# SHIVAJI UNIVERSITY, KOLHAPUR

## STRUCTURE and SYLLABUS

### for

### Ph.D. COURSE WORK

### Under

## FACULTY OF ENGINEERING & TECHNOLOGY

**CIVIL ENGINEERING**

**YEAR 2011-2012**

# SHIVAJI UNIVERSITY, KOLHAPUR

**STRUCTURE FOR Ph.D. COURSE WORK (Common for All Branches)**

| Sr. No. | Name of the Course | Teaching Scheme | | Examination Scheme | | Total Marks |
|---------|--------------------|-----------------|-----|--------------------|-----|-------------|
| | | L | T/P | TP | T/W | |
| 1 | Research Methodology (paper I) | 04 | - | 100 | - | 100 |
| 2 | Advances in Specific Branch (paper II) | 04 | - | 100 | - | 100 |
| 3 | Open Elective(paper III) | 03 | 01 | 80 | 20 | 100 |
| | Total | 11 | 01 | 280 | 20 | 300 |

**Scheme of Examination:**

- The examination shall be conducted at the end of each academic year.
- The Theory paper shall carry 100 marks for paper I & II and Paper II for 80 marks.
- Question Paper will be set in the view of the / in accordance with the entire syllabus and preferably covering each unit of the syllabi.

# Paper - II

# Elective I

# Branch: Civil Engineering

**Teaching Scheme:**                    **Examination Scheme:**

Theory: 4 hrs/week                    Theory Examination: 100 Marks

**Objectives:**

- Learn to focus on Advances in Civil Engineering.
- To study advances in specific areas.
- To study different numerical methods applicable to civil engineering.
- To study analysis methods of structures.

Instructions: 1) select any one elective from following.

- Advances in Structural Engineering
- Advances in Environmental Engineering
- Advances in Geotechnical Engineering
- Advances in Water Recourse Engineering
- Advances in Construction & Management
- Advances in Transportation Engineering
- Advances in Town & country planning

2) All Units have equal waitages of 25 marks.

# Advances in Structural Engineering

### Unit 1

Three dimensional elasticity problems, Torsion of open section, Thermal Stresses, Fracture mechanics. Kirchoff and Mindlin theory of plates, higher order shear deformation theories, classical theories of skew plates, Shell surfaces, bending theory of shells.

### Unit 2

Mechanics of modern materials, laminated composites, functionally graded materials. Application to plates and shell structures. Structural dynamics, Forced and Damped vibration, modal analysis, response spectra, seismic design of multistoried buildings, codal provisions.

### Unit 3

Finite Element Method, 2D and 3D applications in plane and three dimensional elasticity, problems. Analysis of plate and shell structures. Applications using proper, software.Nonlinear analysis of structural elements. Material and geometric nonlinearity, Applications for beam, plates and shells.

### Unit 4

Multi-variable and Multi-objective optimization. Non linear and nontraditional, techniques of optimization. Design for reliability, reliability based optimization. Stability Analysis: Beam column, buckling of frames. Lateral buckling of beams, torsional buckling, energy criterion and energy based methods, dynamic stability.

### Reference Books:

1. Timoshenko and Goodier - Theory of Elasticity, McGraw-Hill Publications

2. S. Crandall, N. Dahl and T. Lardner - Mechanics of Solids, McGraw Hill Publications.

3. Anil K Chopra – Dynamics of Structures Theory and Applications to Earthquake Engineering, Prentice-Hall Publications

4. R.W Clough and J Penzin – Dynamics of Structures, McGraw Hill Publications

5. R.C. Roy - Structural Dynamics an Introduction to Computer Methods, John Wiley & Sons Publications

6. S. Timoshenko and W. Krieger, Theory of Plates and Shells, Mc Graw Hill.

7. Ansel C. Ugural, Stresses in Plates and Shells, Mc Graw Hill

8. J.N. Reddy – An Introduction to the finite element method – Tata McGraw Hill

   Publishing Co. Ltd 16

9. C.S. Krishnamoorthy – Finite Element Analysis – Theory & Programming - Tata McGraw Hill Publishing Co. Ltd

10. Zienkiewicz & Taylor - The Finite Element Method 4th Edition – Vol – I & II – McGraw Hill International Edition

11. Robert D. Cook, D.S. Malkus, M.E. Plesha – Concepts & Applications of Finite Element Analysis – John Wiley & Sons.

12. Timoshenko S.P. and and Gere J.M., Theory of Elastic Stability, Mc Graw Hill,

# Advances in Environmental Engineering

## Unit 1: Water Treatment

Water Quality: Requirement, Standards, Stream & Effluent standards. Water quality indices, Water purification, physical, chemical processes, Unit operations, unit processes. Aeration, Sedimentation, Coagulation & flocculation, Filtration: Adsorption, adsorption, Ion Exchange Membrane Processes, RO, Ultrafiltration, Electrodyalisis, Disinfection Wastewater Treatment, Waste waters-Sources, nature, characteristics, Analysis:- BOD progression & its formulations, Fundamentals of Process Kinetics, Zero order, First order, Second order Reactions, Different Reactors based on type of flow, Design of W/W treatment systems- Primary, secondary and tertiary; ASP, Nitrification-denitrification, Ponds and aerated Lagoons, Attached Growth Biological Treatment Systems: TF, RBC, Activated Biofilters etc., Expanded /fluidized bed reactors, USAB, Expanded granular bed reactors,. Sludge Digestion: anaerobic and aerobic, Waste water reclamation and reuse, Effluent disposal.

