INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
NAAC ACCREDITED WITH 'A' GRADE
Marching Beyond 25 Years Successfully

M.E.
Construction Engineering and Management

Curriculum and Syllabus
(Based on Choice Based Credit System)
Effective from the Academic Year
2018-2019

Department of Civil Engineering
School of Engineering

M.E. CONSTRUCTION ENGINEERING AND MANAGEMENT

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

The post graduates of M.E. Construction Engineering and Management will be able to

PEO 1 Solve construction engineering and management problems by applying mathematical, scientific and construction engineering fundamentals

PEO 2 Identify and define problems, gather data related to the problem, generate and prioritize a set of alternative solutions, select and implement the best option incorporating the recommendations of relevant codes of practice

PEO 3 Acquire, Apply and communicate latest knowledge and tools to construction industry and technical institutes in the desired form through lifelong learning for a successful career in an organization or in the own startup

PEO 4 Demonstrate effective construction knowledge and quality construction management practices leading to savings in time and cost of construction projects

PROGRAM OUTCOMES (PO):

At the end of the programme, M.E. Construction Engineering and Management Engineering will be able to

PO 1 **Engineering Knowledge:** Identify, formulate, plan and schedule construction engineering projectsby applying the knowledge of mathematics, science and engineering fundamentals

PO 2 **Project Management and Finance:** Apply construction management practices and principles to a project and lead the team for efficient project management considering economical and financial factors

PO 3 **Environment and Sustainability:** Use the techniques, skills, advanced modern engineering tools, instrumentation and software packages with strong knowledge on the impact of engineering solutions on environment and the need for sustainable development

PROGRAM SPECIFIC OUTCOMES (PSO)

The Program Specific Objectives of the M.E. Construction Engineerig and Management Engineering are to produce engineers who:

PSO 1 Are competent with the contemporary developments in construction technology, concrete technology and composite materials, their properties and practical applications

PSO 2 Succeed in construction management careers emphasizing applications of construction management principles with the ability to solve broad range of problems in construction

M.E – CONSTRUCTION ENGINEERING AND MANAGEMENT
CURRICULUM

TOTAL NUMBER OF CREDITS : 80

SEMESTER 1

Category	Code No.	Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
Core	18MET011	Statistical Methods and Queuing Theory	3	1	0	4
Core	18MET012	Modern Material of construction	3	1	0	4
Core	18MET013	Construction Equipment and methods	3	1	0	4
Core	18MET014	Project Formulations and Appraisal	3	1	0	4
DSE	18MET___	Discipline Specific Elective I	3	0	0	3
Core	18MET015	Seminar 1	0	0	6	2
		Total	**15**	**4**	**6**	**21**

SEMESTER 2

Category	Code No.	Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
Core	18MET021	Advanced Construction Techniques	3	1	0	4
Core	18MET022	Contract Laws and Regulation	3	1	0	4
Core	18MET023	Quality control and Assurance in construction	3	1	0	4
DSE	18MET___	Discipline Specific Elective II	3	0	0	3
GE	18MET___	Generic Elective I	3	0	0	3
Core	18MET024	Advanced Construction Engineering and ComputingTechniques Laboratory	0	0	6	3
		Total	**15**	**3**	**6**	**21**

SEMESTER 3

Category	Code No.	Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
DSE	18MET___	Discipline Specific Elective III	3	0	0	3
DSE	18MET___	Discipline Specific Elective IV	3	0	0	3
GE	18MET___	Generic Elective II	3	0	0	3
Core	18MET031	Project Work – Phase 1	0	0	18	9
	18MET032	Inplant Training	0	0	0	2
		Total	**9**	**0**	**18**	**20**

SEMESTER 4

Category	Code No.	Course	Hours/Week			Credits
			Lecture	Tutorial	Practical	
Core	18MET041	Project Work – Phase 2	0	0	30	18
		Total	**0**	**0**	**30**	**18**

List of Discpline Specific Elective Courses

18MET101	Advanced Concrete Technology
18MET102	Design of Formworks
18MET103	System Integration in Construction
18MET104	Energy Conservation Techniques in Building Construction
18MET105	Design and Construction of Highway Pavements
18MET106	Material Management
18MET107	Resource Management and Control in Construction
18MET108	Energy Efficiency Buildings
18MET109	Tall structures
18MET110	Ports and Harbour Management
18MET111	Repair and Rehabilitation of Structures
18MET112	Ground improvement techniques
18MET113	Computer Applications in Construction Engineering and Planning
18MET114	Building Acoustics, light and ventilation engineering
18MET115	Building Services and maintenance
18MET116	Construction Personnel Management
18MET117	Construction Project Management
18MET118	Project Safety Management
18MET119	Management Information System
18MET120	GIS in ConstructionEngineering and Management

List of Generic Electives

18MET151	Fundamentals of Entrepreneurship
18MET152	Intellectual Property Rights
18MET153	E- Commerce
18MET154	Fundamentals of Nano Science
18MET155	Global Warming and Climate Change

SYLLABUS

CORE COURSES

18MET011 STATISTICAL METHODS AND QUEUING THEORY 3 1 0 4

COURSE OBJECTIVE:

To study and understand the concepts of Statistical methods and its applications in Engineering, study the effect of estimation theory, testing of hypothesis, correlation and regression, randomized design, and multivariate analysis.

COURSE OUTCOME:

CO –1: To posses knowledge on probability distributions

CO –2: To understand the maximum likelihood estimation and curve fitting

CO –3: To determine the various parametric tests and test the hypotheses

CO –4: To deign a completely randomized block design and analyze the variance

CO –5: To understand the concepts of queuing models

UNIT I PROBABILITY 12

Probability – rules in probability – conditional probability – Baye's theorem (without proof) Probability distributions – Binomial, Poisson, Uniform, Normal distribution.

UNIT II ESTIMATION THEORY 12

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

UNIT III TESTING OF HYPOTHESES 12

Sampling distributions - Type I and Type II errors - Tests based on Normal, t,mean, variance and proportions – chi-square test for Independence of attributes and Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 12

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

UNIT V QUEUING MODELS 12

Poisson process – Markovian queues – Single and Multi-Server models – Little's formula. Machine interference model – Steady state analysis – self service queue.

TOTAL: 60 h

REFERENCE BOOKS:

1. Gupta.S.P., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, Eleventh Edition, 2014.
2. J.E. Freund, Mathematical Statistical", 5th Edition, Prentice Hall of India, 2014.

