee, Scitech Publication, New Delhi.
6. Total Quality Management - Dr. S.Rajaram and Dr. M. Sivakumar--Biztantra
7. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.
8. Engineering Economics by R.Panneerselvam Publisher-PHI Learning; 2nd edition (2014)

Surveying

201009 Surveying

Unit I: Compass and Levelling

a) Definition and Importance of Surveying; Principles of Surveying,
b) Definition, objective and fundamental classification of surveying (Plane and Geodetic), concept of Scale, Ranging, Chaining, Offsetting and Traversing. Construction and use of prismatic compass, Concept of bearing &, types of bearings such as Whole Circle Bearing, Quadrental Bearing, meridian and their types, local attraction and correction for local attraction, dip, declination and calculation of true bearings, including numericals of all types.
c) Equipment required for plane table surveying, uses, advantages and disadvantages and errors in plane table surveying. Methods of plane table Survey Radiation, intersection, traversing and resection –
d) Introduction to leveling, Types of leveling, Types of benchmarks, Study and use of dumpy level, auto level, digital level and laser level in construction industry, principal axes of dumpy level, testing and

permanent adjustments reciprocal leveling, curvature and refraction corrections, distance to the visible horizon. Collimation Plane Method, Rise & Fall Method

Unit II: Theodolite Surveying

a) Study of vernier transit 20” theodolite, uses of theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles, measurement of deflection angles using transit theodolite and magnetic bearing, prolonging a line, lining in and setting out an angle with a theodolite. Fundamental axes of theodolite: testing and permanent adjustments of a transit theodolite.
b) Theodolite traversing – computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch’s rule, Gales traverse table. Checks, omitted measurements, area calculation by independent co-ordinates.

Unit III: Tacheometry and Contouring.

a) Tacheometry – applications and limitations, principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points, finding tacheometric constants. Tacheometric contouring. Numericals
b) Contouring – Definition of Contours, Characteristics of Contours, Contour Patterns for various natural features, direct and indirect methods of contouring, uses of contour maps, study and use of topo-sheets, profile leveling and cross-sectioning and their applications

Unit IV: Curves.

Introduction to horizontal and vertical curves (including numericals but derivation not expected), different types of curves and their applications, simple and compound circular curves, elements and setting out by linear methods such as radial and perpendicular offsets, offsets from long chord, successive bisection of chord and offsets from chords produced. Angular methods: Rankine’s method of deflection angles (one and two theodolite methods). (Numerical on simple circular
curves and compound curves to be asked), Transition curves: necessity.

Unit V: Construction Survey & Modern Techniques such as Space Based Positioning System (SBPS)

a. Introduction to construction survey, establishing of horizontal and

vertical controls, setting out of buildings, maintaining verticality of tall buildings, survey for open traverse (roadway, railways, drainage lines, water lines, canals)., Setting out of a bridge, Determination of the length of the central line and the location of piers. Setting out of a tunnel – Surface setting out and transferring the alignment underground.
b. Introduction to SBPS, SBPS systems - GPS, GLONASS, Galileo, GAGAN, BeiDou and their features, Segments of SBPS (Space, Control and User), applications of SBPS in surveying.

Unit VI: Introduction to Geodetic Survey, Hydrograph Survey & Aerial Photogrammetry
Introduction to Geodetic Survey, Objects, Methods of Geodetic Surveying, Introduction to triangulation and trilateration, Objective of triangulations surveys, Classification of triangulation systems, Triangulation figures, Strength of figure, Study and use of one second theodolite and Electronic Total Station, Introduction to Hydrographic Survey Objects, Applications, Shore line survey, Sounding, Sounding equipment, Methods of Sounding & Sounding Equipment, Stream gauging,
Three point problem Aerial Photogrammetry Objects, Classification-qualitative & quantitative photogrammetry, Applications, comparison of Map and aerial photographs, Flight Planning , Calculation of no of Photographs.

Text Books:
1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi Griha Prakashan.
2. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications.
3. Plane Surveying & Higher Surveying by Dr A. M. Chandra, New age international publishers New Delhi.

Reference Books:
1. GPS Satellite Surveying—Alfred Leick—Wiley
2. Principles of Geographical Information System—Burrough-- Oxford University Press
3. Surveying—M. D. Saikia—PHI Learning Pvt .Ltd. Delhi
4. Advanced Surveying -Total Station, GIS and Remote Sensing by Satheesh Gopi, R. Sathikumar and N. Madhu , Pearson publication
5. Surveying & levelling by R. Subramanian, Oxford Publication.