## Unit 2: Air Quality Monitoring and Control Techniques:

Air pollutants: Sources, classification, Combustion Processes, pollutant emission, Effects on Health, vegetation, materials, atmosphere, Reactions of pollutants Scales of AP studies, effects as per scales, Air sampling, pollution measurement methods, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations, Removal of gaseous pollutants. Particulate emission control; bioscrubers, biofilters, Indoor air quality Models for Water and Air Quality

Introduction to Mathematical Models: Modelling approaches to water quality - classification and considerations in selecting models, Model requirements and limitations. D.O. Models for Streams: DO model for streams,Streeter - Phelps model - oxygen 'sag' curve, Benthal oxygen demand, Study of Mathematical Models, Models for Estuary and Lakes, Air quality models : Gaussian dispersion model, Regional air quality models

## Unit 3: Environmental Management and Impact Assessment

Environmental management, problems and strategies; Future strategies; multidisciplinary environmental strategies, Environmental impact assessment (EIA), Sustainable development (SD), initial environmental examination (IEE), environmental impact statement (EIS), environmental appraisal, environmental audit (EA); Environmental impact factors and areas of consideration, measurement of environmental impact, SWM:Waste Management -Sources, Classifications, Characteristics, Generations, Onsite Handling and Storage, Collection, Transfer Recycling and Disposal Techniques of Municipal Solid Waste (MSW), Economic Evaluation of the Systems. Hospital Waste Management.

**Unit 4: Remote Sensing**

Remote Sensing, GIS and GPS Techniques and their applications in Environmental Studies. Softwares in Environmental Engineering.Pollutant Transport Mechanisms and Modelling, Hazardous Waste Management, Waste Minimisation Techniques, Environmental Risk Management

**Reference Books**:

1.Manual on water supply and Treatment ", CPHEEO, Ministry of Urban Development,

GOI, New Delhi, 1999.

2. Manual on Sewerage and Sewage Development ", CPHEEO, Ministry of Urban

Development, GOI, New Delhi, 1993.

3. B.A. Hauser, " Practical Hydraulics Hand Book ", Lewis Publishers, New York,1991.

4. M.J. Hammer, " Water and Wastewater Technology ", Regents/Prentice Hall, NewJersey, 1991.

5. Wastewater Treatment and Reuse: Metcalf and Eddy.

6. Wastewater Treatment for Pollution Control; Arceivala and DR. Asolekar

7. Industrial Wastewater Treatment: Nelson – Numero

8. Industrial Wastewater Treatment: Dr. A. D. PAtwardhan

9 Kiely, G., Environmental Engineering. McGraw Hill, 1996. ISBN: 007091272

11. Wanielista, M., Kersten, R., and R. Eaglin.. Hydrology: Water Quantity and Quality Control. Wiley Interscience, 1996. ISBN: 0471072591

12. Zipparro, V.J., Davis' Handbook of Applied Hydraulics Fourth Edition. McGraw

Hill, 1993. ISBN: 0070730024

13. Franzini, J., Freyberg, D., Linsley, R., and G. Tchobanoglous, Water ResourcesEngineering. McGraw Hill, 1991. ISBN: 0070380104 14

14 Reed, S.C. and Crites, R.W., Natural Systems for Waste Management and Treatment. McGraw Hill, 1996. ISBN: 0071346627

15 Eckenfelder, W.W. (Jr)., Industrial Water Pollution Control, (2nd Ed). McGraw- Hill, 1989. ISBN: 007018903X.

16 Guyer, H.H., Industrial Processes and Waste Stream Management.Wiley Interscience, 1998. ISBN: 0471299847.

17 Bishop, P., Pollution Prevention: Fundamentals and Practice. McGraw Hill, 2000. ISBN: 0073661473

18 American Water Works Association, Water Treatment Plant Design, (3rd Ed.). McGraw-Hill, 1997. ISBN: 0070016437.

19 American Water Works Association, Water Quality and Treatment: A Handbook of Community Water Supplies. McGraw Hill, 1998. ISBN: 0070015406

20 Kawamura, S., Integrated Design and Operation of Water Treatment Facilities. Wiley and Sons, 2000. ISBN: 0471350931

21 Nyer, E.K., Groundwater Treatment Technology, (2nd Ed.). Wiley Interscience, 1992. ISBN: 0471284149.

# Advances in Geotechnical Engineering

**Unit 1: Advanced Geotechnical Engineering**

Stress distribution under earth embankments and evaluation of settlement profile. Field problems to monitor movement of slopes, foundations, etc.

**Advanced Foundation Engineering**

Foundations in difficult soils: expansive soils, chemically aggressive environment, soft soils, fill, regions of subsidence.