3. Jay L.Devore, “Probability and statistics for Engineering and the Sciences”, 5th Edition, Thomson and Duxbury, Singapore, 2011.
4. Murray.R. SpiegelandLarry J.Stephens, “Schaum’sou Tlines- Statistics”, Third Edition, Tata McGraw-Hill, 2014.
5. R.A.Johnson and C.B.Gupta, “Miller & Freund’s Probability and Statistics for Engineers”, Pearson Education, Asia, 7th Edition, 2007
6. Richard A.Johnson and Dean W.Wichern, “Applied Multivariate Statistical Analysis”, Pearson Education, Asia, 6th Edition, 2007

18MET012 MODERN MATERIALS OF CONSTRUCTION 3 1 0 4

COURSE OBJECTIVE:

- To study and understand the properties of modern construction materials used in construction
- To understand special concretes, metals, composites, water proofing compounds, non weathering materials, and smart materials.

COURSE OUTCOME:

CO –6: To posses knowledge on the construction materials properties and its behavior

CO –7: To understand the roll of metals, composites and smart materials in construction projects

CO –8: To import knowledge on the types of smart and modern materials with its usages

CO –9: To understand the indoor thermal comfort and indoor air quality

CO –10: To understand the smart and intelligent materials in construction Industry

UNIT I SPECIAL CONCRETES 12

Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete- Light weight concrete - Polymer concrete - Hot and cold weather concrete - Self compacting concrete – Vaccum concrete - Alternate Materials to concrete.

UNIT II METALS 12

Steels – New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – anticorrosive polymer coating, anticorrosive treatment inhibited cement slurry coating, cement polymer composite coating and epoxy coated reinforcement – Applications.

UNIT III COMPOSITES 12

Composition – Constitutents – mouldings methods – tooling materials and their selection - Plastics – Representative polymers - Reinforced Polymers – Fibre reinforced polymer (FRP) –Fibre process and moulding process – Application of carbon fibre reinforced polymers and glass fibre reinforced polymers.

UNIT IV OTHER MATERIALS 12

Water Proofing Compounds – scope -, requirements, sampling, packing and marking - Non-weathering Materials – Flooring materials – soft coverings, wood flooring – resilient flooring – hard flooring – seamless chemical flooring – façade materials and their testing.

UNIT V SMART AND INTELLIGENT MATERIALS 12

Smart and Intelligent Materials for intelligent buildings **-** Matrix tool for assessing the performance of intelligent buildiings –Intelligent buildings technology – Thermal comfort , Visual comfort and Indoor air quality – climate , building-climate interaction - Energy Management systems – Smart BuidingsEvalution Tool.

TOTAL: 60 h

REFERENCE BOOKS:

1. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
2. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, “Materials for civil and Highway Engineers”, Prentice Hall Inc., 1998.
3. Mamlouk, M.S. and Zaniewski, J.P., “Materials for Civil and Construction Engineers”, Prentice Hall Inc., 1999.
4. Santhakumar.A.R., “Concrete Technology”, Oxford University press, New Delhi
5. Shan Somayaji, “Civil Engineering Materials”, Prentice Hall Inc., 2001
6. Shetty M.S, “Concrete Technology: Theory and Practice”, S.Chand & Company Ltd., 2005.

18MET013 CONSTRUCTION EQUIPMENT AND METHODS 3 1 0 4

COURSE OBJECTIVE:

- To understand the elements of equipment cost and evaluating investment alternatives.
- To familiarize with construction equipment and their capabilities.
- To properly select heavy equipment based on applications, utilization, productivity and other factors.
- To develop basic understanding of unit price and earthwork quantities**.**

COURSE OUTCOME:

CO –1: To associate the knowledge of construction of sub structures and super structures.

CO –2: To Analyze the techniques of erection of construction units.

CO –3: To demonstrate basic knowledge about construction equipment and machineries.

CO –4: To understand clearly the latest construction equipments used in industry.

CO –5: To clearly explain the equipments used for aggregate and concreting.

UNIT I CONSTRUCTION EQUIPMENT MANAGEMENT 12

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

UNIT II EQUIPMENT FOR EARTHWORK 12

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 12

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 12

Storage Handling equipment – Engineered Systems – Industrial Trucks – Bulk Material handling – On-Rails Transfer Cart –Conveyors - Hauling Equipment – tractors, Trucks, Tipper

UNIT V EQUIPMENT FOR PRODUCTION OF AGGREGATE AND CONCRETING 12

Crushers – Feeders - Screening Equipment – Pneumatic - Batching plants – Mixers – Concrete Pumps – Transit Mixers – Dumpers – Concrete Placers - Handling Equipment - Hauling, Pouring and Pumping Equipment – Transporters

TOTAL: 60 h

REFERENCE BOOKS:

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”, 5th edition, Khanna Publishers, New Delhi, 2011.
3. Deodhar, S.V., “Construction Equipment and Job Planning”,4th edition, Khanna Publishers, New Delhi, 2010.
4. Dr.MaheshVarma, “Construction Equipment and its planning and Application”,Metropolitan Book Company, New Delhi. 1988.

18MET014 PROJECT FORMULATIONS AND APPRAISAL 3 1 0 4

COURSE OBJECTIVE:

- To understand the objectives to address the problems identified in problem analysis.
- To understand about capital budgeting and basic risk concept.
- To know the strategies and to solve the problems identified in problem analysis.
- To understand about the project management plan this specifies the key tasks, targets and time scales.

COURSE OUTCOME:

CO –1: To Analyze and explain the concept of project formulation.

CO –2: To demonstrate the concept of capital budget, basic risks and feasibility report of the project.

CO –3: To clearly explain the principles and procedures in planning and evaluation of the project.

CO –4: To understand the concept of project management and appraisal.

CO –5: To understand clearly about the diiferent types of project costing.

UNIT I PROJECT FORMULATION 12

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 12

Project Cash Flows – relevant and irrelevant cash flow, sunk cost, opportunity cost, project externalities, change in net working capital – estimation of project cash flow and project operating cash flow - Time Value of Money – interest rate, simple rate, compound interest – annuity and its types– frequency of compounding – Cost of Capital

UNIT III PROJECT APPRAISAL 12

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 12

Project Financing – Means of Finance – contractual framework - engineering, procurement and construction contract, operation and maintenance agreement, shareholders agreement, off-take agreement, supply agreement, loan agreement, intercreditor agreement – Special Schemes – Key Financial Indicators – Ratios

UNIT V PRIVATE SECTOR PARTICIPATION 12

Private sector participation in Infrastructure Development Projects – Build Operate Transfer, Build Own Operate Transfer, Built Own Lease Transfer, Design Build Finance Operate and Design Construct Manage Transfer - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer

TOTAL: 60 h

REFERENCE BOOKS:

1. Prasanna Chandra, “Projects – Planning, Analysis, Selection, Implementation Review”, 7th Edition Tata McGraw Hill Publishing Company Ltd., New Delhi. 2009.
2. Joy P.K., “Total Project Management” - The Indian Context, New Delhi, Macmillan India Ltd., 2010.
3. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.

18MET021 ADVANCED CONSTRUCTION TECHNIQUES 3 1 0 4

COURSE OBJECTIVE:

- To study and understand the latest construction techniques applied to engineering construction
- To posses the knowledge on sub structure, super structure, special structures, rehabilitation and strengthening techniques and demolition techniques

COURSE OUTCOME:

CO –1: Aware of various construction activities involve in underground and under water.

