

**M TECH (CONSTRUCTION ENGINEERING AND MANAGEMENT)**

<b>I YEAR</b>		<b>I SEMESTER</b>			
<b>SUBJECT CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MAT-505	STATISTICS, PROBABILITY AND RELIABILITY	3	1	0	4
CIE-501	ENGINEERING PROJECT MANAGEMENT	3	1	0	4
CIE-503	OPERATIONS RESEARCH & DECISION THEORY	3	1	0	4
CIE-505	CONSTRUCTION METHODS AND EQUIPMENTS	3	1	0	4
CIE-507	MANAGEMENT INFORMATION SYSTEMS.	3	1	0	4
HSS-501	RESEARCH METHODOLOGY AND TECHNICAL PRESENTATION	1	0	3	2
CIE-511	PROJECT MANAGEMENT LAB	0	0	6	2
<b>TOTAL</b>		<b>16</b>	<b>5</b>	<b>9</b>	<b>24</b>
<b>I YEAR</b>		<b>II SEMESTER</b>			
CIE-502	CONTRACT MANAGEMENT	3	1	0	4
CIE-504	CONSTRUCTION ECONOMICS AND ACCOUNTING	3	1	0	4
CIE-***	PROGRAM ELECTIVE – I	3	1	0	4
CIE-***	PROGRAM ELECTIVE – II	3	1	0	4
CIE-***	PROGRAM ELECTIVE – III	3	1	0	4
***-***	OPEN ELECTIVE	3	0	0	3
CIE-512	CONSTRUCTION MATERIAL LAB AND QUALITY PRACTICE	0	0	6	2
CIE-514	SEMINAR	0	0	3	1
<b>TOTAL</b>		<b>18</b>	<b>5</b>	<b>9</b>	<b>26</b>
<b>II YEAR</b>					
CIE-669	PROJECT WORK	-	-	-	40
<b>TOTAL</b>		<b>34</b>	<b>10</b>	<b>18</b>	<b>90</b>

### **ELECTIVE – I**

CIE-561– RECENT ADVANCES IN CONCRETE TECHNOLOGY

CIE-562– VALUATION TECHNIQUES IN ENGINEERING

CIE-563– FUNCTIONAL PLANNING SERVICES AND MAINTENANCE MANAGEMENT

CIE- 564– MAINTENANCE AND REHABILITATION OF STRUCTURES

### **ELECTIVE – II**

CIE-565– ORGANIZATIONAL BEHAVIOUR AND HUMAN RESOURCES MANAGEMENT

CIE-566 – CONSTRUCTION SAFETY ENGINEERING & MANAGEMENT

CIE-567 – APPLIED SOCIAL PSYCHOLOGY

CIE- 568 – MANAGEMENT BY VALUES

### **ELECTIVE – III**

CIE-569 – CONSTRUCTION MATERIAL MANAGEMENT

CIE-570 – CONSTRUCTION QUALITY MANAGEMENT

CIE-571 – VALUE ENGINEERING

### **OPEN ELECTIVE**

CIE – 554 – ADVANCED STRENGTH OF MATERIALS

CIE – 556 – NON - DESTRUCTIVE TESTING OF MATERIALS

CIE–558– ENERGY AND ENVIRONMENT

## I SEMESTER

### MAT 505 STATISTICS, PROBABILITY AND RELIABILITY [3 1 0 4]

**Basics of Statistics :** Random Variables and its properties. Applications of Mean, Median, Mode, Standard deviation, Correlation coefficient in analyzing quality related data. Preliminary analysis of data by graphical representation, Measure of central tendency dispersion, peakedness in context with construction industry and quality control problems. Dependent Variables, Co-relation, Co-relation Coefficient and it's significance.

**Basic Probability :** Probability of discrete and Continuous variables. Probability Mass Function, Probability Density Function, Cumulative Density Function. Discrete and Continuous Standard Probability Distributors and their properties. Central Limit theorem, Equivalent Normal distribution for Non-Normal distributions.

Utilization of random events, measures of probability concepts for quality control related issues. Applications of Frequency distribution and probability, probability distributors, continuous and discrete distributions in analyzing data related to process and quality control.

Goodness of fit tests: Chi-square test, Kolmogorov-Smirnov Goodness of fit test and two sample test.

Monte-Carlo Simulation.

**Reliability Analysis:** Concept of Reliability, Risk and Safety factors. Safety Margin function, Reliability Index. FOSM method of Reliability Analysis. Application of FOSM to Linear and Non Linear Safety Margin Functions-Hasofer-Lynd method.

#### References:

1. Blank Leland, (1982), "Statistical Procedure for Engineering, Management and Science", McGraw Hill (Series in Industrial Engineering and Management Science).
2. Angand Tang, (1984), "Probability concepts in engineering planning and design", Vol. I and II, Wiley International.
3. Kottegoda N.T., Rosso Renzo, (1998), "Statistics, Probability and Reliability for Civil and Environmental Engineers", McGraw Hill International.
4. Wackerly D. D., Mendenhall W., and Scheaffer R. L., (2008) "Mathematical Statistics with applications", 7th Edition, Thomson (Brooks/Cole).
5. Ramachandran K. M. , Tsokos C.P., (2009) "Mathematical Statistics with applications", Academic Press.
6. Ramachandran K. M. , Tsokos C.P., (2009) "Mathematical Statistics with applications, Student Solution Manual", Academic Press.