**Unit 2: Rockmechanics and Tunelling**

Deformation characteristics of rocks and its measurement. Instrumentation, Underground excavation and subsidence. Bearing capacity of homogeneous as well as discontinuous rocks.

**Soil Dynamics and Geotechnical Earthquake Engineering**

Soil behaviour under dynamic loads, Dynamic properties of soil. Seismic response, strong ground motion, its parameters and their estimation, seismic hazard analysis, local site effects and design ground motion, seismic slope stability,

**Unit 3: Finite Element Methods in Geotechnical Engineering**

Stress deformation analysis: One-, Two,Three-dimensional formulations; Discretization; Analysis of foundations, dams, underground structures and earth retaining structures.

**Geo-environmental Engineering**

Landfills, in ash ponds and tailing ponds, and in rocks. Detection, control and remediation of subsurface contamination; Engineering properties and geotechnical reuse of waste.

**Unit 4: Soil Structure Interaction**

Elastic and plastic analysis of stress distribution on yielding bases. Analysis of conduits. Interaction analysis of piles and pile groups. Elastic continuum and elastoplastic analysis of piles, Non-linear load-deflection response.

**Geotechnics for Infrastructure**

Exploration studies for different Infrastructure Projects, Investigation reports, Analysis and required measures.

**Reference Books:**

1. Aki K and Richards P G (2002), Quantitative Seismology, University Science Books
2. Bowles J E (1996), Foundation Analysis and Design, McGraw Hill.
3. Das B M (1997), Advanced Soil Mechanics, Taylor and Francis.
4. Das B M (1993), Principles of Soil Dynamics, Brooks/Cole
5. Coduto D P (2001), Foundation Design: Principles and Practices, Prentice -Hall
6. Kaniraj S R (1988), Design Aids in Soil Mechanics and Foundation Engineering, Tata McGraw Hill
7. Poulos H G and Davis E H (1980), Pile Foundation Analysis and Design, John Wiley and Sons
8. Koerner R M (1997), Designing with Geosynthetics, Prentice Hall
9. Karl Terzaghi (1954), Theoretical Soil Mechanics, Chapman and Hall,.
10. Rock Mechanics in Engineering Practice: Stag and Zienkiewez, John Willey & Sons

11. J.C. Jagger and N.G.W. Cook(1971), Fundamentals of Rock Mechanics, Methuen and Co., London.
13. Sarsby R (2000), Environmental Geotechnics, Thomas Telford
14. Hsai-Yang Fang, Introduction to Environmental Geotechnology, CRC Press.
15. Kramer S L (1996), Geotechnical Earthquake Engineering, Prentice Hall
16. Prakash Shamsher and Puri V K (1988), Foundations for Machines; Analysis and Design, John Wiley and Sons
17. Wolf J P (1985), Dynamic Soil-Structure Interaction, Prentice-Hall

# Advances in Water Recourse Engineering

**Unit 1:**
Water resources systems analysis, design and management for water supply, irrigation, drainage, hydropower, food control, droughts. Surface and ground water hydrology, stochastic hydrology, physical and numerical modeling, use of finite difference, finite element and boundary element methods.

**Unit 2:**
Instrumentation and monitoring of hydraulic systems, computer simulation and optimization of hydrosystems.Computational fluid dynamics, coastal hydrodynamics, watershed management, application of numerical methods.

**Unit 3:**
Ground water systems planning and management, ground water pollution investigation. Hydroinformatics, multi criterion decision support system, applications of ANN and GA.

**Unit 4:**
Hydraulics of spillways and energy dissipators, pressure fluctuations in hydraulic jump, static and dynamic uplift pressures in stilling basins. Remote sensing and GIS applications, Dam break analysis using softwares.

**Reference Books:**

1. Principles of water resources planning and management – Goodman
2. Applied hydrology – Linsley Kolhar and Paulhas (McGraw Hill)
3. Computational fluid dynamics – Anderson
4. Neural network fundamentals with graphs, algorithms, applications – Bose N.K. and Liang P (McGraw Hill)
5. Practical handbook of GA applications, Vol I – L. Chambers (CRC Press)
17
6. Hydraulics of spillways and energy dissipators – R. M. Khatsuria (Marcel Dekker Publisher, New York)
7. Energy dissipators and hydraulic jump – W. H. Hager (Kluwer academic publishers, Netherland)
8. Hydrodynamics of coastal zones – Massel S.R.
9. Ground water systems planning management – Robert WillisHager, W.H. (1992). "Energy dissipators and hydraulic jump". Kluwer academic publishers, Netherland.
10. Hager, W.H., Bremen, R. (1989). "Classical hydraulic jump : post jump depths". *J. Hydr. Res.,*27(5), 565-581.
11. Jeppson, R.W. (1970). "Graphical solution to hydraulic jump". *J. Hydr. Engg., ASCE,* 96(1), 103-108.
12. Khatsuria R. M. (2005). "Chapter 20- Hydraulic jump stilling basins". Hydraulics of spillwaysand energy dissipators. Marcel Dekker Publisher, New York.
13. Fox and McDonald, " Introduction to fluid Mechanics", John Wiley
14. R. H. F. Rao, " Fluid Dynamics", Charles E Morn'll Books Inc. 1967

15. I. H. Shames, "Mechanics of Fluids", McGraw Hill, 1962
16. Y. L. Steeter, "Fluid Dynamics", McGraw Hill, 1948
17. Vallentine - Hydrodynamics
18. S. W. Yuan – Fluid Mechancis.