CO –2: Describe various types of concreting operation in tall structures, techniques involved in erection of large span structures and transmission line structures.

CO –3: Aware of various market forms of construction sequences in some of the special structures like chimney, silos, sky scrapers etc.

CO –4: Be acquainted with knowledge of construction techniques in tall structures, special structures.

CO –5: Be familiar with the repairing work techniques.

UNIT I SUB STRUCTURE CONSTRUCTION 12

Box jacking - pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques piling techniques - driving well and caisson - sinking cofferdam cable anchoring and grouting - driving diaphragm walls, sheet piles - laying operations for built up offshore system - shoring for deep cutting - large reservoir construction -well points - dewatering and stand by plant equipment for underground open excavation.

UNIT II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS 12

Vacuum dewatering of concrete flooring – concrete paving technology – techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – launching techniques suspended form work – erection techniques of tall structures, large span structures – launching techniques for heavy decks insituprestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures.

UNIT III CONSTRUCTION OF SPECIAL STRUCTURES 12

Erection of lattice towers and rigging of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – launching and pushing of box decks – Advanced construction techniques for offshore structures – construction sequence and methods in domes and prestress domes – support structure for heavy equipment and conveyor and machinery in heavy industries – erection of articulated structures, braced domes and space decks.

UNIT IV REHABILITATION TECHNIQUES 12

Mud jacking grout through slab foundation - micropiling for strengthening floor and shallow profile - pipeline laying protecting sheet piles, screw anchors - sub grade water proofing, underpinning, crack stabilization techniques.

UNIT V DEMOLITION AND DISMANTLING 12

Advanced techniques in demolition – sequence in demolition – old methods in demolition - applications-techniques in dismantling –Thermal Cutting, Mechanical Cutting and Hydraulic Cutting - sequence in dismantling –- applications.

TOTAL: 60 h

REFERENCE BOOKS:

1. Mr Roy Chudley, “Construction Technology”, 4th Edition reprint, Pearson education ltd, 2007
2. Robertwade Brown, “Practical foundation engineering hand book”, 2nd Edition, McGraw Hill Publications, 2001.
3. Patrick Powers. J., “Construction Dewatering: New Methods and Applications”, 3rd Edition, John Wiley & Sons, 2007.
4. Jerry Irvine, “Advanced Construction Techniques”, CA Rocketr, 1984
5. Peter.H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2008.

18MET022 CONTRACT LAWS AND REGULATIONS 3 1 0 4

COURSE OBJECTIVE:

- To study the various types of construction contracts and their legal aspects and provisions and to study the of tenders, arbitration, legal requirement, and labour regulations.
- To study the tenders, arbitration, legal requirement, and labour regulations.
- To understand the concept on tenders.

COURSE OUTCOME:

CO –1: To know the elements of concluding, and administering contracts

CO –2: To achieve awareness on arbitrations and legal procedures.

CO –3: To study labour regulations and their impact on managing of contracts

CO –4: To study the various types of construction contracts and their legal aspects and provisions.

CO –5: To study the tenders, arbitration, legal requirement, and labour regulations.

UNIT I CONSTRUCTION CONTRACTS 12

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

UNIT II TENDERS 12

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

UNIT III ARBITRATION 12

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

UNIT IV LEGAL REQUIREMENTS 12

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

UNIT V LABOUR REGULATIONS 12

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

TOTAL: 60 h

REFERENCE BOOKS:

1. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", 4th Edition, M.M.Tripathi Private Ltd., Bombay, 2000
2. Jimmie Hinze, "Construction Contracts", 3rdEdtion, McGraw Hill, 2010
3. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", 7th Edition McGraw Hill, 2010.

18MET023 QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION 3 1 0 4

COURSE OBJECTIVE:

- To study the concepts of and control techniques in construction.
- To study the of design philosophy, design of special elements, flat slabs and yield line based design, and ductile detailing quality assurance.

COURSE OUTCOME:

CO –1: To understand the elements of quality planning and the implication

CO –2: To become aware of objectives and advantage of quality assurance and quality control

CO –3: To study and understand the various safety concepts and requirements applied to construction projects.

CO –4: To study the relationship between quality and safety management

CO –5: To study the construction accidents and design the safety programmes and contractual obligations

UNIT I QUALITY MANAGEMENT 12

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

UNIT II QUALITY SYSTEMS 12

ProjectIntroduction - 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 12

Techniques of 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 12

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 12

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: 60 h

REFERENCE BOOKS:

1. James, J.O' Brian, "Construction Inspection Handbook – Quality Assurance and Quality Control", Van Nostrand, New York, 2009.
2. Kwaku, A., Tena, Jose, M. Guevara, "Fundamentals of Construction Management and Organisation", Reston Publishing Co., Inc., Virginia, 2005.
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, 2002
5. Clarkson H. Oglesby, "Productivity Improvement in Construction", McGraw-Hill, 2009.

18MET024 ADVANCED CONSTRUCTION ENGINEERING AND COMPUTING TECHNIQUES LABORATORY **0 0 6 3**

COURSE OBJECTIVE:

- To provide a thorough knowledge of material selection through the material testing based on specification.
- To understand the Design of a simple equipmentinformation system fora construction project.
- To understand the Concrete making equipments.

COURSE OUTCOME:

CO –1: To understand the Various mix design standers of concrete are known (IS, ACI &BS) and characteristics of various concretes

CO –2: To clearly explain the Properties of hardened concrete in Permeability tests

CO –3: To clearly explain the NDT on hardenedconcrete-UPV, Rebound hammer and core test.

CO –4: To understand the Design of a simple equipmentinformation system fora construction project.

CO –5: To clearly explain the Schedulingof a small construction project using tools like MS project scheduling.

(A) ADVANCED CONSTRUCTION ENGINEERING LABORATORY

LIST OF EXPERIMENTS

1. Mix design of concrete as per IS, ACI & BS methods for highperformance concrete.
2. Flow Characteristics of Self Compacting concrete
3. Effect of mineral sand chemical ladmixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.
4. NDT on hardenedconcrete-UPV, Rebound hammer and core test.
5. Permeability tests on hardened concrete

TOTAL: 30h

LIST OF EQUIPMENTS REQUIREMENT:

1. Concrete making equipments.
2. Equipments for self-compacting concrete.
3. Workability and slump equipments for HPC&SCC.
4. Equipments for compression testing with very high precision with automated graph
5. NDTequipments – UPV,rebound hammer,core cutting machine (electricallyoperated)
6. Permeability apparatus
7. Oven (Range0 to600°C)

(B) ADVANCED COMPUTING TECHNIQUES LABORATORY

COURSE OBJECTIVE :This course gives an exposure to students in utilizing the sophisticated spread sheets
programs, estimation software and other package programs and helps to gain knowledge about risk management.

