# Elective – I  MBCT – 301(A) Concrete Technology

Unit.1 **Ingredients of concrete :** Review of cements including blended cements, manufacture, chemical composition, aggregates; Review of types; Elementary mineralogy and petrology; Sampling and testing.
**Admixtures :** Review of types and classification, chemical admixtures, mineral admixtures, effects on properties of concretes.

Unit.2 **Fresh – concrete:** Rheology of mortars and concretes; Workability, segregation and bleeding, theory and principles governing transportation, placing, compaction and curing of concrete, plastic settlement and plastic shrinkage, exothermic characteristics; Early age thermal movements, strength development, maturity, hot and cold weather concreting.

Unit.3 **Properties of Hardened Concrete:** Strength, deformation, elasticity, creep, drying shrinkage and other volume changes, thermal properties, durability.

Unit.4 **Concrete Mix Design :** The process of mix selection, factors governing the selection of mix proportions, combining aggregates to obtain specified grading, statistical quality control.

Unit.5 **Special Concretes :** Lightweight concrete, no-fines concrete, high performance concrete, high density and radiation-shielding concrete, polymer concrete, fiber-reinforced concrete, self compacting concrete, roller compacted concrete, high volume fly ash concrete, ready mixed concrete.

**Suggested books:**
1. Neville, A.M., "Properties of Concrete" Prentice Hall.
2. Mehta, P.K.Paulo, M.J.M., "Concrete Micro Structures, Properties and Materials", Prentice Hall Inc. & McGraw-Hill.
3. Orchard, D.F., "Concrete Technology", Vol.I-II, Applied Science.
4. Shetty, M.S., "Concrete Technology : Theory and Practice", s. Chand & Company Ltd.

# Elective – I   MBCT – 301(B) Analysis and Design for Dynamic Effects

Unit.1 Single Degree of Freedom (SDOF) systems; free and forced vibrations, damped and undamped systems.
Duhamel integral, Rayleigh method, Green's function, Fourier series, elastic response spectra.

Unit.2 Time history analysis of SDOF system, Newmark method and Wilson $-\theta$ method, convergence criteria.
Multi degree of freedom systems, lumped and consistent mass matrix, application to multistory buildings, SRSS and CQC mode superposition techniques.

Unit.3 Vibration of continuous systems including axial effects, introduction to inelastic response spectra, ductile detailing, design specification in IS:1893, IS:13920 and IS:875 (pt 3).

Unit.4 Analysis of buildings and towers for wind loads by static and dynamic methods, design specifications in IS:875.

Unit.5 Active and passive control systems.
Application to dynamic analysis using software packages like SAP2000 and STAAD.

**Suggested books:**

**1.** Clough, R.W. and Penzien, J., "Dynamics of Structures",
McGraw -Hill.
2. Chopra, A.K., "Dynamics of Structures", Pearson.
3. Agarwal, P.and Shrikhande, M.  "Earthquake Resistant Design of Structures", PHI.

# Elective – I  MBCT -301(C) / MVCT- 204 – Financial Management in Construction Industries

**1. Personnel Management :**
Principle of personnel management. Qualities of a personnel manager. Objective of personnel management. Personnel policied procedures and programmes. Organizational structure of personnel department.
Man power resources. Human resource planning. Job analysis. Performance standards, work rules. Recruitment and selection process. Tests and interview Induction orientation and in doctrination.
Policies, promotion, demotion, transfers etc. Training of personnels. Need for training. Principles of training programmes. Types of training programmes on the job training policy and implementation. Task analysis identification and methodologies. Evaluation of training and post training follow up. Performance appraisal-rating scales, rankings etc. Management development programmes. Wage and salary management. Principles of wages and salary administration.
Factors influencing wages. Types of wages and salary structure. Theory of wages. Minimum fair and living wages. Types of wages. Wage incentives. Types of incentive schemes. Profit sharing features-Fringe benefits general scope. Different types of fringe benefits and awards.

**2. Labour Management :**

Industrial relations in construction industry. Principles of industrial relationships. Functional requirements and programme, Industrial disputes, causes of disputes. Types Of disputes. Procedures of the settlement of industrial disputes. Implementation mechanism.Trade Unions - Principles of industrial trade unionism. Objectives and functions. Essentials of trade union. Objectives, forms levels and growth of worker's participation in management. Collective bargaining. Principles and main features of collective bargaining. Different industrial Regulations and labour laws and acts - Industrial Health and Safety. Occupational hazards. Provisions under factory act. Accident and safety at construction sites. nature and causes of accident. Safety Programmes and their principles. Factors effecting accidents etc.