## **CIE 501 ENGINEERING PROJECT MANAGEMENT [3 1 0 4]**

**Introduction:** Construction Projects- Concept, Project Categories, Characteristic of projects, project life cycle phase.

**Project Management-** Project Management Function, Role of Project Manager. Organising For Construction - Principles of organisation, type of organisation structure

**Project Feasibility Reports:**

Introduction, Significance in feasibility report- Technical analysis, Financial analysis, Economic analysis, Ecological analysis, Flow diagram for feasibility study of a project.

**Project planning Scope:** Planning Process, Objectives, Types of Project plans, Resource Planning Process

**Scheduling :** Introduction, Scheduling using Net work analysis- PERT and CPM Network, and related problems

**Precedence Network :** A-O-N Network-Logic and Precedence diagrams, advantages, Drawing A-O-N network from A-O-A network and related problems.

**Time Cost relationship:** Direct and indirect cost, step in optimization of cost, related problem.

**Allocation of resources:** Histogram, Resource smoothening, Resource leveling and related problem.

**Project updating using CPM network.**

### **References:**

1. Tenah Kwaku A. / Gvevara lose M., (1985), "Fundamentals of construction management and organization", Rertan publishing Co. Inc.
2. Raina V.K., (1988), "Construction Management practice", Tata – McGraw Hill publishing co. Ltd.
3. George I. Ritz, (1994), "Total Construction Project Management", McGraw - Hill Inc.
4. Sengupta B., Guha M, (1998), "Construction Management and Planning" ,McGraw Hill Companies.
5. Punmia B.C. and Khandelwal K.K., (1989), "Project Planning and Control with PERT. and CPM", Laxmi Publication II Edn..
6. K K Chitkara, (1999), "Construction Project Management", Tata- McGraw Hill publishing co. Ltd.
7. Seetharaman. S., (1997), "Construction Engg. and Management", Umesh Publication.
8. Vaid K.N.,(1988) "Construction Safety Management" National Institute of Construction management, Mumbai.
9. Krishna, N.V., (1983) "An Introduction to Safety Engineering and Management" OPS Publishers Limited 14, Hare street, Calcutta, first Edition.
10. David Goldsmith (1987) "Safety Management in Construction and Industry" - McGraw Hill book company.

## CIE 503 OPERATIONS RESEARCH AND DECISION THEORY

[3 1 0 4]

**Introduction to Operation Research:** Origin, development, scope, characteristics and limitation. Phases of OR - Classification of OR models.

**Decision Theory:** Decision strategies - Decision under certainty, risk and uncertainty - Formulation - Decision criteria and decision under competitive situations-Decision trees.

**Game Theory:** Classification of games - two person zero sum games, formulation of pay - off matrix - saddle points - games with pure and mixed, strategies - value of the game.

Solution to  $2 \times 2$ ,  $2 \times n$  and  $m \times n$  pay - off matrix:- Graphical, algebraic and linear programming methods.

**Linear Programming:** Formulation, general and standard forms of LPP, dual of LPPs. Solution methods -Graphical method, Simplex techniques, Big M method and Two phase methods.

**Transportation Models:** Introduction - Balanced and unbalanced transportation problems - Methods of finding initial and optimal solution: NWC method, Least cost method, Vogel's approximation method, MODI method.

**Assignment Models:** Introduction - Solution methods – Hungarian assignment method.

**Dynamic Programming:** Introduction – Recursive equation approach, solution of Discrete DPP, Solution of LPP by Dynamic Programming

**Network Analysis:** Introduction- Minimum Span Problems, Shortest- Route problems, Maximal-Flow Problems

**Queuing Theory/Waiting Line Theory:** Introduction - General structure of a queuing system – operating characteristics of queuing system.

**Waiting line models:** Poisson - Exponential single server model – infinite and finite population, Poisson - Exponential multiple server model – infinite population.

**Post optimality analysis:** Monte - Carlo system simulation

### References:

1. Bronson Richard, (1983) Theory and Problem of operations Research Schaum's outline series, McGraw Hill Book Co,
2. Hamdy Taha A., (1989) Operations Research: An Introduction, Maxwell Macmillan International Edition, IV Edition
3. Shenoy G.V., Srivastav U.K., Sharma S.C. (1988) Operations Research for Management - Wiley Eastern Limited
4. Gupta M.P., Sharma J.K. (1987) Operations Research for Management National Publishing House, II Edition
5. Mcclain John O. and Thomas Joseph (1987) Operations Management Prentice Hall of India Private Limited, New Delhi
6. Gupta R.C. (1986) Quantitative methods and operations Research – CBS Management Series
7. N.D. Vohra., (2001) Quantitative Techniques in Management – Tata McGraw Hill Book Co.

## **CIE 505 CONSTRUCTION METHODS AND EQUIPMENTS [3 1 0 4]**

Conventional and modern methods of construction of building elements, different stages of construction, types of form works, elements of precasting and prefabricated construction, use of prestressing.

General data on mechanized construction equipments. Construction equipments such as cranes, hoists, mixers, vibrators, scaffolding, shuttering, conveyors, etc., their characteristics, performance and application to the building process. Excavating equipments, Earthmoving equipments, Conveying equipments, Hauling equipments, Power requirement, Cycle time, Resistances, output Shovel truck performance. Performance Characteristics of equipments. Drilling, Blasting & Processing equipments. Asphalt and concrete plants & Equipments.