# Advances in Construction & Management

## Unit 1: Essentials of Construction Management

CPM ,PERT networks, Cost / Resource based networks, scheduling, monitoring and updating, resource planning and allocation, LOB, network crashing, time cost tread off. Computer Application in Construction Management- Softwares for .Precedence network analysis, CPM, PERT, GERT, decision tree analysis,

## Unit 2: Financial Aspects of Construction Projects

Means of Finance, Working Capital Requirements, Project Cash Flow Projections and Statements, Project Balance Sheet, Profit Loss Account Statements, Concept of Debt Equity Ratio, Tax – Need and types Risk Management Introduction, Principles, types, origin, risk control, Use of mathematical models:Sensitivity Analysis, Break Even Analysis, Simulation Analysis, Decision Tree Analysis, Risk identification, analysis and mitigation of project risks, Role of Insurance in Risk Management.

## Unit 3: Construction Techniques & Material Management

Introduction to construction operations, erection work, automation processes and special Equipments for Infrastructure Projects- Dams, bridges, ports, harbors, flyovers, recent trends in construction techniques

Material planning, accounting and material reconciliation, Systems of material classification. Deterministic and probabilistic models and applications, ABC analysis, replenishment and replacement policies, VED analysis, lead time demand, purchase planning, EOQ model. Wastage audit at site, Site waste material management plan. Computer applications based upon available softwares

## Unit 4: Equipment management:

New trends and construction equipment of future. Planning and selection of equipments, for earthmoving, hauling, hoisting, conveying, pneumatic, pumping, aggregate production, concrete production, pile driving, tunneling and road construction applications. Equipment procurement, purchase, import of equipment, procedural formalities for Import Operations Research in Construction- Decision Theory, Game Theory, Linear Programming, Non linear programming

**Reference Books-**

1. Construction Engineering and Management by. S. Seetharaman, Umesh Publications, New Delhi

2. Total Project Managemtn- the Indian Context by P. K. Joy Macmillan India Ltd. Financial Managemnt by Prasanna Chandra, Tata Mc Graw Hill Publicaitons

3. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi

4. Materials Management – Gopalkrishnan and Sunderasan, Prentice Hall Publications

5. Construction Planning, Methods & Equipment: Puerifoy – Tata McGraw Hill

6. Operations Research- Hamdy A. Taha

7. Engineering Optimisation- S. S. Rao

# Advances in Transportation Engineering

**Unit 1:**

Regional analysis and development concepts, the role of transportation planning in the overall regional system, Methodology and models for regional transportation system, Planning and implementation framework.Introduction, Basic for traffic engineering, Planning and design of facilities, Travel forecasting principles and techniques, Design Hourly volumes and speed, Highway capacity and performance characteristics, Parking, simulation in Traffic engineering design.

**Unit 2:**

Theory of uninterrupted and interrupted traffic flow, Traffic Planning Process, Demand Analysis, Transportation Economics, capacity & Delay analysis, The planning process, Sequential demand analysis Models of trip generation, distribution, traffic assignment, and modal split.Introduction to transportation systems, transportation innovations, social and economic impacts of transportation; Decision makers and their options, demand modeling and predictions; Modelling transportation technologies;

**Unit 3:**

Analysis of network flows; Transportation network; Network theory, wardrops external principle of traffic assignments, evaluation of impacts; Basic physics of transportation; Concepts in transportation models and location models. Materials for road construction; Specifications and tests; Macadam construction, surfacing and surface treatment; Asphal mix design pavement structure Sub grade evaluation; , Construction and maintenance of concrete pavement, Construction of interlocking block pavements, Quality control tests; Construction of various types of joints. Types of pavement structures, Factors affecting design and performance of pavements, Estimation of layer thicknesses, Pavement drainage, Stresses and strains in flexible pavement, IRC method of pavement design, Stresses in rigid pavements: Types of stresses and causes; Introduction to Westergaard's equations for calculation of stresses in rigid pavement due to the influence of traffic and temperature; Considerations in rigid pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

**Unit 4:**

Rigid pavement design: Design of cement concrete pavement for highways and runways; Design of joints, reinforcements, tie bars, dowel bars. IRC method of design; Design of continuously reinforced concrete pavements. Highway alignment study, controls for selection of Alignment, Engineering Surveys, Geometric design of highways: crosssectional elements, horizontal and vertical alignments, Geometric Design of Intersections – rotaries, Safety; Characteristics and design considerations for freeways/expressways; At-grade intersections - types, design considerations; Grade separations and interchanges - structures, interchange types and general design considerations.

