

ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2009

M.E. CONSTRUCTION ENGINEERING AND MANAGEMENT

I SEMESTER (FULL TIME) CURRICULUM AND SYLLABI

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA 9211	Statistical Methods and Queuing Theory	3	1	0	4
2	CN 9201	Modern Construction Materials	3	0	0	3
3	CN 9202	Construction Equipment	3	0	0	3
4	CN 9203	Project Formulation and Appraisal	3	0	0	3
5		Elective I	3	0	0	3
6		Elective II	3	0	0	3
		TOTAL	18	1	0	19

ELECTIVES FOR M.E. CONSTRUCTION ENGINEERING AND MANAGEMENT

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	CN 9251	Advanced Concrete Technology	3	0	0	3
2	CN 9252	Shoring, Scaffolding and Formwork	3	0	0	3
3	CN 9253	System Integration in Construction	3	0	0	3
4	CN 9254	Energy Conservation Techniques in Building Construction	3	0	0	3
5	CN 9255	Construction of Pavements	3	0	0	3
6	CN 9256	Construction Project Management	3	0	0	3
7	CN 9257	Quantitative Techniques in Management	3	0	0	3
8	CN 9258	Construction Personnel Management	3	0	0	3
9	CN 9259	Business Economics and Finance Management	3	0	0	3
10	CN 9260	Quality Control and Assurance in Construction	3	0	0	3
11	CN 9261	Resource Management and Control in Construction	3	0	0	3
12	CN 9262	Project Safety Management	3	0	0	3
13	CN 9263	Management Information Systems	3	0	0	3
13	CN 9264	Energy-Efficient Buildings	3	0	0	3
14	ST 9257	Maintenance and Rehabilitation of Structures	3	0	0	3

OBJECTIVE:

- To study and understand the concepts of statistical methods and queuing theory and its applications

UNIT I ONE DIMENSIONAL RANDOM VARIABLE 9+3

Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.

UNIT II ESTIMATION THEORY 9+3

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.

UNIT III TESTING OF HYPOTHESES 9+3

Sampling distributions - Type I and Type II errors - Tests based on Normal, t , χ^2 and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 9+3

Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT V QUEUEING MODELS 9+3

Poisson Process – Markovian queues – Single and Multi Server Models – Little's formula Machine Interference Model – Steady State analysis – Self Service queue.

TOTAL (L: 45+T: 15) : 60 PERIODS

REFERENCES:

1. Jay L. Devore, Probability and Statistics and Probability for Engineers, CENGAGE Learning, Indian Edition, Singapore, 2008.
2. D. C. Montgomery, G. C. Runger, Applied Statistics and Probability for Engineers, Third Edition, John Wiley and Sons, 2007.
3. D. Gross, C. M. Harris, Fundamentals of Queuing Theory, Third Edition, John Wiley and Sons, 2002.
4. Walpole, R.E., Myer, R.H., Myer, S.L. and Ye, K., Probability and Statistics for Engineers and Scientists, 7th edition, Pearson Education, Delhi, 2002.
5. Vohra, N.D. "Quantitative Techniques in Management", Tata McGraw – Hill Company Limited, 2007.
6. Gupta, S. C. and Kapoor, V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 2001.
7. Taha, H. A., Operations Research: An Introduction, Seventh Edition, Pearson Education Edition, Asia, New Delhi , 2002.

OBJECTIVE:

- To study and understand the properties of recent materials used in construction.

UNIT I	SPECIAL CONCRETES	10
Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete		
UNIT II	METALS	10
Steels - New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – Applications.		
UNIT III	COMPOSITES	10
Plastics –Reinforced Polymers – FRP – Applications		
UNIT IV	OTHER MATERIALS	10
Water Proofing Compounds – Non-weathering Materials – Flooring and Facade Materials		
UNIT V	SMART AND INTELLIGENT MATERIALS	5
Smart and Intelligent Materials for intelligent buildings - Special features		

TOTAL: 45 PERIODS**REFERENCES:**

1. Santhakumar A.R., Concrete Technology, Oxford University press, New Delhi, 2007.
2. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
3. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
4. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
5. Aitkens , High Performance Concrete, McGraw Hill, 1999
6. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for civil and Highway Engineers, Prentice Hall Inc., 1998.
7. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005.
8. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.

