CONCRETE TECHNOLOGY

COURSE OBJECTIVE

The course relates to the fundamentals related to concrete and concrete material, besides dealing with masonry, reinforcement, etc. The course begins with an outline of what concrete is, what are the processes involved in formation of concrete, various materials that are used in concrete formation, properties of each ingredient of concrete, standard tests to be applied to concrete and concrete ingredients. The course then moves on to design-mix, special concretes, Nondestructive testing, etc.

COURSE CONTENT

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.

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.

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.

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

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.

COURSE OUTCOME:-

- The knowledge of what concrete is, how it is formed, what materials are involved and properties and requirements of each concrete ingredient.
- Ability to perform various tests on concrete ingredients and also on concrete (Fresh and Hardened).
- Ability to analyze various special concrete and their applications.
- Basic knowledge of Nondestructive testing.

REFERENCES

1. M S Shetty, Concrete Technology. S. Chand Technical
2. M L Gambhir,Concrete Technology Theory and Practice, McGraw-Hill Education.
3. J Thomas, Concrete Technology, Cengage Learning.
4. AM Neville, Concrete Technology, Pearson Education India.
5. Santhakumar ,Concrete Technology., Oxford University Press
6. SS Bhavikatti, Concrete Technology, IK International
7. Sinha, S N Reinforced Concrete Design, Tata McGraw Hill Education Private Limited.
8. Rai Mohan, M.P. Jai Singh, Advances in Building Materials & Construction.
9. Jackson N, R K Dhir, Civil Engineering materials, Macmillan

LIST OF EXPERIMENT

1. To determine the normal consistency of cement.
2. To determine the initial and final setting time of cement .
3. To determine compressive strength of cement.
4. To determine the soundness of cement.
5. To determine the fineness modulus of fine aggregate & course aggregate.
6. Mix design of concrete by IS code Method.
7. slump test for determining workability of concrete.
8. compressing strength of concrete cube.
9. To determine the flexure strength of concrete.

IS CODES:

1. *New Building Materials* B.M.T.P.C., New Delhi
2. *Hand books on Materials & Technology*. BMTPC & HUDCO

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Water Supply & Waste Water Engineering-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.

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.

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.

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.

Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, 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.

RECOMMENDED BOOKS & REFERENCES:

1. Water Supply Engineering- B. C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engineering- G.S. Birdi - Dhanpat Rai Publications (P) Ltd. N.Delhi
3. Water & Waste Water Technology - Mark J.Hammer-Prentice-Hall of India, New Delhi.
4. Environmental Engineering-H. S. Peavy & D. R. Rowe- Mc-Graw Hill Book Company,N.Delhi.
5. Water Supply & Sanitary Engineering - S. K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
8. Chemistry for Environmental Engg.-Sawyer & Mc Carty Mc Graw Hill Book Company N Delhi
9. Waste Water Engineering - Metcalf & Eddy -McGraw Hill Book Company New Delhi.
10. Relevant IS Codes on Water Supply and Waste Water Engineering

LIST OF EXPERIMENTS:

1. To study the various standards for water and waste water.
2. To study of sampling techniques for water and waste water.
3. Measurement of turbidity of water and waste water.
4. To deter mine the coagulant dose required to treat the given turbid water sample
5. To deter mine the concentration of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples
10. Determination of Dissolved Oxygen (DO) in the water sample.

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STRUCTURAL ANALYSIS-I

COURSE OBJECTIVE

To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures. To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems. The course runs through a number of techniques which are used for the analysis of civil engineering structures.

COURSE CONTENT

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.

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)

Indeterminate Structures - II: Analysis of beams and frames by slope Deflection method, Column Analogy method.

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.

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.

COURSE OUTCOME

- Ability to distinguish between determinate and indeterminate structures.
- Ability to analyze determinate and indeterminate structures.
- Ability to use influence line diagrams as a valid tool for structural analysis.

REFERENCE

1. Rammamurtham, Theory of Structures, Dhanpat Rai .
2. Bhavikatti S.S. Analysis of Structures (I&II) Vikas Publication
3. B C Punmia, Theory of Structures, Firewall Media.
4. A Kassimali, Structural Analysis, Cengage Learning.
5. A Ghali, A Neville, T G Brown, Structural Analysis: CRC Press.
6. Hibbler, Structure Analysis -1, Pearson Education India
7. C S Reddy, Basic Structural Analysis, Tata McGraw Hill Publishing Company.
8. Pandit and Gupta, Theory of Structures – I, McGraw Hills
9. West HH, Fundamental of Structural Analysis, Wiley India
10. Das MM, Structural Analysis, PHI
11. Thandavamurthy TS, Structural Analysis, Oxford
12. Muthuku, Azmi I, Basic Structural Analysis, IK International Publisher
13. C KWang, Intermediate Structural Analysis, McGraw Hill
14. J Kinney Sterling, Indeterminate structural Analysis, Addison-Wesley
15. RR Mamuther S Theoty of Structures Dhanpat Rai
16. Jain O.P.-Jain B.K. Theory& Analysis of Structures (I&II) Nem Chand

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BUILDING PLANNING & ARCHITECTURE

COURSE OBJECTIVE

To understand the concept of building planning and architecture. To understand the various building codes to be followed while planning a building. To have the knowledge of various building components.

COURSE CONTENT

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.

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans, presentation techniques, pictorial drawings, perspective and rendering, model making, introduction to computer aided design and drafting, Applying of principle of architectural composition (i.e. unity, contrast, etc.), Principles of planning, orientation in detailed drawings.