LIST OF EXPERIMENTS

1. Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project.
2. Design of a simple equipmen tinformation system fora construction project.
3. Scheduling f asmall construction project using Primavera scheduling systems including reports and tracking.
4. Schedulingof a small construction project using tools like MS project scheduling systems including reports and tracking.
5. Simulation models for project risk analysis.

TOTAL: 30h

LIST OF EQUIPMENTS/ SOFTWARES/ TOOLS REQUIREMENTS

1. MS OFFICE
2. QEPRO
3. MSOFFICE SUIT
4. PRIMAVERA POWER USER
5. PRIMAVERA CONTRACTOR STANDARD
6. PERTMASTER
7. PRIMAVERA MONTECARLO SIMULATION
8. PRIMAVERA EXPEDITION

SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE COURSES

18MET101 ADVANCED CONCRETE TECHNOLOGY 3 0 0 3

COURSE OBJECTIVE:

- To study the properties of concrete making materials, tests, mix design, special types of concretes
- To know the applications of different materials with purposes, various methods for making concrete.
- To study different strengths of the special concretes

COURSE OUTCOME:

CO –1: The students will gain knowledge of constituents, manufacturing process and testing of cement.

CO –2: Make proper choice of retarders, air entraining agents, plasticizers and other admixtures that should be used in concrete.

CO –3: Choose proper testing methods and aware of codes available for aggregates.

CO –4: Execute mix proportioning of concrete and become aware of influence of addition of fibre on concrete properties.

CO –5: Develop knowledge of durability testing methods of concrete.

UNIT I CONCRETE INGREDIENTS 9

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 9

Fibre Reinforced Concrete – effect of fibers in concrete and its benefits - Self Compacting Concrete – Polymer Concrete – High performance concrete and High Strength Concrete – vacuum concrete – Sulphur concrete.

UNIT III CONCRETE MIX 9

Mix Proportioning – Mixes incorporating Fly ash, Silica fume, GGBS – Mixes for High Performance Concrete High strength concrete – variations in concrete strength – proportioning, uses of waste materials in concrete

UNIT IV MECHANICAL PROPERTIES OF CONCRETE 9

Interfacial Transition Zone – Fracture Strength – Brittle and Ductile Fracture – Crack separation modes Compressive strength – testing method and its specification – Tensile strength – flexural tensile strength and Splitting tensile strength - Impact strength - Bond strength.

UNIT V DURABILITY OF CONCRETE 9

Factors affecting durability – Chemical Attack – Permeability – chloride penetration – Rapid chloride Penetration Test - water absorption – creep – Factors influencing creep – Effect of Creep - Shrinkage – Plastic and Drying Shrinkage.

TOTAL: 45 h

REFERENCE BOOKS:

1. Santhakumar.A.R., “Concrete Technology”, 7th Edition, Oxford University press, New Delhi. 2011.
2. Gambhir.M.L., “Concrete Technology”, 4th Edition, Tata McGraw Hill Book Co. Ltd.,Delhi, 2011.
3. Neville, A.M., “Properties of Concrete”, 4th Edition, Longman, 2000.
4. ACI 214, “Recommended Practice for Evaluation of the Strength Tests Results of Concrete”, American Concrete Institute, Farmington Hills, MI, www.concrete,org.
5. M.S. Shetty., “Concrete Technology”, first Reprint, S.Chand Publication New Delhi, 2010

18MET102 DESIGN OF FORMWORKS 3 0 0 3

COURSE OBJECTIVE:

- To study and understand the overall and detailed planning of formwork, plant and site equipment. To understand the Design and erection of forms for various elements such as slabs, beams, columns, walls, shells and tunnels.
- To know the latest methods of form construction.

COURSE OUTCOME:

CO –1: To understand the planning and site requirements and various formworks

CO –2: To understand the uses of form materials

CO –3: To design the shoes and forms and basic calculations of column, ties and anchor.

CO –4: To understand the use of formwork for building

CO –5: To understand the forms for domes and tunnels, slip forms and safety practices for scaffolds

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 h

REFERENCE BOOKS:

1. Robert L. Peurifoy and Garold D. Oberlender, “Formwork For Concrete Structures”, 4th Edition, McGraw – Hill , 2010.
2. Hurd, M.K., “Formwork for Concrete”, 7th Edition , American Concrete Institute, Detroit, 2006
3. Michael P. Hurst, “Construction Press”, London & New York, 2003
4. Austin, C.K., “Formwork for Concrete”, Cleaver – Hume Press Ltd., London, 1996.

18MET103 SYSTEM INTEGRATION IN CONSTRUCTION 3 0 0 3

COURSE OBJECTIVE:

To study and understand the construction system integration, environmental factors such as the quality of air, acoustic control; services such as airconditioning , maintenance and safety systems.

COURSE OUTCOME:

CO –1: To study and understand the construction system integration,

CO –2: To understand the environmental factors

CO –3: To expose the building service conditions

CO –4: To study about maintenance and safety systems in construction.

CO –5: To know the requirement of various structural systems in construction.

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 – advance methods, advance materials – Electricity – advance methods - Vertical circulation and their interaction – Heat, Ventilation and Air-Conditioning

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 h

REFERENCE BOOKS:

1. William T. Mayer, “Energy Economics and Building Design” , McGraw-Hill Book Company, 1999.

2. Peter R. Smith and Warren G. Julian, “Building Services”, Applied Science Publishers Ltd., London, 2003.
3. A.J.Elder and MartizVindenBarg, “Handbook of Building Enclosure”, McGraw-Hill Book Company, 1993.
4. Jane Taylor and Gordin Cooke, “The Fire Precautions Act in Practices”, 2006.
5. David V.Chadderton, “Building Services Engineering”, Taylar and Francis, 2007.

18MET104 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION **3 0 0 3**

COURSE OBJECTIVE:

- To study the various energy saving and management techniques applied to building and construction with relevance to environment.
- To gain knowledge on building and construction.
- To gain knowledge on energy conservation techniques

COURSE OUTCOME

CO –1: Understand and apply fundamental concepts of energy and utilities as related to the built environment

CO –2: Explain the approaches of the two primary national residential green building programs (LEED for Homes and the NAHB Green Building Standard) in their treatment of energy efficiency.

CO –3: Describe the objectives and procedures of energy and IEQ focused rating systems such as the Home Energy Rating System.

CO –4: Feel prepared to take the BPI Infiltration and Duct Leakage (IDL) Certification exam, with some additional self-directed preparation as needed

CO –5: Identify the objectives and challenges in designing and building highly efficient or zero energy buildings.

CO –6: Gain experience with HVAC controls and maintenance.