OBJECTIVE:

- To study and understand the various types of equipment and its applications in construction project

UNIT I CONSTRUCTION EQUIPMENT MANAGEMENT 10

Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management

UNIT II EQUIPMENT FOR EARTHWORK 10

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers

UNIT III OTHER CONSTRUCTION EQUIPMENTS 10

Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment – Equipment for Demolition.

UNIT IV MATERIALS HANDLING EQUIPMENT 5

Forklifts and related equipment - Portable Material Bins – Conveyors - Hauling Equipment

UNIT V EQUIPMENT FOR PRODUCTION OF AGGREGATE AND CONCRETING 10

Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters

TOTAL: 45 PERIODS

REFERENCES:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore, 2006.
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.
3. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
4. Dr.Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983.

OBJECTIVE:

- To study and understand the formulation, costing of construction projects and techniques of project appraisal.

UNIT I PROJECT FORMULATION 10

Project – Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required

UNIT II PROJECT COSTING 10

Project Cash Flows – Time Value of Money – Cost of Capital

UNIT III PROJECT APPRAISAL 15

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice

UNIT IV PROJECT FINANCING 5

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators - Ratios

UNIT V PRIVATE SECTOR PARTICIPATION 5

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer

TOTAL : 45 PERIODS

REFERENCES:

1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, Tata McGraw Hill Publishing Company Ltd., New Delhi. 2006.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992
3. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987
4. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.

OBJECTIVE :

- To study the properties of materials, tests and mix design for concrete.

UNIT I CONCRETE MAKING MATERIALS 9

Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified gradings, Testing of aggregates. Cement, Grade of cement, Chemical composition, Testing of concrete, Hydration of cement, Structure of hydrated cement, special cements. Water Chemical admixtures, Mineral admixture.

UNIT II CONCRETE 9

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage, Variability of concrete strength, durability of concrete.

UNIT III MIX DESIGN 9

Principles of concrete mix design, Methods of concrete mix design, Testing of Concrete. Statistical quality control- sampling and acceptance criteria.

UNIT IV SPECIAL CONCRETE 9

Light weight concrete, Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete, Super plasticised concrete, hyper plasticized concrete, Epoxy resins and screeds for rehabilitation - properties and applications - high performance concrete. High performance fiber reinforced concrete, self-compacting-concrete.

UNIT V CONCRETING METHODS 9

Process of manufacturing of concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering - underwater concrete, special form work.

TOTAL : 45 PERIODS**REFERENCES:**

1. Neville, A.M., Properties of Concrete, Prentice Hall, 1995, London.
2. Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2003.
3. A.R.Santhakumar ;"Concrete Technology",Oxford University Press,2007.
4. Rudhani G. Light Weight Concrete Academic Kiado, Publishing Home of Hungarian Academy of Sciences, 1963.

OBJECTIVE:

- To study and understand the various types of scaffolding, formworks, shoring methods and techniques

UNIT I PLANNING AND SITE EQUIPMENT & PLANT FOR FORM WORK 9

At Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms.

Overall Planning – detail planning – Standard units – Corner units – Schedule for column formwork – Formwork elements – Planning Crane arrangements – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales and ties – scaffold frames from accessories – Vertical transport table form work.

UNIT II FORM MATERIALS**9**

Lumber – Types – Finish – Sheathing boards working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminum Form lining materials – Hardware and fasteners – Nails in Plywood

Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic pressure and pressure distribution – Examples – Vertical loads - Uplift on shores – Adjustment for non standard conditions.

UNIT III DESIGN OF FORMS AND SHORES**9**

Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam forms – Ties, Anchors and Hangers – Column forms – Examples in each.

Simple wood stresses – Slenderness ratio – Allowable load – Tubular steel shores patented shores – Site Preparation, Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multistories – More concentrated shore loads T- heads – Tow Tier wood shores – Ellis shores – Dayton sure grip and Baker Roofs shores – Safeway Symons shores – Beaver – advance shores Dead shore – Raking and Flying shores.

UNIT IV FORMWORK FOR BUILDINGS**9**

Location of job mill – Storage – Equipment – Footings – Wall footings – Column footings Sloped footing forms – Curb and gutter forms – Wall forms –Prefabricated panel systems – Giant forms curved wall forms – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Concrete joint construction – Flying system forms.

Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping – Errors in design – Failure to follow codes – How formwork affects concretes quality – ACI – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – Advantages of reshoring.

UNIT V FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SAFETY PRACTICES FOR SCAFFOLDS**9**

Hemispherical, Parabolic, Translational typical barrel vaults, Hyperbolic Folded plates – Shell form design considerations loads – Inserts , Anchors bolts – Building the forms-Placing concrete – Form removed – Strength requirements – Tunnel forming components – Curb forms invert forms – Arch forms – Concrete placement methods – Cut and cover construction – Tolerances – Form construction – Shafts.

Slip Forms - Principles – Types – advantages – Functions of various components – Planning – Desirable characteristics of concrete – Common problems faced – Safety in slip forms special structures built with slip form Technique – Codal provisions - Types of scaffolds – Putlog and independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties plan – bracing – knots – safety net – General safety requirements – precautions against particular hazards – Truss suspended – Gantry and system scaffolds.

TOTAL: 45 PERIODS**REFERENCES:**

1. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw – Hill , 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London & New York, 2003
4. Austin, C.K., Formwork for Concrete, Cleaver – Hume Press Ltd., London, 1996.

OBJECTIVE:

- To study and understand the construction system integration

UNIT I STRUCTURAL INTEGRATION 9

Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

UNIT II ENVIRONMENTAL FACTORS 9

Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

UNIT III SERVICES 9

Plumbing – Electricity – Vertical circulation and their interaction - HVAC

UNIT IV MAINTENANCE 9

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

UNIT V SAFETY 9

Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

TOTAL: 45 PERIODS**REFERENCES:**

- William T. Mayer, Energy Economics and Building Design , McGraw-Hill Book Company, 1983.
- Peter R. Smith and Warren G. Julian, Building Services, Applied Science Publishers Ltd., London, 1993.
- A.J.Elder and Martiz Vinden Barg, Handbook of Building Enclosure, McGraw-Hill Book Company, 1983.
- Jane Taylor and Gordin Cooke, The Fire Precautions Act in Practices, 1987.
- David V.Chadderton, Building Services Engineering, Taylor and Francis, 2007.

CN9254 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION**L T P C
3 0 0 3****OBJECTIVE:**

- To study the various energy saving and management techniques applied to building and construction with relevance to environment

UNIT I INTRODUCTION 6

Fundamentals of energy- Energy Production Systems-Heating, Ventilating and Air-conditioning – Solar Energy and Conservation – Energy Economic Analysis – Energy conservation and audits – Domestic energy consumption – savings - challenges – primary energy use in buildings - Residential – Commercial – Institutional and public buildings – Legal requirements for conservation of fuel and power in buildings.

UNIT II	ENVIRONMENTAL	7
Energy and resource conservation – Design of green buildings – Evaluation tools for building energy – Embodied and operating energy – Peak demand – Comfort and Indoor Air quality – Visual and acoustical quality – Land, water and materials - Airborne emissions and waste management.		
UNIT III	DESIGN	8
Natural building design consideration – Energy efficient design strategies – Contextual factors – Longevity and process Assessment – Renewable Energy Sources and design – Advanced building Technologies – Smart buildings – Economies and cost analysis.		
UNIT IV	SERVICES	12
Energy in building design – Energy efficient and environment friendly building – Thermal phenomena – thermal comfort – Indoor Air quality – Climate, sun and Solar radiation, - Psychometrics – passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation – Goals and policies – Energy audit – Types of Energy audit – Analysis of results – Energy flow diagram – Energy consumption / Unit Production – Identification of wastage- Priority of conservative measures – Maintenance of energy management programme.		
UNIT V	ENERGY MANAGEMENT	12
Energy management of electrical equipment - Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – Energy savings in Lighting systems – Air conditioning systems – Applications – Facility operation and maintenance – Facility modifications – Energy recovery dehumidifier – Waster heat recovery – Steam plants and distribution systems – Improvement of boiler efficiency – Frequency of blow down – Steam leakage – steam Flash and condense return.		

TOTAL: 45 PERIODS

REFERENCES:

1. Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.
2. Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons, 1985.
3. Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.
4. J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.