**3. Waste Management :**
Introduction to waste and waste management, the concept of productivity and its inter relationship with productivity. Systems concept of waste. Complementarity of waste and resource management.
Identification of construction waste material waste, man power waste, energy waste, space waste time waste, equipment waste, capital waste, utilities and services waste. Data and information waste.
Design of waste reduction in construction. Reduction, Collection, recycling treatment and disposal of waste in construction systems. Modelling of resources and waste flow in construction systems waste management and cost reduction. Roles of legislation and government.

**4. Financial Management :**
*Managerial Economics & Financial Statement*
Nature and scope of managerial economics. Economic theories. Demand analysis and fore casting . Elasticities of demand. Cost and production analysis. Pricing decisions, Policies and practices. Break even analysis.

Time value of money, Economics. Comparisons using time value of money basic of comparisons. Decision making amongst alternatives. Cash flow, discounted cash flow. Cash flow forecasting, Project appraisal through financial statements. Statement analysis. Financial ratio analysis, Trend analysis yield. Taxation and inflation, Sinking fund provisions. Risks and uncertainties. Project risk and firm risk. Replacement analysis. Finances & working capital. Capital budgeting & Performance budgeting. Benefit-cost ratio. Project selection, Control and evaluation, Pre-project and post project evaluation.

5. Capital Generation & Financial Accounting
Banking : Financial Institutes like IFCI, IBI, International financing etc.
Book keeping process in construction. The acciybtabcy cycle. Journals, ledgers etc. for

labour cost, materials and purchases miscellaneous ledgers and accounting procedures,

types of financial statements in Govt.

# Elective – I   MBCT – 301(D) – Quantitive Methods

**Unit- I**
**System Engineering :** System theory & principles; Decision theory & analysis ; Decision under uncertainty & certainty, Risk analysis, Optimization theory for constrained & its techniques.

**Unit- II**
**Theory of Probability:** Definition of Probability; Theorems of Probability; Statistical methods; Probability distribution functions & its applications e.g. Normal, Log normal, Beta, Gamma, Pearson and Poisson's distribution; Introduction to correlation and regression; Simple & Multiple regression, Bivariate and Multivariate correlation.

**Unit- III**
**Programming Techniques – I:** Linear programming & applications, Graphical methods, Simplex method; Modified simplex method, Transportation problem; Assignment Problem.

**Unit- IV**
**Programming Techniques –II:** Goal Programming; Integer Programming; Dynamic Programming ; Non – Linear Programming.

**Unit- V**
**System Models:** Deterministic models; Probabilistic Models; Queuing model, Game theory; Simulation (Monte Carlo's Simulation).

# Elective – II  MBCT – 302(A) Analysis and Design of Multistoreyed Buildings

Unit- I Performance based design philosophy, structural systems for multistoreyed buildings, gravity and lateral loads on buildings, analysis of multistoreyed frames. Analysis of asymmetric buildings- mass irregularity in plan and elevation, analysis for torsion in buildings.

Unit- II Behavior of framed tube system, tube-in-tube system, bundled tube system , simplified analytical models for symmetrical tubular structures.

Unit- III Design of buildings with shear walls and coupled- shear walls, design specification in IS codes.

Unit- IVDesign and detailing of various members and beam-column joints for ductility, design specifications IS codes.

Unit- VDesign of raft and pile foundations, design specifications in IS codes. Application of software packages such as MS-Excel, ETABS and SAFE.

**Suggested books:**

1. Jain, A.K.,  "Reinforced Concrete –Limit State Design" , Nem Chand & Bros.
2. James, K.K.and Gregor, J.G.M., "Reinforced Concrete Mechanics and Design", Pearson.
3. Arthur, H.N., "Design of Concrete Structures," Tata McGraw-Hill.
4. Park, R. and Paulay, T., "Reinforced Concrete Structures", John-Wiley.