**Reference Books:**

1. D. Salvo Perspectives in Regional Transportation Planning, Laxington Books, USA, 1974.

2. Mishra ,Sundaram and Prakash Rao, Regional Development Planning in India, Vikas Publishing House Pvt. Ltd., 1974.

3. G.J. Pingnataro, Principles of Traffic Engineering, Mc Graw-Hill, 1970.

4. Wohl and Martin, Traffic System Analysis for Engineering and Planners, Mc Graw Hill,

5. Ronald D. Drew, Traffic Flow Theory, Mc Graw Hill, 1964.

6. Manheim, Analysis of Transportation Systems, MIT, USA, 1980.

7. R.G. Weilson, Entropy in Urban and Regional Transportation, McGraw-Hill, 1980.

8. Miller and Mayor, Decision Analysis and Decision Making Oriented Urban Transportation, McGraw-Hill, 1984.

9. Hails, J.R. Ed., Applied Geomorphology and Engineering, Downden, Hutchinson and Ross, Stroundsburg, 1976.

# Advances in Town & Country Planning

**Unit 1:**

Historic Development & Planning Theory-Origin ,evolution and contemporary developments in planning, Formation of metropolitan areas &impacts of Industrial Revolution, Socio-economic & technological, impacts of growth of population; rural urban migration, Characteristics of the urban environment: Land uses, physical structure ,The interim and comprehensive plans: Structure Plan, Master Plan, Zonal Development Plan - their purpose and contents, Surveys, analyses and design methods and practices in comprehensive planning, Residential Areas : Neighborhood and Sector Planning, Planning of New Towns in India and abroad. Spatial & Environmental Aspects of Planning-Environmental degradation and its impact, environmental impact assessments, principles of environmental approach to planning. Indicators of sustainabity in planning & development of settlement, Environmental design w.r.t. natural resource management. Environmental impacts of traffic; energy issues in transportation; transportation safety. Spatioenvironmental Planning principles and techniques.

**Unit 2:**

Transportation & Utility Services-Transportation systems; Land use-transportation interrelationships;

transportation planning process, Traffic management, Recent innovations in technologies and its probable impacts, Transport policies and evaluation of transportation proposals, Water supply systems, Waste water disposal systems & Solid wastes collection and disposal, Reuse and recycle Techniques, Planning for urban electrical distribution system and communication systems, Economic feasibility tests. Planning Administration & Professional Practices-Planning legislation ,Constitutional basis and provisions relating to land, Evolution of planning laws, Land Acquisition Act of India, MRTP Act 1966,UDPFI Guidelines (implications of 73rd and 74th amendment of the constitution),EPA, Conservation of natural resources, Conservation and Management of Ancient Monuments and Archaeological sites and ruins., Land Development Control, Urban Arts Commission Act, Transportation, Landscape, Housing and slum clearance legislation. Role in interdisciplinary groups

**Unit 3:**

Social formation & Housing. Housing problems: Urbanization and Industrialization, Slums and squatters settlements - problems and possibilities, Residential layouts, housing densities, neighborhood unit, community facilities, Social aspects : built environment and human behavior, Evaluation of user's satisfaction, Finance for housing: priority in the national plans - role of public

and private agencies, role of cooperatives and various institutions, Cost reduction techniques in housing, Housing norms and standards. Rural & Urban Planning Decentralized planning: conceptual framework; Dimensions of District and Block planning : their spatial disparities and sectoral variations; identification of spatial units under decentralized planning, Infrastructure planning with application of forecasting techniques, Resource mobilization and credit planning; organizational aspects; participatory planning approach; training needs and plan execution, Rural development schemes and programs, Plan financing, monitoring and evaluation of rural development schemes ,Urban design: Design Survey, Modern Techniques, Issues in urban design; Principles of urban spatial organization; Conservation with historic preservation. Case studies from India and abroad. Urban renewal: Designing Central Business District (CBD) and Business Improvement District (BID) ,Growth and trends of metropolitan development, Components of a metropolitan plan ,Multi-nuclei developments: hierarchy of urban centers and their functional linkages, Metropolitan region and problems, Case studies of metropolitan planning in India and abroad.

**Unit 4:**

Remote Sensing and GIS in Planning & Disaster management‑Aerial photography, Application of aerial photography in town planning studies, Satellite remote sensing. , Application of remote sensing in regional studies, G.I.S applications in planning and its role in remote sensing ,Disaster, Prevention, Preparedness (Warning),Relief Quantitative Method in Planning ‑Survey, analysis and projections in City Planning; Ranking and Scaling; Applications of Probabilistic Modeling in City Planning; Applications of Queueing Theory in City Planning; Applications of Network Models in City Planning; Simulation in the Urban Context,  Implementation Problems.

**Reference Books:**

1. K.S.Rangwala and P.S.Rangwala,. "Town Planning", Charotar Publishing House,15th Edition,1999.

2. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.