CN 9255	CONSTRUCTION OF PAVEMENTS	L T P C
		3 0 0 3

OBJECTIVE:

- To study the properties of flexible and rigid pavement

UNIT I	ROAD MAKING MATERIALS FOR FLEXIBLE AND RIGID PAVEMENTS	9
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Classification, testing and applications of road making aggregates – Road binders – Bitumen - Cement

UNIT II	PROPERTIES OF BITUMINOUS MIXTURES	10
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Resistance of bituminous mixtures to permanent deformation – Flexibility and brittleness - Common mechanical tests – Permeability characteristics – Weathering of bituminous road surfacing – Adhesion of bituminous binders to road aggregates – Effect of aggregate size in bituminous courses – Temperature susceptibility of bituminous courses – Design of bituminous mixes.

UNIT III	PROPERTIES OF PAVEMENT QUALITY CONCRETE MIXURES AND CONSTRUCTION PRACTICE	11
	Properties of fresh and hardened concrete – laboratory tests – Design of concrete mixes for Pavement Quality Concrete. Construction of various layers in rigid and flexible pavements – Quality assurance during construction – sampling and analysis.	
UNIT IV	MACHINERIES	8
	Road making machineries – Road formation, bituminous constructions - Road surface evaluation	
UNIT V	LATEST ADVANCEMENTS	7
	Methods to improve bitumen quality – Rheological and chemical additives – Polymer modified bitumen – Super pave concepts – Recycling of bituminous courses – Smart materials for cement concrete pavement – Use of admixtures and fibres.	

TOTAL: 45 PERIODS

REFERENCES:

1. Mix Design Methods for Asphalt Concrete and other Hot mix types MS 2, Sixth Edition, The Asphalt Institute, 1997.
2. Edwin J.Barth, Asphalt Science and Technology, Gordon and Breach Science Publishers, New York, 1984.
3. Bituminous materials in road construction, The English Language Book Society and Her Majesty's Stationery Office, 1966.

CN 9256	CONSTRUCTION PROJECT MANAGEMENT	L T P C 3 0 0 3
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OBJECTIVE:

- To study the various management techniques for successful completion of construction project

UNIT I	THE OWNERS' PERSPECTIVE	9
	Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers	
UNIT II	ORGANIZING FOR PROJECT MANAGEMENT	9
	Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team	
UNIT III	DESIGN AND CONSTRUCTION PROCESS	9
	Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment	

CN 9259 BUSINESS ECONOMICS AND FINANCE MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- To study the role and methods of economics and finance concepts applied to construction business.

UNIT I ECONOMICS 10

Role of Civil Engineering in Industrial Development – Advances in Civil Engineering - Engineering Economics – Support Matters of Economy related to Engineering – Market demand and supply – Choice of Technology – Quality Audit in economic law of returns governing production.

UNIT II CONSTRUCTION ECONOMICS 10

Construction development in Housing, transport energy and other infrastructures – Economics of ecology, environment, energy resources – Local material selection – Form and functional designs – Construction workers – Urban Problems – Poverty – Migration – Unemployment – Pollution.

UNIT III FINANCING 13

The need for financial management - Types of financing – Financing instruments– short term borrowing – Long term borrowing – Leasing – Equity financing – Internal generation of funds – External commercial borrowings – Assistance from government budgeting support and international finance corporations – Analysis of financial statements – Balance Sheet - Profit and Loss account – Cash flow and Fund flow analysis – Ratio analysis – Investment and financing decision – Financial Control - centralized management.

UNIT IV ACCOUNTING METHOD 6

General Overview – Cash basis of a accounting – Accrual basis of accounting – Percentage completion method – Completed contract method – Accounting for tax reporting purposes and financial reporting purposes – Accounting Standards

UNIT V LENDING TO CONTRACTORS 6

Loans to Contractors – Interim construction financing – Security and risk aspects.

TOTAL: 45 PERIODS

REFERENCES:

1. Prasanna Chandra, Project Selection, Planning, Analysis, Implementation and Review, Tata McGraw Hill Publishing Company, 1995.
2. Halpin, D.W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.
3. Warneer Z Hirsch, Urban Economics, Macmillan, New York, 1993.
4. Kwaku A, Tenah and Jose M.Guevara, Fundamental of Construction Management and Organisation, Prentice – Hall of India, 1995.
5. Madura, J and Veit, E.T., Introduction to Financial Management, West Publishing Co., St. Paul, 1988.