UNIT I INTRODUCTION **9**

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 **9**

Energy and resource conservation – Design of green buildings – Evaluation toolsfor 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 **9**

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 9

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 9

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 h

REFERENCE BOOKS:

1. Moore F., “Environmental Control system”, McGraw 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”, McGraw Hill, 1984.
4. J.R. Waters, “Energy conservation in Buildings: A Guide to part L of the Building Regulations”, Blackwell Publishing, 2003.

18MET105 DESIGN AND CONSTRUCTION OF HIGHWAY PAVEMENTS 3 0 0 3

COURSE OBJECTIVE:

- To study the properties of flexible and rigid pavement the properties of bituminous mixture.
- The properties of pavement quality concrete mixtures is obtained.
- To gain knowledge on the advanced technologies

COURSE OUTCOME:

CO –1: To expose on the philosophy underlying the concept of design of structures.

CO –2: To study the properties of road construction materials.

CO –3: To know the various types of equipment used in road construction.

CO –4: To study the properties of pavement quality concrete mixtures and construction practices

CO –5: To clearly understand the latest advancements in construction

UNIT I ROAD MAKING MATERIALS FOR FLEXIBLE AND RIGID PAVEMENTS 9

Road Pavements and pavement layers - types, functions, choice Factors affecting design and performance of flexible and rigid pavements – Pavement design factors, loads Classification, testing and applications of road making aggregates – Road binders – Bitumen - Cement

UNIT II PROPERTIES OF BITUMINOUS MIXTURES 9

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 MIXTURES AND CONSTRUCTION PRACTICE 9

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 9

Road making machinery Role of labour versus machinery, in roadconstruction, earth work machinery, rock excavation machinery, aggregate – transportation and watering equipment - wet mix WMM Plant, Asphalt plant, (computerized), drum mix, Continuous batch mix, compaction equipment,bituminous equipment, storage, heating and spraying equipment, hot mixplants, cold mix plants, paver, finisher, concrete road making machinery - equipment usage rates - factors affecting usage rate - Road formation, bituminous constructions - Road surface evaluation

UNIT V LATEST ADVANCEMENTS 9

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 h

REFERENCE BOOKS:

1. Mix Design Methods for Asphalt Concrete and other Hot mix types MS 2, Sixth Edition, The Asphalt Institute, 2010.
2. Edwin J.Barth, “Asphalt Science and Technology”, Gordon and Breach Science Publishers, New York, 2004.
3. Bituminous materials in road construction, The English Language Book Society and Her Majesty’s Stationery Office, 2006.

18MET106 MATERIALS MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:

- To understand reducing the price of items, operating cost but in enhancing the profits.
- To ensure the efficiency with which the capital of the company is utilized resulting in higher return on investment.
- To gain knowledge in procuring of quality materials.
- To understand handling of materials effectively and efficiently.

COURSE OUTCOME:

CO –1: To clearly understand the meaning of materials management and are able to plan and manage material flows.

CO –2: To understand the coordination of planning, sourcing, purchasing, moving, storing and controlling of materials.

CO –3: To save the material cost and increase the profits

CO –4: To minimize procurement costs and improves opportunities for reducing the overall project costs.

CO –5: To clearly understand the methods of disposal and rules and regulation followed for disposal.

UNIT I MATERIAL CLASSIFICATION 9

Material Classification- Organizing for materials management – basis for, forming organizations – conventional and modern approaches to organizing,materials management. Materials identification – classifying of materials – codification of materials – standardization – simplification and varietyreduction of materials

UNIT II MATERIAL PURCHASING 9

Material Purchasing– Planning Purchasing Materials – Norms of Vendor, Rating – Cei Methodology – Material Selection And Development – Purchasing Procedures And Methods – Legal Aspects – Insurance of Materials.

UNIT III PROCUREMENT MANAGEMENT 9

Supply Management – Sources Of Supply – Out Sourcing Material,Management- Procurement Organization - Procurement Planning – Functions of Material Management - Inventory Control.

UNIT IV STORE MANAGEMENT 9

Storing of Materials-Management of stores – location – different types of stores – methods of storing – safety and security of materials – stores equipment – materials handling equipment – factors affecting materials handling

UNIT V WASTE MANAGEMENT 9

Scrap & Obsolete Materials-Management of surplus obsolete and scrap materials – reasons for accumulation of surplus obsolete and scrap materials– methods of disposal – regulations and procedures

Total : 45 h

REFERENCE BOOKS:

1. A.K. Datta, “Materials Management: Procedures, Text and Cases”, PHI Learning Pvt. Ltd.,2004.
2. Arnold, “Introduction To Materials Management”, Pearson Education India,2009
3. Richard J. Tersine, “Principles Of Inventory And Materials ,Management”, Prentice Hall,2004
4. Richard J. Tersine, “Modern Materials Management”, John Hardin Campbell - 2007
5. P. Gopalakrishnan, “Handbook of Materials Management”, PHI Learning Pvt. Ltd.2004

18MET107 RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION 3 0 0 3

COURSE OBJECTIVE:

- To study, manage and control the various resources involved in construction industry.
- To study the effect of resource planning, labour management, material and equipment in the construction.
- To understand the time management and forecasting for future.
- To plan and manage the resources (men, material, money, machineries) in the construction efficiently.

COURSE OUTCOME:

CO –1: To be well versed in resource planning and management in construction

CO –2: To demonstrate the time management for all kind of projects.

CO –3: To ensure the availability of resources and optimize time, effort and money.

CO –4: To clearly understand the labour costs and schedule in construction.

CO –5: To be well versed to manage the materials at site

UNIT I RESOURCE PLANNING 9

Definition - Principles - 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 9

Prismatic compass - Surveyor's 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 9

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 9

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 9

Time-cost trades off, Computer application - resource leveling, resource list, resource allocation, Resource loading, Cumulative cost - Value Management.

TOTAL: 45 h

REFERENCE BOOKS

1. Andrew,D., Szilagg, “Hand Book of Engineering Management”, 2nd Edition, 2001.
2. James.A.,Adrain, “Quantitative Methods in Construction Management”, American Elsevier Publishing Co., Inc., 1973.
3. Harvey, A., Levine, “Project Management using Micro Computers”, Obsorne-McGrawHillC.A.Publishing Co., Inc. 1988.

18MET108 ENERGY EFFICIENCY BUILDINGS 3 0 0 3

COURSE 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.
- To understand the energy requirement of the building construction,
- To understand the key design elements for energy efficient buildings

COURSE OUTCOME

CO –1: To Know the energy requirement of the building construction.

CO –2: To Understand the key design principles for energy efficient buildings.

CO –3: To Know the Heat transmission, heat control and ventilation.

CO –4: To Know about the Energy efficient buildings for various zones.

CO –5: To study the design of energy efficient buildings which balances all aspects of energy, lighting, space conditioning and

UNIT I ENERGY REQUIRED FOR BUILDING 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 PRINCIPLES 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 MATERIAL REQUIREMENT 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 day lighted buildings – Illumination requirement– Components of Daylight factor – Recommended Daylight factors –Daylighting analysis – Supplementary Artificial Lighting Design

UNIT IV MATERIAL REQUIREMENT 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 ENERGY EFFICIENCY 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: 45h

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,2005.