3. National Building Code of India- Part-III.

4. Municipal and Panchayat bye-laws, CMDA Rules and Corporation bye-laws.

5. KA. Ramegowda, Urban and regional planning , University of Mysore

6. M/s DVan, The urban pattern, city planning and design.

7. Time saver standards for site planning, Mc Graw Hill Book company

8. John Rate life, An Introduction to town and country planning,London

9. The art of home landscaping – Mc Graw Hill Book company

10. Harvey M. Rubenstain ,A Guide to site and Environmental planning, Newyork

11. The Small Town Planning Handbook by: Thomas L. Daniels, John W. Keller, Mark B. Lapping.

# Paper – III

**Teaching Scheme:**                    **Examination Scheme:**

Theory: 3 hrs/week                    Theory Examination: 80 Marks

Practical/Tutorial 1 hr. /week          Term work: 20 marks

**Term work consists of presentation/ seminar on review of literature on special area of research.**

**Select any one subject from following.**

1. New Construction Materials
2. Project Risk Analysis and Mitigation Techniques
3. Soil Structure Interaction
4. Geotechnical Earthquake Engineering
5. Systems Techniques in water Resource Engineering.
6. Design of Composite Construction
7. Non-linear Analysis of Structures
8. Project economics & financial management
9. Environmental Auditing & EMS

# NEW CONSTRUCTION MATERIALS

Teaching Scheme                                    Examination Scheme
Lect. 3 hrs./week                                  Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                     Term work: 20 marks

Material composition and properties, production, storage, distribution, testing, acceptance criteria applications, limitations of use, economic consideration, recent development related to the following materials to be studied.

1. Various construction chemicals/admixtures.
2. Flyash and its use in concrete
3. Silica fume concrete
4. Self compacting concrete
5. Fibre Reinforced plastics and concrete
6. High performance concrete
7. Smart materials
8. Materials used in nuclear-containment structures
9. Glenium Concrete
10. Crumb modified bitumen Rubber
11. Composite materials

Reference Books
1. Concrete Technology by Neville
2. Concrete Technology by M.S.Shetty
3. Building Materials by Ghosh
4. New Building Materials and Construction World magazine
5. Civil Engineering and Construction Review magazine

# PROJECT RISK ANALYSIS AND MITIGATION TECHNIQUES

Teaching Scheme                                    Examination Scheme
Lect. 3 hrs./week                                  Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                     Term work: 20 marks

General – Importance of Risk, types of risks, quantifiable and unquantified risks, Risk analysis and Management for projects (RAMP) – Identifying risk events, Probability distribution. Stages in Investmentlife-cycle; determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows.

Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty index method, 3 point estimated method; use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment.

Risk Mitigation – by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of unquatified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI). Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.


Reference Books
1. Industrial Engineering and Management of manufacturing systems.- Dr.Surendra Kumar
   Satya Prakashan
2. RAMP Handbook by institution of Civil Engineers and the faculty and Institute of Actuaries-
   Thomas Telford publishing, London.
3. Construction Engineering and Management – Seetharaman.
4. Projects Planning analysis selection implementation and Review – Prasanna Chandra.

# PROJECT ECONOMICS & FINANCIAL MANAGEMENT

Teaching Scheme                                      Examination Scheme
Lect. 3 hrs./week                                    Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                       Term work: 20 marks

Principles of Economics – Importance of the economic background to measurement, objectives of business firm. Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms, Study of present economy. Capital – Analysis of need working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Managing payments to suppliers and out standings.

Economic Analysis – Cost implication to different forms of construction and maintenance and maintenance and replacement lives of material, Installation and running cost of services, Capital investment in project, Cost analysis by traders and by functional element, Cost planning techniques, Cost control during design and Construction, Depreciation, Various Appraisal Criteria Methods. Break-even analysis, Cash flow analysis, Risk Analysis and Management Practice, Role of Lender's Engineer.

Financial Planning – Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves. Over and under capitalisation. Budget – Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual. Cash now forecast. Problems of expansion and merger of companies, Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction, CIDC-IRA grading of construction entities.

Construction Accounts – Accounting process, preparation of profit and loss account and balance sheet as per the companies Act, 1956, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office. Case study of how project appraisal is done, funds are raised, accounts are kept for execution of a major construction project.

Reference Books
1. Prasanna Chandra, 'Projects planning, Analysis Selection, Implementation and Review. Tata McGraw Hill, New Delhi.
2. Singh H. 'Construction Management and Accounts", Tata McGraw Hill, New Delhi.
3. Cormican D. 'Construction Management : "Planning and finance", Construction press, London.
4. Brealey R.A. "Principles of Corporate Finance", Tata McGraw Hill, New Delhi.
5. Leland T. Blank. Anthony Tarquin. 'Engineering Economy' McGraw Hill.
6. David Bedworth, Sabah Randhawa. 'Engineering Economics' McGraw Hill.
7. Bruggeman. Fishr 'Real Estate, Finance and investment' McGraw Hill.
8. Block Hirt. 'Foundations of Financial Management' McGraw Hill.