CN 9260 QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION L T P C
3 0 0 3

OBJECTIVE:

- To study the concepts of quality and assurance and control techniques in construction

UNIT I QUALITY MANAGEMENT 9

Introduction – Definitions and objectives – Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality Management Guidelines – Quality circles.

UNIT II QUALITY SYSTEMS 9

Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

UNIT III QUALITY PLANNING 9

Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi’s concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

UNIT IV QUALITY ASSURANCE AND CONTROL 9

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

UNIT V QUALITY IMPROVEMENT TECHNIQUES 9

Selection of new materials - Influence of drawings, detailing, specification, standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing - Value engineering and value analysis.

TOTAL: 45 PERIODS

REFERENCES:

1. James, J.O’ Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van Nostrand, New York, 1989.
2. Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.
3. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1993
4. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2000
5. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw-Hill, 1989.
6. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989.
7. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, England. 1998.

CN 9261 RESOURCE MANAGEMENT AND CONTROL L T P C
IN CONSTRUCTION 3 0 0 3

OBJECTIVE:

- To study the management of various resources involved in construction

UNIT I RESOURCE PLANNING 10

Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.

UNIT II	LABOUR MANAGEMENT	5
Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.		
UNIT III	MATERIALS AND EQUIPMENT	10
Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.		
UNIT IV	TIME MANAGEMENT	10
Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects - Cash flow and cost control		
UNIT V	RESOURCE ALLOCATION AND LEVELLING	10
Time-cost trade off, Computer application - resource leveling, resource list, resource allocation, Resource loading, Cumulative cost - Value Management.		

TOTAL: 45 PERIODS

REFERENCES:

1. Andrew,D., Szilagg, Hand Book of Engineering Management, 1982.
2. James.A., Adrain, Quantitative Methods in Construction Management, American Elsevier Publishing Co., Inc., 1973.
3. Harvey, A., Levine, Project Management using Micro Computers, Osborne- McGraw Hill C.A.Publishing Co., Inc. 1988.
4. Oxley Rand Poslcit, Management Techniques applied to the Construction Industry, Granda Publishing Ltd., 1980.

CN 9262	PROJECT SAFETY MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVE:

- To study and understand the various safety concepts, requirements applied to construction projects

UNIT I	CONSTRUCTION ACCIDENTS	10
Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications		
UNIT II	SAFETY PROGRAMMES	10
Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives		
UNIT III	CONTRACTUAL OBLIGATIONS	5
Safety in Construction Contracts – Substance Abuse – Safety Record Keeping		
UNIT IV	DESIGNING FOR SAFETY	15
Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation		

UNIT V OWNER'S AND DESIGNER'S OUTLOOK 5
 Owner's responsibility for safety – Owner preparedness – Role of designer in ensuing safety – Safety clause in design document.

TOTAL: 45 PERIODS

REFERENCES:

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.
3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil nadu.

CN 9263 MANAGEMENT INFORMATION SYSTEM L T P C
3 0 0 3

OBJECTIVE:

- To study the concepts of information systems and their general applications

UNIT I INTRODUCTION 7
 Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolution of Information Systems.

UNIT II SYSTEM DEVELOPMENT 8
 Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.

UNIT III INFORMATION SYSTEMS 10
 Integrated Construction Management Information System - Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel - Levels, DSS, EIS, and ES - Comparison, Concepts and Knowledge Representation - Managing International Information System.

UNIT IV IMPLEMENTATION AND CONTROL 10
 Control - Testing Security - Coding Techniques - Defection of Error - Validating - Cost Benefit Analysis - Assessing the value and risk of Information System.

UNIT V SYSTEM AUDIT 10
 Software Engineering qualities - Design, Production, Service, Software specification, Software Metrics, Software quality assurance - Systems Methodology - Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation.