### **References:**

1. Mahesh Varma, (1987), "Construction Equipment and its Planning and Application" Metropolitan Book Co.(P) Ltd.
2. R. L. Peurifoy, W. B. Ledbeffe, (1985), "Construction Planning, Equipment and Methods", McGraw Hill Book Company.
3. James F. Russell, (1985), "Construction Equipment" Reston Publishing Company, Inc.
4. Prof. S. S. Ataev, (1985), "Construction Technology" Mir Publishers Moscow.
5. M. Antill and Paul W.S. Ryan, (1982), "Civil Engineering Construction" McGraw Hill Book Co ; Sydney.
6. Lindley R. Higgins, (1982), "Practical Construction Equipment Maintenance and Reference Guide" McGraw Hill Book Company.
7. Back Volumes of Civil Engg and Construction Review, India.

## **CIE 507 MANAGEMENT INFORMATION SYSTEMS [3 1 0 4]**

**Management:** Definition, functions, levels, role of different levels of management in planning, decision making and control.

**Information:** Definition, Attributes and Value of information, Types of decision and value of information, Age of information.

**System:** Definition, Description, Types of systems, Decoupling and Control of Systems, Stress in systems.

**MIS:** Definition, Characteristics, Problems, Classification.

**Computer hardware and software for MIS, Database, DBMS.**

**MIS in practice:** Transaction processing systems, Information reporting systems, Decision support systems, Expert systems and Office automatic systems.

**Project Planning, Analysis and Design of MIS:** MIS as system, Software development life cycles, Feasibility study, Requirement analysis, data flow diagram and data dictionary, Process description. Software requirement specifications, Systems design, Structures Charts, Input-output design

Development - testing, implementation and maintenance of MIS.

### **References:**

1. Gordan Davis B., (1989) "Management Information Systems. Conceptually foundation, Structure and Development", McGraw Hill Book Company, International Edition.
2. Parker Charles S., (1989) "Management Information Systems: Strategy and Action", McGraw Hill Publication Company.
3. Arora Asok, (1999) Bhatia Akshaya, "Information Systems for managers", Excel Books, New Delhi.
4. Sadgopan S., (1998) "Management Information Systems", Prentice Hall India Ltd., New Delhi.
5. Murdick Robert C., Ross Joel E., (1990) "Management Information Systems for Modern Management", Prentice Hall India Ltd., New Delhi
6. Scott George C., (1986) "Principles of Management Information Systems", McGraw Hill Book Company, International Students Limited

## HSS 501 RESEARCH METHODOLOGY AND TECHNICAL PRESENTATION [1 0 3 2]

**Mechanics of Research Methodology:** Types of research, Significance of research, Research framework, Case study method, Experimental method, Sources of data, Data collection using questionnaire, Interviewing, and experimentation.

**Research formulation:** Components, selection and formulation of a research problem, Objectives of formulation, and Criteria of a good research problem. **Research hypothesis:** Criterion for hypothesis construction, Nature of hypothesis, Need for having a working hypothesis, Characteristics and Types of hypothesis, Procedure for hypothesis testing.

**Sampling Methods:** Introduction to various sampling methods and their applications. Data Analysis- Sources of data, Collection of data, Measurement and scaling technique, and Different techniques of Data analysis.

**Thesis Writing and Journal Publication:** Writing thesis, Writing journal and conference papers, IEEE and Harvard styles of referencing, Effective presentation, Copyrights, and avoiding plagiarism.

### References:

1. Dr Ranjit Kumar(2005) “Research Methodology: A Step-by-Step Guide for Beginners”, SAGE.
2. Geoffrey R. Marczyk, David DeMatteo & David Festinger(2004), “Essentials of Research Design and Methodology”, John Wiley & Sons.
3. John W. Creswel(2004) , “Research Design: Qualitative, Quantitative, and Mixed Methods Approaches”, SAGE.
4. Suresh C. Sinha and Anil K. Dhiman(2006), “Research Methodology (2 Vols-Set), Vedam Books.
5. C. R. Kothari(2008), “Research Methodology: Methods and Techniques”, New Age International Publisher.
6. Donald R Cooper & Pamela S Schindler(2007), “Business Research Methods”, McGraw Hill International.
7. R. Pannershelvam(2006), “Research Methodology”, Prentice Hall, India.
8. Manfred Max Bergman(2006), “Mixed Methods Research”, SAGE Books.
9. Paul S. Gray, John B. Williamson, David A. Karp, John R. Dalphin(2007), “The Research Imagination”, Cambridge University press.
10. Cochrain & Cox(2006), “Experimental Designs”, II Edn. Wiley Publishers.



## **CIE 511 PROJECT MANAGEMENT LAB [0 0 6 2]**

### **Part I**

Spread sheet programming. Programming management problems such as price forecasting, regression analysis, inventory models, Operation Research and project management problems. Database Management using popular DBMS like Access.

Introduction to Project Management Softwares- MS Project & Primavera  
Working on Practical Projects

### **Part II**

Modelling / Handling actual practical project management projects.