18MET109 TALL STRUCTURES 3 0 0 3

COURSE OBJECTIVE:

- They should know the rudimentary principles of designing tall buildings as per the existing course.
- At the end of this course the student should have understood the problems associated with large heights of structures with respect to loads(wind and earthquake and deflection of the structure).

COURSE OUTCOMES:

CO –1: To know about the distribution of forces in vertical structure plane and the different types of framing and bracing systems.

CO –2: To clearly understand the behaviour of common high rise buildings under loading.

CO –3: To explore knowledge on the shear walls, shear truss etc., and their counteracting or dynamic response.

CO –4: To know how to analyze the different wall structures and to understand the concepts on deformation of framed structures.

CO –5: To clearly come up about the behaviour of other high rise structures such as deep beam, suspension systems, pneumatic high-rise buildings etc.,

UNIT I INTRODUCTION 9

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High RiseBuildingStructures – GeneralPlanningConsiderations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UNIT II THE VERTICAL STRUCTURE PLANE 9

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT III COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD 9

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design

Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS 9

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT V OTHER HIGH-RISE BUILDING STRUCTURE 9

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

TOTAL : 45 h

REFERENCEBOOKS

1. Wolfgang Schueller "High-rise building Structures", John Wiley and Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc.,1991.
3. Coull, A. and Smith, Stafford, B. " Tall Buildings ", Pergamon Press, London, 1997.
4. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.
5. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

18MET110 PORTS AND HARBOUR MANAGEMENT 3 0 0 3

. **COURSE OBJECTIVE :**

- To study about port management bodies , port and harbours, their facilities.
- To learn about the risk assessment criteria and structuring , environmental management and tools and also safety management

COURSE OUTCOME:

CO –1: To study the various types of organization and their impact on and suitability to construction projects

CO –2: To understand the role of environmental factors in ports and harbor management.

CO –3: To study about the implication of proper safety management for seashore condition.

CO –4: To clearly understand the concept of safety management system.

CO –5: To be well versed in Environmental management practices and rogramme.

UNIT I INTRODUCTION 9

Overview – Port Management Bodies – Port and Habour – Systematic Framework for Port Management and Administration – Port facilities and procedures for entering and leaving.

UNIT II RISK ASSESSMENT CRITERIA AND STRUCTURING 9

Port and habour risk assessment criteria – frequency criteria – consequence criteria across four categories – derived risk matrix – using the risk matrix – structuring the risk assessment – defining the skill base – defining the framework - Undertaking the risk assessment – data gathering and system assessment – hazard identification process – risk analysis – assessment of existing risk management strategies – development of new measures – assessment of control Racing.

UNIT III SAFETY MANAGEMENT SYSTEM 9

Port and habour safety management system – safety management system challenges – introducing and making procedures work – safety management system review and technique.

UNIT IV ENVIRONMENTAL MANAGEMENT TOOLS FOR PORTS AND HABOUR 9

Environmental Management System – Scope of EN ISO 14001 – Eco-Management and Audit Scheme and its scope – Environmental Review, Environmental Aspects and Impacts, Environmental Audit, Environmental Awareness Training.

UNIT V ENVIRONMENTAL MANAGEMENT PRACTICES AND PROGRAMME 9

Environmental Management Practices for Development Plans - Environmental Management Practices for Operations – developing and Implementing an Environmental Management Programme.

TOTAL: 45 h

REFERENCE BOOKS

1. Marc J. Hershman, “Urban Ports And Harbour Management”, Taylor & Francis Publishing Co,2007
2. Patrick Alderton, “Port Management and Operations”, Lloyd's Practical Shipping Guides, 2008
3. John D. Donahue and Mr. Mark H. Moore, “Ports in a Storm: Public Management in a Turbulent World”, 2010
4. Brebbia C. A.,Sciutto G., “Maritime Engineering & Ports III (Water Studies)”, 2002

18MET111 REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3

COURSE OBJECTIVE:

- To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
- To understand the rehabilitation of structures.

COURSE OUTCOME:

CO –1: To expose on the repair and rehabilitation of structures

CO –2: To study about the materials and their behavior while used in construction.

CO –3: To study about Durability of Different Types of Buildings

CO –4: To study about the Techniques for Repair and Strengthening Measures

CO –5: To be well versed about sequence of demolition in construction.

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

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 9

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 9

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, Gunite 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 9

Repair of structures distressed due to earthquake – Strengthening using FRP- Strengthening and stabilization techniques for repair. Repairs to overcome low member strength – Deflection – Cracking – Chemical disruption - weathering corrosion – wear – fire - leakage and marine exposure

UNIT V DEMOLITION OF STRUCTURES 9

Engineered demolition techniques for structures – application – sequence – damage assessment – controlled blasting for demolition – Techniques for residual stress measurements. Case studies

TOTAL: 45 h

REFERENCE BOOKS:

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), RaikarBhavan, 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.

18MET112 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3

COURSE OBJECTIVES

- To provide knowledge on various dewatering techniques and to gain knowledge about compaction techniques
- To distribute Knowledge about various stabilization techniques and its applications
- To give knowledge about various strengthening materials and techniques of soil

COURSE OUTCOMES

CO –1: To Understand the techniques of ground improvement in cohesive and granular soils.

CO –2: To Perform the Stability analysis and Design of Reinforced earth retaining wall.

CO –3: To Understand the various soil stabilization

CO –4: To Design and assess the degree of improvement methods and influencing factors.

CO –5: To Understand the principles of soil reinforcement and confinement in engineering constructions

UNIT I INTRODUCTION 9

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable groundimprovement techniques based on soil condition.

UNIT II DRAINAGE AND DEWATERING 9

Drainage techniques - Well points - Vaccum and electroosmotic methods - Seepage analysis fortwo dimensionalflow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compactionand consolidation Vibrofloation - Sand pile compaction - Preloading with sand drains and fabricdrains – Stone columns – Lime piles -Installation techniques only - relative merits of variousmethods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth –use of Geotextiles for filtration, drainage and separation in road and other works.

UNIT V GROUT TECHNIQUES 9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

TOTAL: 45 h

REFERENCE BOOKS:

1. Moseley M.P., “Ground Improvement Blockie Academic and Professional”, Chapman andHall, Glassgow, 2003
2. Jones J.E.P., “Earth Reinforcement and Soil Structure”, Butterworths, 2005.
3. Koerner, R.M., “Design with Geosynthetics”, (3rd Edition) Prentice Hall, New Jersey, 2002
4. Jewell, R.A., “Soil Reinforcement with Geotextiles”, CIRIA special publication, London, 2011
5. Das, B.M., “Principles of Foundation Engineering”, Thomson Books / Cole, 2003.