# Elective – II  MBCT – 302(B) Computer Applications in Structural Analysis

Unit- I   Need of computer applications in structural analysis, introduction to software packages like STAAD, SAP and MATLAB.
Static and kinematic indeterminacy, stiffness and flexibility matrices.

Unit- II  Stiffness matrices for prismatic and non prismatic members, solution techniques, substructure.

Unit- III  Application to plane truss, space truss, beams, grids, plane frames and space frames subjected to various in-plane/out of plane loadings including effects of temperature change and support displacements.

Unit- IV  Techniques of nonlinear structural analysis, material and geometric nonlinear problems, incremental and iterative procedures, convergence criteria.

Unit- V   Application of software packages such as SAP and STAAD, development of software codes for simple structural analysis problems using MATLAB.

**Suggested books:**

1. Weaver, W.,Jr. and Gere, J.M., "Matrix Analysis of Framed Structures", CBS.
2. McGuire, H.G. and Ziemian, R.D., "Matrix Structural Analysis", John Wiley.
3. Jain, A.K., "Advanced Structural Analysis with Finite Element and Computer Applications", Nem
4. Wang, C.K., "Intermediate Structural Analysis", McGraw-Hill.
5. Bansal, R.K., Goel, A.K.and Sharma, M.K., "MATLAB and its Application in Engineering",Pearson

# Elective – II  MBCT 302(C)/ MVCT 203  – Construction Equipment and Material Management

1. Planning and Selection of Construction Equipment :
Advantage of mechanization of Construction industry. Merits of Labour intensive construction. Planning for construction equipments. Analytical studies, equipment operation. Selection of construction machinery & equipments.

2. Production Estimates, Sizing and Matching :
Cycle time capacity ratings and output of Excavators, Power shovels, drag lines, scrapper, bulldozers, tractor shovels rippers, motor graders etc. Sizing and matching. Capacity ratings and output of compactors, aggregate processing plant concrete production plants etc.

3. Economics of Construction Equipment :
Equipment working rates, Investment cost, Depreciation cost, major repair cost. Cost of fuel and lubricants. Cost of labour, servicing and field repairs, overheads. Recommendations of statuatory bodies.

4. System Approach :
Problems of equipment management. Application of CPM in equipment management. Application of the assignement model, transportation model and waiting line models in equipment management.

5. Material Management :
Materials planning and budgeting. Role and functions at different levels of management and budgeting variations. Stages of materials management. A.B.C. analysis. Advantages, mechanics purpose cautions, limitations and tabular analysis.

Purchasing parameters and inter relationships. Time source quantity, price, quality, grading systems. Special purchasing systems. Obsolesence. Scrap disposal.

# Elective – II  MBCT 302(D)  – Experimental Stress Analysis

Unit- I **Strain Measurement** : Strain gauges-theory of resistance strain gauges, basic types and constructions, gauge configurations and their uses, gauge materials and requirements, mounting techniques, strain gauge circuitry , reduction of strain gauge data, special applications such as high temperature, fatigue and creep.
**Displacement Measurement** : Mechanical dial gauges, linear variable differential transformers, linear resistance potentiometers.

Unit- II **Stress and Force Measurements:** Load cells-types and sizes, embedded stress meters and plugs, proving rings.
**Temperature Measurements:** Thermo – couples and thermistors, thermistor type thermometers.

Unit- III**Vibration Measurements:** Vibration pickups for measuring displacements, velocities and accelerations-principles of operations phase distortions, sensitivity, practical applications.

Unit- IV **Photoelasticity :** Photoelastic theory, Photoelastic equipment, Photoelastic model materials,  reduction of Photoelastic data, extrapolation to the prototype , practical applications.
**Smart Materials:** Characteristics, piezoelectric materials, shape memory alloys, self healing materials, practical applications.

Unit- V  **Measurement Devices:** UPV method, radar and dynamic response testing, radiography and radiometry, infrared thermography, X-Ray diffraction, SEM techniques.

**Suggested books:**

1.  Dally, J.W. and Riley, W.F., "Experimental Stress Analysis", McGraw-Hill
2.  Sabmis, G.J.et al.,"Structural Modeling and Experimental Techniques", Prentice – Hall.
3.  Bungey, J.H.and Millard, S.G., "Testing of Concrete in Structures", Blackie Academic & Professional.
4.  Encyclopedia of Smart materials, John Wiley & Sons.