### **References:**

1. Raina V.K., (1988), "Construction Management practice", Tata – McGraw Hill publishing co. Ltd.
2. Punmia B.C. and Khandelwal K.K., (1989), "Project Planning and Control with PERT. and CPM", Laxmi Publication II Edn..
3. K K Chitkara, (1999), "Construction Project Management", Tata- McGraw Hill publishing co. Ltd.Publication.
4. Rain Diana, "Training Guide to Microsoft Access", BPB Publications, New Delhi
5. Step by step Microsoft access(CD ROM),PHI Delhi
6. User Manual- MS Project & Primavera P6
7. Ang and Tang, (1984) "Probability concepts in engineering planning and design", Vol. I and II, Wiley International.
8. Kottegoda N.T., Rosso Renzo, (1998) "Statistics, Probability and Reliability for Civil and Environmental Engineers", Mc-Graw Hill International.
9. AICTE Continuing Education Programme, "Quantitative Methods in Construction Management"

**II SEMESTER**  
**CIE 502 CONTRACTS MANAGEMENT [3 1 0 4]**

**Introduction to contracts:** Definitions, Essentials for a legally valid contract, Salient features of a contract, Discharging of a contract, Documents for an Engineering Contract; Types of contracts: Classification Based on – Tendering Process, Economic Consideration, Tasks Involved; Main and Sub Contracts, Features, Merits, Demerits, Applicability of the various types of contracts.

**Tendering process:** Definitions, List of Documents, EMD, SD, Preparation of Enquiry Documents, Invitation for Tenders and sale of Documents, Preparation of Tender Documents and its submission, Receipt of Tender Documents and its opening, Evaluation of Tender and Award of contract – Letter of Award, Letter of Intent, Issues in tendering process: Pre - Registration, Pre – Qualification, Nominated Tendering, Rejection of Tenders, Repeat Orders, Revocation of Tenders, Unbalanced Bidding, Cartel or Collusion in Tendering.

**Administration/Performance of contract:** Responsibilities (Duties and Liabilities) of Principal & Contractor, Monitoring and Quality control/assurance, Settlement of claims – Advances, Bills, Extension for time, Extras & Variations, Cost Escalations. Security Deposit, Retention Money, Performance Bond, Liquidated Damages, Penalties, Statutory Requirements, Social Obligations/Responsibilities, Labour Welfare, Reports, Records, Files.

**Breach of contract:** Definition and Classification, Common Breaches by – Principal, Contractor, Damage Assessment, Claims for Damages, Quantum Meruit, Force Majeure or Frustration.

**Dispute resolution:** General, Methods for dispute resolution – Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Litigation/Adjudication by courts. Conciliation – Appointment of Conciliator, Role of Conciliator, Special Features of Conciliation Dispute Resolution Boards (DRB) – Constitution Of DRB, Functioning of DRB, Procedure for Hearings, Status of Award.

Arbitration – Arbitration Agreement, Terms of Reference, Arbitrator’s Powers, Types of Awards, Interventions by Courts, Setting Aside of Award, Revocation of Arbitrator – Misconduct of Arbitrator.

**International contracts / contracts with international funding:** International Competitive Bidding, Domestic Preference, FIDIC Documents, Conditions, Currency of Bid and Payment, Escalation in Foreign Currency, Financing of projects, Applicable Law and Settlement of Disputes, International Arbitration.

**References:**

1. Prakash V. A.,(1997) “Contracts Management in Civil Engineering Projects”, NICMAR
2. Patil B. S.,(2009) “Civil Engineering Contracts and Estimates”, University Press.
3. John G. Betty(1993/ Latest Edition) “Engineering Contracts”, McGraw Hills.
4. Vasavada B. J.,(1997) “ Engineering Contracts and Arbitration”, (Self Publication by Jyoti B. Vasavada).
5. Albett Robert W., (1961/ Latest Edition) "Engineering Contracts and Specifications", John Willey and Sons, New York.
6. Vaid K.N., (1998)"Global perspective on International Construction Contracting Technology and Project Management", NICMAR, Mumbai.

## **CIE 504 CONSTRUCTION ECONOMICS AND ACCOUNTING [3 1 0 4]**

**Economics:**Industrial Development - Matters related to Construction Industry- Market Demand and Supply - Theory of Production – Economics of Scale- Cost Concepts - Theory of Costs and Break Even Analysis - Its importance- Contracts.

**Financial Accounting :** Meaning and Importance - Journal, Ledger, Trial Balance and Bank Reconciliation Statement. Preparation of financial statements Its nature, importance and interpretation.

**Management Accounting:** Meaning, importance and scope. Techniques or Tools of Management Accounting - Comparative and Common sized Balance sheet - Ratio analysis.

**Financial Management:** Meaning, scope and importance – Investment evaluation- capital budgeting, Budgets and Budgetary Control.

**Business finance:** Source of finance - short term and long term – Working Capital.

**Accounting through computers**

### **References:**

1. Varshney R L, Maheswari K. L., (2005), 'Managerial Economics', Sultan Chanda and Sons, New Delhi.
2. H.L. Ahuja, (2005), 'Business Economics', S. Chand and Co., New Delhi.
3. M.C. Shukla and T.S. Grewal, (2002), 'Advanced Accounts', S.Chand and Co., New Delhi.
4. Pandey LM., (1998), 'financial Management', Vikas Publishing House, New Delhi.
5. Khan M.Y., and Jain P.K., (1992) 'financial Management', Tata McGraw Hill, New Delhi.

## CIE 561 RECENT ADVANCES IN CONCRETE TECHNOLOGY

[3 1 0 4]

**Introduction to Recent Advances in Concrete & Review of Conventional/Normal Concrete:** Introduction, Merits and Demerits of concrete, Features of Recent Advances in Concrete, Types of Concrete to be dealt; Terminologies, Ingredients, Properties of Fresh & Hardened concrete, related tests, Production and use of concrete.

**High Performance Concretes:** Definition & Introduction, Classification, general properties, Advantages, Disadvantages, Applications, Description of types, Guidelines for Mix design and use of following concretes:

Light weight concrete, High strength concrete, Ultra-high strength concrete (reactive powder concrete), High workability concrete/Self compacting concrete, Fiber reinforced concrete, Polymer-concrete composites.