TOTAL: 45 PERIODS

REFERENCES:

1. Kenneth C Laudon and Jane Price Laudon, Management Information Systems - Organisation and Technology, Prentice Hall, 1996.
2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, McGraw Hill, 1974.
3. Joyce J Elam, Case series for Management Information Systems , Simon and Schuster, Custom Publishing, 1996.
4. Ralph H Sprague and Huge J Watson, Decision Support for Managers, Prentice Hall, 1996.
5. Michael W. Evans and John J Marciniah, Software Quality assurance and Management, John Wiley and Sons, 1987.
6. Card and Glass, Measuring Software Design quality , Prentice Hall, 1990.

OBJECTIVE:

To study the design of energy efficient buildings which balances all aspects of energy, lighting, space conditioning and ventilation by providing a mix of passive solar design strategies and to learn the use of materials with low embodied energy.

UNIT I INTRODUCTION 9

Energy required for building construction - Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Green house Effect – Psychrometry Chart – Measuring latent and sensible heat. Thermal Comfort – Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Protection – Types of Shading Devices – Conservation – Heating and Cooling loads.

UNIT II PASSIVE SOLAR HEATING AND COOLING 9

General Principles of passive Solar Heating – Key Design Elements - Direct gain Trombe Walls, Water Walls, Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Predicting ventilation in buildings – window ventilation calculations - Radiation – Evaporation and dehumidification – Mass Effect – Load Control – Air Filtration and odor removal – Heat Recovery in large buildings

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details - Insulation – Optical materials – Radiant Barriers Glazing materials - Daylighting – Sources and concepts – Building Design Strategies – Case Studies – Electric Lighting –Light Distribution – Electric Lighting control for daylighted buildings – Illumination requirement – Components of Daylight factor – Recommended Daylight factors – Daylighting analysis – Supplementary Artificial Lighting Design

UNIT IV HEAT CONTROL AND VENTILATION 9

Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation.

UNIT V DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – an overview of design concepts and architectural interventions – Energy efficient buildings for various zones – cold and cloudy – cold and sunny – composite – hot and dry – moderate – warm and humid – case studies of residences, office buildings and other buildings in each zones – Energy Audit - Certification

TOTAL : 45 PERIODS**REFERENCES:**

1. Moore, F., Environmental Control System, McGraw Hill Inc. 2002
2. Brown, G.Z. and DeKay, M., Sun, Wind and Light – Architectural Design Strategies, John Wiley and Sons Inc, 2001
3. Chilogioji, M.H., and Oura, E.N., Energy Conservation in Commercial and Residential Buildings - Marcel Dekker Inc., New York and Basel, 1995.
4. Cook, J., Award-winning Passive Solar Designs, McGraw Hill Book Company, 1984
5. Dubin, F.S. and Long, C.G., Energy Conservation Standards – For Building Design, Construction and Operation - McGraw Hill Book Company 1990.
6. Majumdar, M. (Ed), Energy – efficient Buildings in India, Tata Energy Research Institute, Ministry of Non Conventional Energy Sources, 2002.
7. Tyagi, A. K.(Ed), Handbook on energy audits and management Tata Energy Research Institute, 2000.
8. Handbook on Functional Requirements of Buildings Part 1 to 4 SP: 41 (S and T) -1995
9. Energy Conservation Building Code, Bureau of Energy Efficiency, New Delhi, 2007.

OBJECTIVE:

- To study the damages, repair and rehabilitation of structures.

UNIT I MAINTENANCE AND REPAIR STRATEGIES 8

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE 8

Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking

UNIT III MATERIALS AND TECHNIQUES FOR REPAIR 15

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement and polymers coating for rebars loadings from concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels and cathodic protection.

UNIT IV REPAIRS TO STRUCTURES 10

Repair of structures distressed due to earthquake – Strengthening using FRP- Strengthening and stabilization techniques for repair.

UNIT V DEMOLITION OF STRUCTURES 4

Engineered demolition techniques for structures - case studies

TOTAL : 45 PERIODS

REFERENCES:

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. Allen R.T and Edwards S.C, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.
3. Raikar, R.N., "Learning from failures - Deficiencies in Design, Construction and Service" - R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. Santhakumar A.R., "Concrete Technology" Oxford University Press, Printed in India by Radha Press, New Delhi, 2007.
5. Peter H.Emmons, "Concrete Repair and Maintenance Illustrated", Galgotia Publications pvt. Ltd., 2001.