# Soil Structure Interaction

Teaching Scheme                                           Examination Scheme
Lect. 3 hrs./week                                         Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                            Term work: 20 marks

General soil-structure interaction problems. Contact pressures and soil-structure interaction for shallow foundations. Concept of sub grade modulus, effects/parameters influencing sub grade modulus.
Analysis of foundations of finite rigidity, Beams on elastic foundation concept, introduction to the solution of beam problems. Curved failure surfaces, their utility and analytical/graphical predictions from Mohr-Coulomb envelope and circle of stresses.

Earth pressure computations by friction circle method. Earth pressure distribution on walls with limited/restrained deformations, Dubravo's analysis. Earth pressures on sheet piles, braced excavations. Design of supporting system for excavations. Arching in soils. Elastic and plastic analysis of stress distribution on yielding bases. Analysis of conduits. Design charts for practical use.

Modern concept of analysis of piles and pile groups. Axially, laterally loaded piles and groups. Interaction analysis. Reese and Matlock's solution. Elastic continuum and elastoplastic analysis of piles and pile groups. Hrennikoff's analysis. Ultimate lateral resistance of piles by various approaches. Non-linear load-deflection response. Uplift capacity of piles and anchors.

Reference:
1. Bowels J.E.," Analytical and Computer Methods in Foundation",     McGraw Hill Book Co. New York. (1974)
2 .Desai C.S. and Christian J.T."Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
3. Soil Structure Interaction, the real behaviour of structures, Institution of Structural Engineers.
4 .Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg.vol-17, Elsevier Scientific Publishing Co.

# Geotechnical Earthquake Engineering

Teaching Scheme                                   Examination Scheme
Lect. 3 hrs./week                                 Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                    Term work: 20 marks

Introduction, Seismic Risks and seismic hazards, cause and strength of earthquake, social and economic consequences, theory of dynamics and seismic response, the nature and attenuation of ground motion.
Determination of site characteristics, local geology and soil condition, site investigation and soil test. Determination of design earthquake, response spectra and accelerograms as design earthquake, criteria for earthquake resistant design. Site response to earthquake, liquefaction of saturated cohesion less soils,
Seismic response of soil structure system, shallow foundation, pile foundation, foundation in liquefiable ground. Raft foundation, Coffer dams and caissons.
A seismic design of earth retaining structures.

Reference:
1. Wiegel R.L., "Earthquake Engineering", Prentice Hall, 2nd Ed, 1989.
2. Jai Krishna and A.R. Chandrasekhar, "Elements of Earthquake Engineering".
3. Arya, Shamsher Prakash, Srivastava L.S., Brijesh Chandra, "Earthquake Engineering
4. Vibration Analysis and Foundation Dynamics by N.S.V, Kameswara Rao, published by heeler publishing
5. Analysis and Design of Foundation for Vibration by P.J. Moore published by Oxford and IBH Publishing Company
6. Soil Dynamics and Machine Foundation by Swami Saran published by Galgotia Publication
7. Vibration of Soil and Foundation by F.E. Richart, J.R. Hall and R.D. Woods Published by Prentice-Hal Inc, New Jersy
8. IS: 5249-1969/1975 Method of test for Determination of In situ Dynamic Properties of soils

# SYSTEM TECHNIQUES IN WATER RESOURCE ENGINEERING

Teaching Scheme                                    Examination Scheme

Lect. 3 hrs./week                                  Theory Paper : 80 Marks,

Practical/Tutorial 1 hr. /week                     Term work: 20 marks

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**1. System Concepts  &Linear Programing :**

System concepts, definitions, needs for system approach, different types of system parameters and variables. Revision, Big M Method, duality, sensitivity analysis. Application of Linear Programming for Hydraulics & Water Resource.

**2. Non Linear Programming & Dynamic Programming :**

Unconstrained one Dimensional search methods, Dichotomous search method, Fibonacci, Golden section, multivariable unconstrained, gradient techniques, steepest ascent and desent methods, Newton's methods, Application of Dichotomous search method, Fibonacci & Golden section to the various sectors of Water Resource Engineering, FP methods, constrained Lagrangian multiplier techniques, Kuhn Tucker's conditions, penalty function methods. Principle of optimality, recursive equations. Application of Dynamic programming to Water Resource Engineering.

**3. Stochastic Methods &Capitalisation :**

Queueing theory, simulation technique, sequencing model, Morkov's process.

Annuity, benefit-cost analysis. Benefit Cost Analysisfor multi purpose water resource projects.

**4. Geometric Programming :**

Poynomial, unconstrained minimization problem, arithmatics geometric unequality, solution of unconstrained geometric programming, constrined minimization, geometric programming with mixed inequality constrained. **Games Theory.**

**Reference Books**

1. Engineering Optimazation Theory & Practce – S.S. Rao.
2. Operation Research – Taha Hamdey A.
3. Operation Research – Wagner.