**Special Concretes:** Definition & Introduction, General properties, Advantages, Disadvantages, Applications, Concreting practices, Guidelines for Mix design and use of following concretes: Heavy weight concrete, Shrinkage compensating concrete, Mass concrete, Roller compacted concrete.

**Durability of Concrete:** Definitions, Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for ensuring durability, Corrosion of reinforcing steel, protective measures.

**Testing and Quality Control of Concrete:** Classification of test methods, In-situ, Non-Destructive & Partially-Destructive tests for fresh concrete, hardened concrete and durability of concrete.

### References:

1. P. Kumar Mehta And Paulo J. M. Moteiro, (2005), “Concrete – Micro Structure, Properties and Materials”, Indian Concrete Institute, Chennai and Prentice Hall & Mc Graw-Hill in USA.
2. Neville A. M. And Brooks J. J, (2000), “Concrete Technology”, Addison Wesley Longman Ltd.
3. M. L. Gambhir, (2008/ Latest Edition), “Concrete Technology”
4. M. S. Shetty, (2009 / Latest Edition), “Concrete Technology”

## **CIE 562 VALUATION TECHNIQUES IN ENGINEERING [3 1 0 4]**

**Purpose of valuation, Different forms of values.**

**Outgoings:** Municipal & Govt. Taxes, insurance, Loss of rent, collection charges, sinking fund, Annual repairs & maintenance. Depreciation. Methods of calculation of depreciation

**Year's Purchase, Capitalized value, Obsolescence, Amortization.**

**Methods of valuation:** Open land valuation, Factors affecting intrinsic values of land, Comparative method, Abstractive method, Belting method.

**Rent:** Definition, Forms of rents.

**Cost of structure, BIS rules for measuring plinth area and cubical contents.**

**Valuation of land with buildings:** Rental method, Land and building method, Valuation on profit basis, Direct comparison of capital value, Residual or Development method.

**Valuation of agricultural/farm lands**

**Rights and Liabilities of Lessor & Lessee, Leasehold properties, freehold Properties.**

**Easements :** Self-imposed, Legally created, Dominant and Servient heritage Effect of easements on valuation.

**Market :** Real Estate market and market value, fair market value, open market value , affecting parameters

**Case Studies:** Valuation of real properties.

### **References:**

1. Banerjee D.N (1998) " Principles and Practice of Valuation ". Eastern law house
2. Roshan H. Namavathi,(2001) "Professional Practice " Lakhani Book Depot.
3. Mitra A.K., (1986)"Theory and Practice of Valuation " Eastern law house
4. Rao Gopinath C H,(2002) "Valuation Practices of Immovable Properties." Edition 12, Publisher, C H Gopinath Rao, Chennai.

## **CIE 563 FUNCTIONAL PLANNING SERVICES AND MAINTENANCE MANAGEMENT [3 1 0 4]**

Components of urban forms and their planning, Concepts of neighborhood unit, Street system and layout in a neighborhood, Functional planning buildings. Optimization of space: Spatial Synthesis graphical techniques, heuristic procedures. Space requirements and relationships for typical buildings, like residential offices, hospitals, etc. Standard fire, fire resistance, classification of buildings, means of escape, alarms, etc.

Engineering services in a building as a systems. Lifts, escalators, cold and hot water systems, waster water systems, and electrical systems.

Building Maintenance: Scheduled and contingency maintenance planning. Maintenance standards. Economic maintenance decisions.

Environmental factors; Thermal performance of buildings; Comfort factors and measurements; climatic design; Solar control and shading devices, Louver design, ventilation; Introduction to lighting; units of light, colour lamps, luminaries, Daylight design of general lighting schemes; Energy management and lighting; acoustical design of auditoria and noise control in buildings.

### **References:**

1. Chiara Joseph, Koppelman Lee, (1975) 'Urban planning and design criteria', Van Nostrand Reinhold, New York.
2. Catanese Anthony J , Snyder James C, (1979) 'Introduction to urban planning', MGH, New York.
3. Kut Euring David, (1993) 'Illustrated encyclopedia of building services ' , E and F N Spon, London.
4. Building Services Research Information Association, (1987) 'Building services material hand book', E and FN Span, London.
5. Chadderton David V, (1991) 'Building services engineering', E and FN Span, London.
6. Shear Mel A, (1983) 'Hand book of building maintenance management', Reston Publishing, Reston.
7. Miller Elmo J, Blood Jerome W, (1971) 'Modern maintenance management', Taraporevala, Bombay.
8. Newbrough E T, (1967) 'Effective maintenance management', MGH New York.
9. Cowan Henry J, (1980) 'Solar energy applications in the design of buildings', Applied Science Publishers, London.
10. Durrant D W, (1977) 'Interior lighting design', Lighting Industry Federation, London.
11. Watson Lee, (1990) 'Lighting design handbook', Mc Graw Hill, New York.

## **CIE 564 MAINTENANCE AND REHABILITATION OF STRUCTURES [3 1 0 4]**

Performance of construction materials and components in services; Causes of deterioration; preventive measurements and maintenance; principles of assessment of weathering and durability.

Deterioration process in concrete structures, Construction and design defects. Diagnostic methods, Load testing and nondestructive testing. Causes and prevention of cracks in masonry structures, Corrosion in structures, process and prevention, Fire damage of buildings. Repair materials, cement aggregate, polymer and construction chemicals. Management of concrete for durability. Damage assessment and restoration techniques, case studies of restoration works, buildings, bridges, water retaining structures, marine structures.