18MET113 COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING **3 0 0 3**

COURSE OBJECTIVE:

- To study and understand the hardware and software requirements of computer, programming, optimization techniques, inventory models and scheduling techniques applied to construction engineering.
- To give knowledge about computer applications in construction engineering.

COURSE OUTCOMES:

CO - 1 : To understand the optimization techniques in construction engineering.

CO - 2 : To understand the Software applications , Resource Allocation ,Over Allocation, Resource Leveling and Smoothening,Preparation of Detailed Reports.

CO – 3 : To understand about the resource allocation and leveling

CO – 4 : To be well versed in scheduling and monitoring

CO – 5 : To clearly understand the concept of Monitoring and controlling.

UNIT I INTRODUCTION **9**

Introduction to System Hardware – Languages – Feasibility study and analysis – procurement, training, implementation and system management – procedural language - developing application with spread sheet -developing application with files and database software.

UNIT II OPTIMIZATION TECHNIQUES **9**

Basic skills and techniques required producing construction drawings and specifications conforming to current building codes Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications

UNIT III INVENTORY MODELS AND RESOURCE ALLOCATION CONCEPTS **9**

Deterministic and Probabilistic Inventory Models - Software applications - Resource Allocation - Over Allocation- Resource Leveling and Smoothening-Preparation of Detailed Reports.

UNIT IV SCHEDULING APPLICATION **9**

Project planning and scheduling- Critical path method (CPM) – Project Evaluation Review Techniques (PERT) – Advanced planning and scheduling concepts – computer application- Case study.

UNIT V OTHER PROBLEMS **9**

Estimating – project planning and scheduling- accounting and cost engineering – Quantity takeoff-men, material, machinery and duration - A complete Estimate of a project- A Case study Enterprises – Introduction to ERP systems - operations simulation

TOTAL: 45 h

REFERENCE BOOKS:

1. Billy E.Gillet., “Introduction to Operations Research – A Computer Oriented Algorithmic Approach”, Tata McGraw Hill, 1990
2. Paulson, B.R., “Computer Applications in Construction”, McGraw Hill, 1995
3. Feigenbaum,L., “Construction Scheduling with Primavera Project Planner”, Prentice Hall Inc., 2002

18MET114 BUILDING ACOUSTICS, LIGHT AND VENTILATION ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

- To study the key terminology used in building acoustics inside the building
- To identify the right codes and standards used for the buildings
- To understand the concept of reverberation, absorption coefficient and sound transmission loss.
- To apply the acoustic features to HVAC design and specifications.

COURSE OUTCOME:

CO –1: To clearly understand the effects of sound, noise control and sound insulation and its remedial measures. in buildings.

CO –2: To demonstrate types of ventilation, air conditioning and fire resistance in the buildings.

CO –3: To clearly understand the basic principles in designing open air theatres, cinemas, lecture halls for acoustics.

CO –4: To incorporate the elements of sound and noise, and their control, the design of constructional measures to control acoustics

CO –5: To clearly know about the noise pollution and its control

UNIT I INTRODUCTION 9

Sound waves, Frequency, Intensity, Wave length, Measurement of sound, Decibel scale speech and music frequencies, human ear characteristics-Tone structure

UNIT II NOISE MEASUREMENT 9

Outdoor noise levels - acceptable indoor noise levels-IS codes -sonometer, determinate of density of a given building material, absorption co-efficients and measurements, choice of absorption material, resonance , reverberation ,echo, exercises involving reverberation time and absorption co-efficient.

UNIT III NOISE CONTROL 9

Sources and impacts of noise – Sound level meter - Effects – Assessment – Standards - Types of noises, transmission of noise, transmission loss, noise control and sound insulation, remedial measures and legislation.

UNIT IV INSULATION 9

Walls /partitions, floors/ceilings, windows/doors, insulating fittings and gadgets machine mounting and insulation of machinery. Thermal insulation – Heat transference – insulating material – method of application – ventilation – requirements – types of ventilation – Air conditioning – Fire proof construction methods – Principles of acoustical design of building.

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UNIT V APPLICATIONS 9

Site selection ,shape ,volume ,treatment for interior surfaces-basic principles in designing open air theatres ,cinemas, broadcasting studios, concert halls, class rooms, lecture halls and theatres for acoustics.

TOTAL: 45 h

REFERENCE BOOKS

1. Dr.V.Narasimhan, “An introduction to Building Physics”, Kabeer printing works,chennai-5, 1974
2. D.J.Groomet, “Noise ,Building and People”, Pergumon Press, 1977
3. Thomas D.North wood, “Architecture acoustics” dowden, Hutchinson and Ross Inc., 1977
4. B.J.Smith ,R.J.Peters, Stephanie Owen, “Acoustics and Noise Control”, Longman Group Ltd - New york ,USA, 1982

18MET115 BUILDING SERVICES AND MAINTENANCE 3 0 0 3

. **COURSE OBJECTIVE:**

- To study the basic knowledge on the principles and functional design of buildings
- To identify the right codes and standards used for the buildings
- To understand the concept of buildings relating to water supply, sanitary, electrical, and also intelligent buildings.
- To understand the ideas of smart and intelligent buildings and its services.

COURSE OUTCOME:

CO –1: To be well versed in water purification and treatment and rain water harvesting.

CO –2: To clearly understand the arrangement of sewerage systems, piping systems in housing.

CO –3: To understand the electrical installations, wiring systems in the buildings.

CO –4: To clearly understand about air conditioning and protection against fire.

CO –5: To be well versed in intelligent building concepts

UNIT I WATER SUPPLY 9

Water quality, Purification and treatment- water supply systems-distribution systems in small towns - types of pipes used- laying jointing ,testing-testing for water tightness plumbing system for building-internal supply in buildings- municipal bye laws and regulations - Rain Water Harvesting.

UNIT II SANITATION ARRANGEMENTS 9

Sanitation in buildings-arrangement of sewerage systems in housing -pipe systems- storm water drainage from buildings -septic and sewage treatment plant - collection, conveyance and disposal of town refuse systems.

UNIT III ELECTRICAL INSTALLATIONS 9

Types of wires , wiring systems and their choice -planning electrical wiring for building -main and distribution boards -transformers and switch gears -modern theory of light and colour -synthesis of light -luminous flux -candela- lans of illumination-lighting design-design for modern lighting.

UNIT IV AIR CONDITIONING 9

Ventilation and its importance-natural and artificial systems-Window type and packaged air-conditioners-chilled water plant -fan coil systems-water piping -cooling load -air conditioning systems for different types of buildings -protection against fire to be caused by A.C.Systems.

UNIT V INTELLIGENT BUILDINGS 9

Causes of fire in buildings-safety regulations-NBC-planning considerations in buildings like Non-combustible materials, construction, staircases and A.C. systems, special features required for physically handicapped and elderly in building types-heat and smoke detectors-dry and wet risers-Automatic sprinklers - Capacity determination of OHT and UGT for firefighting needs.. Intelligent buildings-Building automation-Smart buildings- Building services in high rise buildings.

