

**ANNA UNIVERSITY OF TECHNOLOGY MADURAI**

**MADURAI – 625002**

**REGULATIONS 2010**

**CURRICULAM & SYLLABI**

**M.E CONSTRUCTION ENGINEERING AND MANAGEMENT**

**(PART TIME)**

**SEMESTER I**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	10277SQ101	<a href="#">Statistical Methods and Queuing Theory</a>	3	1	0	4
2	10211CM102	<a href="#">Modern Construction Materials</a>	3	0	0	3
3	10211CM103	<a href="#">Construction Equipment</a>	3	0	0	3
<b>TOTAL</b>						<b>10</b>

**SEMESTER II**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
4	10211CM104	<a href="#">Project Formulation and Appraisal</a>	3	0	0	3
5	E01	<a href="#">Elective I</a>	3	0	0	3
6	E02	<a href="#">Elective II</a>	3	0	0	3
<b>TOTAL</b>						<b>9</b>

**ELECTIVES FOR SEMESTER-II**

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	10211SEE11	<a href="#">Advanced Concrete Technology</a>	3	0	0	3
2	10211CME12	<a href="#">Shoring, Scaffolding and Formwork</a>	3	0	0	3
3	10211CME21	<a href="#">System Integration in Construction</a>	3	0	0	3
4	10211CME22	<a href="#">Energy Conservation Techniques in Building Construction</a>	3	0	0	3

## SEMESTER-I

**10277SQ101 STATISTICAL METHODS AND QUEUEING THEORY** **L T P C**

**3 1 0 4**

**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,  $\chi^2$  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**

### **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

**10211CM102 MODERN CONSTRUCTION MATERIALS**

**L T P C**  
**3 0 0 3**

**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**

**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.

**10211CM103 CONSTRUCTION EQUIPMENT**

**L T P C  
3 0 0 3**

**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**

**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.

**SEMESTER-II**

**10211CM104      PROJECT FORMULATIONS AND APPRAISAL      L T P C**  
**3 0 0 3**

**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**

**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.

## ELECTIVE-I FOR SEMESTER-II

**10211CME11      ADVANCED CONCRETE TECHNOLOGIES      L T P C**  
**3 0 0 3**

**UNIT I      CONCRETE INGREDIENTS      15**

Composition of OPC – Manufacture – Modified Portland Cements – Hydration Process of Portland Cements – Structure of Hydrated Cement Pastes

Mineral Admixtures – Slags – Pozzolanas and Fillers – Chemical Admixtures – Solutes – Retarders – Air Entraining Agents – Water Proofing Compounds – Plasticizers and Super Plasticizers

Aggregates – Properties and testing of fine and course aggregates – combining of aggregates – Substitute material for aggregates – recent advancements.

**UNIT II      SPECIAL CONCRETES      5**

Fibre Reinforced Concrete – Self Compacting Concrete – Polymer Concrete – High performance concrete – Sulphur concrete.

**UNIT – II      CONCRETE MIX DESIGN      10**

Mix Proportioning – Mixes incorporating Fly ash, Silica fume, GGBS – Mixes for High Performance Concrete – High strength concrete – variations in concrete strength.

**UNIT IV      MECHANICAL PROPERTIES OF CONCRETE      7**

Interfacial Transition Zone – Fracture Strength – Compressive strength – Tensile strength - Impact strength - Bond strength.

**UNIT V      DURABILITY OF CONCRETE      8**

Factors affecting durability – Chemical Attack – Permeability – chloride penetration – water absorption – creep – Shrinkage.

**TOTAL: 45**

**REFERENCES:**

1. Santhakumar.A.R., Concrete Technology, Oxford University press, New Delhi. 2007.
2. Gambhir.M.L., Concrete Technology – Tata McGraw Hill Book Co. Ltd.,Delhi, 2004.
3. Neville, A.M., Properties of Concrete, Longman, 1995.
4. Metha P.K.and Montreio P.J.M., Concrete Structure Properties and Materials, Prentice Hall, 1998.
5. Gupta.B.L. and Amit Gupta, Concrete Technology, Standard Publishers Distributer, New Delhi, 2004.

**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**

### **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.



**ELECTIVE-II FOR SEMESTER-II**

<b>10211CME21</b>	<b>SYSTEM INTEGRATION IN CONSTRUCTION</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

<b>UNIT I</b>	<b>STRUCTURAL INTEGRATION</b>	<b>9</b>
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Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

<b>UNIT II</b>	<b>ENVIRONMENTAL FACTORS</b>	<b>9</b>
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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.

<b>UNIT III</b>	<b>SERVICES</b>	<b>9</b>
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Plumbing – Electricity – Vertical circulation and their interaction - HVAC

<b>UNIT – IV</b>	<b>MAINTENANCE</b>	<b>9</b>
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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.

<b>UNIT – V</b>	<b>SAFETY</b>	<b>9</b>
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Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

**TOTAL: 45**

**REFERENCES:**

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

**10211CME22 ENERGY CONSERVATION TECHNIQUES IN BUILDING L T P C**  
**CONSTRUCTION 3 0 0 3**

**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**

**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