Special repairs, maintenance inspection and planning, Budgeting and management.

### **References:**

1. Emmons Peter H, (2001) 'Concrete Repair and Maintenance illustrated', Galgotia Publications Pvt. Ltd., New Delhi.
2. Allen R.T.L., Edwards S. C., (1987) 'The Repair of Concrete Structures', Blackie & Sons Ltd., Glasgow, London.
3. Peter H Emmons,(200 1), "Concrete Repair and Maintenance Illustrated', Galgotia Publications Pvt. Ltd., New Delhi.
4. Allen R.T.L ., Edwards S. C., (1987)'The Repair of Concrete Structures', Blackie & Sons Ltd., Glasgow, London.
5. Tedkay, (1992)'Asserssment and Renovation of Concrete Structures', Longman Scientific & Technical, Harlow, England.
6. Jagadisa R., (1995)'Structural Failures- Case Histories', Gcford & IBH Publishing Co. Ltd., New Delhi.
7. Raikar R.N., (1994) 'Diagnosis and Treatment of Structures in Distress', R & D Centre Structural Designers & Consultants Pvt. Ltd., Vashi, New Bombay.

## **CIE 565 ORGANIZATIONAL BEHAVIOUR & HUMAN RESOURCE MANAGEMENT**

### **[3 1 0 4]**

**Organizational Behaviour:** Nature of organizational behaviour: Definition key elements, scope, model. Stages of evolution of OB, Researches in OB.

**Foundations of Individual Behaviour:** Personality, Perception, Learning Attitudes, Values and Job satisfaction, Concepts of motivation.

**Foundations of Group Behaviour:** Small groups in an organization, Leadership, Power and Politics, Communication, Conflict. **Organization:** Organization culture, work stress, organizational changes and development.

**Human Resource Management:** Definition, Scope, Objectives' HR Planning Job Analysis and Design. Recruitment, Selection, Placement, Training Performance appraisal, Employee remuneration and Benefits. Industrial relations: Trade unions, Disputes and their resolution.

### **References**

1. Aswathappa A., (2000) "Organizational Behaviour: Texts and cases Himalaya Publishing House, Mumbai.
2. Hersey Paul, Kenneth Blanchard H., "Management of Organizational Behaviour: Utilising Human Resources", Prentice Hall India Ltd. Edition, New Delhi.
3. Davis Keith, "Human Behaviour at work: Organizational Behavior", Tata-McGraw Hill, New Delhi.
4. Gupta N.S., "Organization: Theory and Behaviour", Himalaya Publishing House, Mumbai.
5. Pareek Uday, Rao T.V., Pestonji D.M., (1996) "Behavioral Process in Organisations", Oxford-IBH Publishing Company.
6. Tyagi Archana, "Organisational Behaviour", Excel Books, New Delhi.
7. Aswathappa K., (1997) "Human Resource and Personnel Management", Tata - McGraw Hill, New Delhi.
8. Mirza S. Sayadin, (1988) "Human Resource Management", Tata McGraw Hill Book Company, New Delhi.
9. Suri S.K. (1988) "Human Resource Development and Productivity: New Perspective", National Productivity Council, Delhi.
10. Rao Subba P, (1999) Essential of HRM and Industrial Relations, "Text cases and Games", Himalaya Publishing house, II Edition.
11. Gupta C.B., (2003) "Human Resource Management", Sultan Chand and Sons, New Delhi.



## **CIE 566 CONSTRUCTION SAFETY ENGINEERING AND MANAGEMENT [3 1 0 4]**

**Construction Safety :** meaning and scope

**Current Situation in Safety of Construction:** Technological aspects, Organizational aspects, Behavioural aspects

**Safety clauses in contract document:** Safety rules in Construction

**Planning for safety in construction projects:** Legal requirements, Reporting occurrence of accidents and hazards, Action to be taken by site engineer in case of accidents, First aid/ Ambulance room/ dispensary

**Fire prevention and Control:** Causes- Types of extinguishers and uses, Fire prevention planning, Fire prevention and control features.

**Role of various parties in Construction Safety Management:-**Designers, Workers, Manufactures/Dealers, Employers. Site safety management-, Site organization.

**Safety remedies for common hazards:** Dust, Vibration, Lead poisoning, Noise, Movement, Material, Lighting.

**Safety in Use of Construction equipments.**

**Human Factors in Construction Safety management**

**Motivation:** Management, Supervisors, Workers. Motivational scheme- Possible areas of improvement.

**Safety in Construction Operation:** Drilling and Blasting operation, Excavation, Concrete framed structure.

**Accident Investigation, Records and Cost:** Purpose of investigation, Measuring safety and records to be maintained.

**Hazard Analysis Technique:** Job hazard analysis, Fault tree analysis, Failure mode analysis.

**ISI Standards for safety for building and Civil Engineering Projects.**

**References:**

1. Vaid K.N.,(1988) "Construction Safety Management" National Institute of Construction management, Mumbai.
2. Krishna, N.V., (1983) "An Introduction to Safety Engineering and Management" OPS Publishers Limited 14, Hare street, Calcutta, first Edition.
3. David Goldsmith (1987) "Safety Management in Construction and Industry" McGraw Hill book company.