Building Services- Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings, elevators & escalators their standards and uses, air-conditioning systems, fire fighting systems, building safety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

Principles of architectural design – Definition of architecture, factors influencing architectural development, characteristics features of style, historic examples, creative principles.
Principles of architectural composition – Unity, balance, proportion, scale, rhythm, harmony , Accentuation and contrast.
Organising principles in architecture-Symmetry, hierarchy, axis linear, concentric, radial, and asymmetric grouping, primary and secondary masses, Role of colour, texture, shapes/forms in architecture.
Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems.
Elements of architecture : Functions – Pragmatic utility, circulatory function , symbolic function, physiological function. Structure– Physical structure, Perceptual structures. Space in architecture –Positive and negative space. Aesthetics: Visual perception. Protective: Protection from climate and other elements, architecture a part of the environment. Comfort factors.

Perspective Drawing and Town Planning- Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings.
Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs - planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network, standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts, panning of control development schemes, urban financing, land acquisition, slum clearance schemes, pollution control aspects

COURSE OUTCOME

- Understanding of building planning, orientation, drawing and architectural aspects.
- Representation of a building on Paper.

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REFERENCES

1. Shah, Kale &Patki; Building Design and Drawing; TMH
2. Malik &Meo; Building Design and Drawing
3. W B Mckay,Orient Blackswan Building Construction Vol 1 -4, Pearson
4. Gurucharan Singh & Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.
5. Layal JS, Dongre A, Building Design and Drawing, Satya Prakashan
6. Ghose D.N., Civil Engineering Design and Drawing, CBS publisher
7. Das B M, Principles of Foundation Engineering, Cengage Learning.
8. Agrawal S. C., Architecture and Town Planning, Dhanpat Rai & Co.
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. Lewis Keeble, Principles and Practice of Town and Country Planning.
11. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, Manasa Gangotri.

LIST OF EXPERIMENTS

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

Programming Tools

Introduction to following softwares

1. Autocad

2. Microsoft Project or equivalent open source software

3. M.S. Excel or equivalent open source software

4. Matlab or Scilab

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MATHEMATICS-III (APPLICABLE TO CE/TX BRANCHES)

COURSE OBJECTIVE- The objective of this course is to fulfill the needs of Engineers to understand the Applications of Fourier Series, Different Transforms, Complex Analysis & Numerical Solution of Algebraic and Transcendental Equations in order to enable young technocrats to acquire Mathematical thinking of Formulating, Analyzing and Solving a wide range of Practical Problems Appearing in Science & Engineering.

Course Contents

Fourier Series: Fourier Series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, Half range Fourier series, Complex form of Fourier Series.
Integral Transforms:

Fourier Transform-Complex Fourier Transform, Fourier Sine and Cosine Transforms, Applications of Fourier Transform in Solving the Ordinary Differential Equation.

Laplace Transform- Introduction of Laplace Transform, Laplace Transform of elementary Functions, Properties of Laplace Transform, Change of Scale Property, First and Second Shifting Properties, Laplace Transform of Derivatives and Integrals. Inverse Laplace Transform & its Properties, Convolution theorem, Applications of Laplace Transform in solving the Ordinary Differential Equations

Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for Evaluation of Real Integrals.

Numerical Solution of Algebraic and Transcendental Equations: Method of Bisection, Secant Method, Regula-Falsi Method, Fixed Point iteration Method, Newton-Raphson Method, Graffe's Method, Lin-Bairstow's Method.

COURSE OUTCOMES- The curriculum of the Department is designed to satisfy the diverse needs of students. Coursework is designed to provide students the opportunity to learn key concepts of Fourier Series, Different Transforms, Complex Analysis & Numerical Solution of Algebraic and Transcendental Equations.

EVALUATION- Evaluation will be continuous, an integral part of the class as well as through external assessment.

REFERENCES:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. B.S. Grewal: Higher Engineering Mathematics , Khanna Publication.
3. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication
4. Ramana: Advance Engg. Mathematics, TMH New Delhi
5. Numerical Methods for Engineers by Steven C. Chapra, McGraw Hill Education
6. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
7. Numerical Methods By Shrimanta Pal, Oxford

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SYSTEM ENGINEERING

COURSE OBJECTIVE

This course in systems engineering examines the principles and process of creating effective systems to meet application demands. The course is organized as a progression through the systems engineering processes of analysis, design, implementation, and deployment with consideration of verification and validation throughout.

COURSE CONTENT

What is System Engineering, Origin, Examples of Systems requiring systems engineering, Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, System Engineering Approaches.
Structure of Complex Systems, System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.
Concept Development and Exploration, Originating a New System, Operations Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.
Engineering Development, Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction.
Integration and Evaluation, Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.

COURSE OUTCOME

After successful completion of the course, students would be able to Plan and manage the systems engineering process and examine systems from many perspectives (such as software, hardware, product, etc.) Students can distinguish critical functions, diagnose problems, and apply descoping strategies and judge the complexity of production and deployment issues.

EVALUATION

Evaluation will be a continuous and integral process comprising classroom and external assessment.

REFERENCES:

1. Alexander Kossiakoff, William N Sweet, “System Engineering Principles and Practice, Wiley India
2. Blanchard Fabrycky, Systems engineering and analysis, Pearson
3. Dennis M. Buede, William D.Miller, “The Engineering Design of Systems: Models & Methods” Wiley India
4. JeffreyL Whitten, Lonnie D Bentley, “System Analysis and Design Methods”
5. Richard Stevens, Peter Brook,” System Engineering – Coping with complexity, Prentice Hall

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