# DESIGN OF COMPOSITE CONSTRUCTION

Teaching Scheme                                   Examination Scheme
Lect. 3 hrs./week                                 Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                    Term work: 20 marks

**Unit 1:**
Introduction of Composite Constructions. Benefits of Composite Construction, Introduction to IS, BS and Euro codal provisions. Composite beams, elastic behaviour of composite beams, No and Full Interaction cases, Shear Connectors, Ultimate load behaviour, Serviceability limits, Effective breadth of flange, Interaction between shear and moment, Basic design consideration and design of composite beams. Composite floors, Structural elements, Profiled sheet decking, Bending resistance, Serviceability criterion, Analysis for internal forces and moments

**Unit 2:**
Composite Columns, Materials, Concrete filled circular tubular sections, Non-dimensional slenderness, local buckling of steel sections, Effective elastic flexible stiffness, resistance of members to axial compressions, Composite Column design, Fire Resistance.

**Unit 3:**
Composite trusses, Design of truss, Configuration, Application range, Analysis and Design aspects and connection details. Design of Multi-storeyed commercial and residential composite building, Design basis, load calculations, Design of composite slabs with profile decks, composite beam design, design for compression members, vertical cross bracings, design of foundation.

**Unit 4:**
Design of Composite Construction in Bridges – IRC specifications and code of practice for loads and composite construction. Composite Deck Slab Design – Design of one way deck slab for Class AA and Class A loading, Design of Cantilever Portion of deck Slab. Design of longitudinal girders.

*Reference Books*
1. Johnson R. P. – Composite Structures of Steel and Concrete, Vol I, Beams, Columns and Frames in Buildings, Oxford Blackwell Scientific Publications.
2. INSDAG teaching resources for structural steel design Vol – 2, Institute for Steel Development and Growth Publishers, Calcutta
3. INSDAG Handbook on Composite Construction – Multi-Storey Buildings, Institute for Steel Development and Growth Publishers, Calcutta

# NONLINEAR ANALYSIS OF STRUCTURES

Teaching Scheme                               Examination Scheme
Lect. 3 hrs./week                             Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                Term work: 20 marks

**Unit 1:**
Types of Nonlinearities - Geometric Nonlinearity, Material Nonlinearity, Nonlinear Governing Equation for Beams: Moment-curvature Nonlinearity, Geometric Nonlinearity Due to trectching, Material Nonlinearity, Geometrically Nonlinear Beam Problems - Moment-Curvature Nonlinearity-Cantilever Beam, Centrally Loaded beam with two supports, Cantilever Beam subjected to Tip Load. Nonlinear Static Analysis of Plates - Geometric and Material Nonlinearities, Governing Nonlinear Equations of Plates: Stress Function Approach, Displacement Equations Approach.

**Unit 3**:
Nonlinear Static Analysis of Plates - Boundary Conditions and method of solution, Large Deflection of Rectangular Plates. Nonlinear Analysis of Columns- Post buckling of cantilever column, Large deflection of column with both ends hinged

**Unit 4:**
Nonlinear Analysis of Trusses and Nonlinear Elastic Analysis of Frames - Derivation of non linear stiffness matrix, Matrix displacement method for nonlinear analysis of structures, Nonlinear analysis of plane frames. Elastic-Plastic Analysis - The displacement Transformation matrix for a member with a hinge, The overall stiffness matrix. Elastic-Plastic analysis of a Propped cantilever, Elastic Plastic analysis of frames

**Reference Books**
1. M.Sathyamoorthy, 'Nonlinear Analysis of Structures', CRC Press, New York
2. K.I. Majid, 'Non Linear Structures', Butter worth Publishers, London.
3. N G R Iyengar, 'Elastic Stability of Structural elements', Macmillan India Ltd

# Environmental Auditing & EMS

Teaching Scheme                                  Examination Scheme
Lect. 3 hrs./week                                Theory Paper : 80 Marks,
Practical/Tutorial 1 hr. /week                   Term work: 20 marks

Concepts of Environmental Audit, Objectives of audit. Types of audits, Features of effective auditing, Programme Planning, Organisation of auditing programme,

Pre-visit data collection, Audit protocol, Onsite audit, Data Sampling: Inspections, Evaluation and presentation, Exit interview. Audit Report – Action Plan – Management of audits. Waste management contractor audits, Life cycle approach.

Introduction, Principles and Elements of Successful environmental management. ISO Principles, EMS, Creating an environmental management system in line with ISO 14000. Benefits of an environmental management system. Principles and elements of successful environmental management:

Leadership, Environmental management planning, Implementing an environmental management system, Measurement and evaluations required for an environmental management system, Environmental management reviews and improvements. Legal and regulatory concerns. Integrating ISO 9000 and ISO 14000.

**Reference Books** *:*

1. Maheswar Dayal, "Renewable Energy Environment & Development", Konark Pub. Pvt. Ltd., 1998.
2. Girdhar Gyani and Amit Lunia, "Planning & Implementation of ISO 14001, Environmental Management System", Raj Publishing House, Jaipur, 2000
3. Joseph Caseion (Ed.) "The ISO 14000 Handbook", CEMM Information Services.
4 Don Sayre, "INSIDE ISO 14000 – The Competitive Advantage of Environmental Management", Vinity Books International, New Delhi, 2001
5. Ritchie, I & Hays, W., "A Guide to Implementation of the ISO 14000 Series on Environmental Management", Prentice Hall, New Jersy, 1998.