## CIE 567 APPLIED SOCIAL PSYCHOLOGY [3 1 0 4]

**Organisations and the Systems Concept:** Characteristics of Social Organisations. Growth of Organisational structure and sub systems Environment, Organisational typology, roles, effectiveness. Concept of **Organisational Psychology:** Organisational man and process of management. Groups and inter-groups relationships. Organisation in relation to environment.

**Time-motion study:** Individual differences, Howthorne Study, Psychological tests and their validity. Attitudes, Industrial moral and job satisfaction. Industrial conflict and fatigue. Monotony and boredom. Scientific management, Selection and Placement, Employee-Employer relationships, Incentives.

### References:

1. Katz Daniel, Kohn Robert L., (1978) "The Social Psychology of Organisations", John Willey and Sons, New York.
2. Mohanty Girishbal, (1983) "Textbook of Industrial and Organisational Psychology", Oxford and IBH, New Delhi.
3. Schein Edger H., (1973) "Organisational Psychology", Prentice Hall India, New Delhi.
4. Seigel Lawrence, Lane Irwing M., (1974) "Psychology in Industrial Organisations", D.B. Taraporewala Sons and Co. Pvt. Ltd. Bombay.

## **CIE 568 MANAGEMENT BY VALUES [3 1 0 4]**

Values for Indian Managers. Anatomy of ethico-moral management from self to SELF: The ascent from pettiness to dignity. Appraisal of Management by value programmes. Socio-Cultural change and managers travails. Social values and Individual attitudes, Work ethic. India's vision of Humanism. Heirarchism as Organisational Value. Rediscovering Indian Psychology for Managers. Leadership modeling. Mental health of a manager.

### **References:**

1. Chakraborty S.K., (1991) "Management by Values: Towards Cultural congruence", Oxford University Press, New Delhi.
2. Chakraborty S.K., (1987) "Managerial Effectiveness and Quality of Work life: Indian Insights", Tata-McGraw Hill.
3. Monappa A., (1972) "Ethical Attitudes of Indian Managers", All India Management Association.

## **CIE 569 CONSTRUCTION MATERIAL MANAGEMENT [3 1 0 4]**

**Integrated material Management :** Meaning, Functions, and Advantages.

Selective Control, Codification and Standardization.

Material planning and budgeting.

Price forecasting, Purchasing under uncertainties, Purchasing Capital equipments.

Source selection.

**Stores management:** Principles and Practice

**Inventory management:** Different inventory costs, Static risk model, EOQ, Practical systems, - P and Q systems, Probability base inventory control, OR Techniques in Material Management. Statistical methods and application of computers.

### **References:**

1. Gopal Krishnanan P., Sundaresan M., (1992) "Material Management Integrated Approach", Prentice Hall India, New Delhi.
2. Datta A.K., (1988) "Material Management and Inventory Control: Principles and Practice", Jaico Publishing House, Bombay.
3. Shah N.M., (1988) "Integrated Concept of Material Management", Tata Mc Graw Hill.
4. Michael R. Leenders, Fearn, ( 1977) "Purchasing and Material Management", D.B. Tarporevale Sons and Co., Bangalore.
5. Tersine, Richard J., (1994) "Principles of Inventory and Material Management", Prentice Hall International.
6. Zipkin, Paul H., (2000) "Foundations of Inventory Management", McGraw Hill International

## CIE 570 CONSTRUCTION QUALITY MANAGEMENT [3 1 0 4]

**Foundations of Total Quality Management:** Understanding quality, TQM philosophy: Concept of Deming, Juran, Crosby, Imai, Ishikawa, Taguchi, Shingo philosophies. Models and frame works.

**TQM Tools:** An overview of Flowcharts, Check sheets, Histogram, Cause and effect diagrams, Pareto diagram, Scatter diagram and Control charts.

**Planning:** Policy, Strategy and goal deployment, Partnership and resources, Design for quality.

**Performance:** Measurement frame works, Self-assessment audit and review, benchmarking. Process management, Redesign, Quality management system, Quality assurance.

**People:** Human resource management(Introduction only), Cultural change, Innovation and learning, Leadership and commitment.

**Implementing TQM:** TQM and management of change, Planning and implementation of TQM, Sustained improvement, TQM models in practice.

**ISO 9000** quality systems, Six sigma practice. Customer-Supplier Chain, Continuous improvement.

**ISO 14001** quality systems.

**Case studies**

### References:

1. Oakland John S (2006) “ TQM”, Text with cases, Butterworth- Heinemann, Oxford.
2. Zairi Mohamed, (1992) "Total Quality Management For Engineers", Aditya Books, NewDelhi.
3. Goetsch David L., Davis Stanley B., (1997) "Introduction to Total Quality", Prentice Hall International Inc.
4. Feigenbaum Armand V., (1991) "Total Quality Control", McGraw Hill Inter- national Edition.
5. Dalela Suresh, Saurabh, (1997) "ISO-9000 A Manual for Total Quality Management", S.Chand, NewDelhi.
6. Logothetis N., (1997) "Managing For Total Quality", Prentice Hall India, NewDelhi.
7. Bank John, (1996) "Essence Of Total Quality Management", Prentice Hall India, New Delhi.
8. Joseph, Berk Susan, (1995) "Total Quality Management", Excel Books, Delhi.
9. Kanji Gopal K., Asher Mike (1996) “100 Methods for Total Quality Management”, Sage publications ,New Delhi.
10. Woodside Gayle, Aurrichio Patrick (2000) “ ISO 14001,Auditing manual” Mc-graw Hill, New Delhi.
11. Bhat Sridhara K (2007) “Total Quality Management”, Himalaya Publication House, Mumbai

Introduction and background of value Engineering. Hurdles in value Engineering. Value Engineering Job Plan. Functional Analysis. Creative thinking, Cost modeling, Life cycle costing, Project work, Worksheets, Guidelines, Checklists. Value Engineering Case studies.

**References:**

1. Zimmerman Larry W., Hart Glen P., (1988) "Value Engineering", CBS Publishers, New Delhi.
2. Iyer S.S., (1996) "Value Engineering", New Age International.
3. Krishnan P., Saxena K.R., (1995) "Value Engineering in Project Management", Oxford and IBH.
4. Vittal M.S., (1993) "Value Engineering", System Consultancy Service, Bangalore.
5. AICTE, "Value Engineering", New-Delhi, 1990.
6. Brown, **James**, (1992) "Value Engineering", Industrial Press, New York.

## OPEN ELECTIVES

### CIE 554 ADVANCED STRENGTH OF MATERIALS [3 0 0 3]

**Torsion :** Torsion of non-circular sections - Torsion of thin walled sections.

**Unsymmetrical bending of straight beams** - stress distribution - shear centre - shear flow in thin walled beam cross sections - shear centre for thin walled sections.

**Bending of Curved Beams:** Crane hooks, closed rings - correction factor for flanged cross sections.

**Bending of beams curved in plan.**

**Beams on Elastic foundation** - Infinite beams - Semi - infinite beams - short beams.

#### References:

1. Srinath L.S (2000), Advanced Solid Mechanics TMH., New Delhi. Boresi A.P., and Sidebottom O.M., (1985),
2. Advanced Mechanics of Materials, John Wiley and sons in N.Y.
3. Den Hartog, (1952), Advanced Strength of Materials, McGraw Hill, N.Y.
4. N.Krishnaraju and D.R. Gururaja, (1997), Advanced Mechanics of solids and structures, Narosa Publishing House, New Delhi.
5. William F. Riley, Leroy D. Sturges and Don H. Morris, (2001), Mechanics of Materials, John Wiley & Sons, New Delhi.

## **CIE 556 NON- DESTRUCTIVE TESTING OF MATERIALS [3 0 0 3]**

Introduction, Need, Tensile test, Fatigue test, creep test, hardness test, impact test, Basic elements of NDT, Rebound hammer test, Magnetic particle test, liquid Particle test, ultrasonic test, Radiography, Acoustic Emission Test, Eddy current test, Leak test, New methods, reliability, case studies.

### **References:**

1. Barry Hull & Vernon John(1989), “ Non-destructive Testing”, ELBS edition., Macmillan, London.
2. R. Halmshaw(1991), “Non-destructive Testing”, 2nd edition., Edward Arnold, London.
3. McGonnagle W. J.,( 1983 ) “Non-destructive testing”, Gordon & Beach Science, New York,.
4. George E. Dieter,(1998) “Mechanical Metallurgy” McGraw Hill Publication.
5. Warren J. McGonnagle,(1961/latest edition)) “ Non Destructive Testing” ” McGraw Hill Publication.
6. ASME Metals Hand Book.
7. TMEH Hand Book.



## **CIE 558 ENERGY AND ENVIRONMENT [3 0 0 3]**

Introduction: Global energy, Environmental resources, energy needs, energy crisis.

Indian scenario - Energy consumption, needs and crisis.

Energy production, utilization, Laws and Principles

Renewable sources of energy and Environmental aspects - Bio gas, Bio- Mass,

Hydro power, ocean energy, solar energy, geothermal energy, wind energy

Urban waste derived energy, agricultural waste derived energy.

Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil , natural gas, Nuclear energy,

Global temperature, Green house effects, global warming.

Acid rain - Causes, effects and control methods.

Regional impacts of temperature change.

### **References:**

1. Wilber L.C. "Hand book of Energy Systems" Engg Wiley and Sons 1989
2. Masten G.M. "Introduction to Environmental Engg and Science" .
3. Sincero and Sincero, Environmental Engg - A design approach, Prentice Hall of India (1999)
4. Rao and Parulekar B.B. Energy Technology- Non-conventional Renewable and Conventional, Second Edition Khanna Publication 1977

## **CIE-512 CONSTRUCTION MATERIALS LABORATORY AND QUALITY PRACTICE**

### **[0 0 6 2]**

Concrete mix design, Tests on fiber reinforced concrete, Tests on concrete with different binders, Tests related to self compacting concrete, Pretensioning System, Non destructive tests, Corrosion tests.

Applications of statistics in analyzing data for construction quality management.

Model making.

### **References**

1. Raju N Krishna, (2004) "Design of concrete mixes", CBS Publishers, New Delhi.
2. Gahlot P S, "Concrete mix design", Indian society for technical education, Mysore.
3. Krishnamurthy S , Bhattacharjee B, "Concrete mix design and recent technology of placing concrete", Indian society for technical education, Mysore.
4. Kishore Kaushal, (1992) "Method of concrete mix design with chemical admixtures and for pumped concrete", Standard Publishers, Delhi.
5. Rathore Shailendra Singh, (2003) "Computer aided concrete mix design", Allied Publishers Delhi.
6. "Fibre reinforced concrete", SERC, 1987.
7. Raj Baldev, (1997) "Practical non destructive testing", Narosa Publishing House Delhi.
8. Maldague Xavier P V, Moore Patrick O, (2001) "Non destructive testing Handbook", American Society for Non-destructive Testing, USA.