TOTAL: 45 h

REFERENCE BOOKS:

1. G.M.Fair,J.C.Geyer and D.Okun, “Water and waste Engineering” ,Vol.II,John Wiley &sons,Inc.,New York. 1968
2. R.G.Hopkinson and J.D.Kay , “The Lighting of buildings” ,Faber and Faber,London, 1969
3. Hand book for Building Engineers in Metric systems,NBC, New Delhi, 1968
4. Philips Lighting in Architecture Designs, McGraw Hill, New York, 1964
5. Time saver Standards for Architecture Design Data , Callendar JH ,McGraw Hill, 1974
6. William H.Severns and Julian R.Fellows, “Air conditioning and refrigeration” ,John Wily and sons, London,1988.

18MET116 CONSTRUCTION PERSONNEL MANAGEMENT 3 0 0 3

COURSE OBJECTIVE :

- To study about the elements of human behaviour and their impact on construction personnel management, awareness on fundamentals of human behavior under varying stress conditions, behaviour pattern to manpower planning in organizational setups, the means of management of construction personnel and utility of training as a tool for improvement.
- To understand the concept on Organization process and Organization chart.

COURSE OUTCOME:

CO –1: To understand the Manpower Planning process and Factors influencing supply and demand of human resources.

CO –2: To clearly explain the Organization process and Organization chart.

CO –3: To understand the concept of Compensation and evaluation of training.

CO –4: Elaborate the concept on management and development methods and descriptions and organization structure and human relations.

CO –5: To clearly explain the Laws related to welfare measures.

UNIT I MANPOWER PLANNING 9

Manpower Planning process , Organising, Staffing, directing, and controlling – Estimation, manpower requirement – Factors influencing supply and demand of human resources – Role of HR manager – Personnel Principles.

UNIT II ORGANISATION 9

Organisation – Span of Control – Organisation Charts – Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection - Placement, Training and Development.

UNIT III HUMAN BEHAVIOUR 9

Introduction to the field of people management - basic individual psychology; motivation - Job design and performance management - Managing groups at work - self-managing work teams - intergroup behaviour and conflict in organisations – Leadership - Behavioural aspects of decision-making; and communication for people management

UNIT IV WELFARE MEASURES AND DEVELOPMENT 9

Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures - Identification of training needs- training calendar- outsourcing for training-in-house training- training to overcome deficiencies- evaluation of training.

UNIT V MANAGEMENT AND DEVELOPMENT METHODS 9

Compensation - Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services - Safety and Health – Discipline and discharge - Special Human resource problems, Performance appraisal. - Employee hand book and personnel manual - Job descriptions and organization structure and human relations – Productivity of Human resources.

TOTAL: 45 h

REFERENCE BOOKS:

1. Carleton Counter II and Jill Justice Coutler , "The Complete Standard Handbook of Construction Personnel Management", Prentice-Hall, Inc., New Jersey, 1989.
2. Memoria,C.B., "Personnel Management", Himalaya Publishing Co., 1997.
3. Josy.J. Familaro, "Handbook of Human Resources Administration", McGraw-Hill International Edition, 1987.

18MET117 CONSTRUCTION PROJECT MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:

- To study the various management techniques for successful completion of construction projects.
- To study the effect of management for project organization, design of construction process, labour, material and equipment utilization, and cost estimation

COURSE OUTCOME:

CO –1: Develop knowledge of Construction Professional Services, Finance facilities, Legal and regulatory requirements, Role of contractors and Project Managers.

CO –2: Gain knowledge on Professional Construction Management and interpersonal behavior in Project Organization, leadership and motivation.

CO –3: Apply knowledge on Construction Planning , Computer Aided Engineering and Value Engineering, Feasibility Studies.

CO –4: Get Awareness about the Cost Estimation in the Construction Project

CO –5: To gain knowledge on utilization of labour, materials and eqipments.

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

UNIT IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION 9

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity - Labour Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment -

Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks

UNIT V COST ESTIMATION 9

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

TOTAL: 45 h

REFERENCEBOOKS:

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders”, 2.2 Edition, Prentice Hall, Pittsburgh, 2008.
2. Chitkara, K.K., “Construction Project Management: Planning, Scheduling and Control”, 2nd Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2010.
3. George J.Ritz , “Total Construction Project Management”, McGraw-Hill Inc,1994.

18MET118 PROJECT SAFETY MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:

- To study and understand the various safety concepts and requirements applied to construction projects and to study the of construction accidents, safety programmes, contractual obligations & design for safety.
- To understand the designing for safety

COURSE OUTCOME:

CO –1: To understand the construction accidents and Legal Implications.

CO –2: To clearly explain the Elements of an Effective Safety Programme.

CO –3: To understand the Safe Workers and its types.

CO –4: To clearly explain the Owners responsibility and safety and role of designers in ensuring safety – safety clause in design document.

CO –5: To clearly explain the contractual obligations and owners' and designers' outlook

UNIT I CONSTRUCTION ACCIDENTS 9

Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications

UNIT II SAFETY PROGRAMMES 9

Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives

UNIT III CONTRACTUAL OBLIGATIONS 9

Safety in Construction Contracts – Substance Abuse – Classification – Public Health, Medical, Drug misuse – Signs and Symptoms – Safety Record Keeping

UNIT IV DESIGNING FOR SAFETY 9

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 OWNERS' AND DESIGNERS' OUTLOOK 9

Owners responsibility and safety –owners responsibility clause, general clause paramount, seaworthiness – deviation clause – laydays and canceling day - owners preparedness – role of designers in ensuring safety – safety clause in design document.

TOTAL: 45 h

REFERENCES BOOKS:

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.

18MET119 MANAGEMENT INFORMATION SYSTEM 3 0 0 3

COURSE OBJECTIVE:

- To study the concepts of information systems and their applications, system development and information systems, implementation and control, and system audit.
- To understand the importance of Management Information System.

COURSE OUTCOME:

CO –1: To understand the concept on Information Systems , Establishing the Framework ,Business Models, Information System Architecture.

CO –2: To clearly explain the System Development Life Cycle and Structured Methodologies.

CO –3: To understand the importance of Management Information System.

CO –4: Obtain knowledge on SYSTEM AUDIT and Systems Methodology.

CO –5: Elaborate the concept on value and risk of Information System.

UNIT I INTRODUCTION 9

Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolution of Information Systems.

UNIT II SYSTEM DEVELOPMENT 9

Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.

UNIT III INFORMATION SYSTEMS 9

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 9

Control - Testing Security - Coding Techniques - Defection of Error - Validating - Cost Benefit Analysis - Assessing the value and risk of Information System.

UNIT V SYSTEM AUDIT 9

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 h

REFERENCE BOOKS:

1. Kenneth C Laudon and Jane Price Laudon, Management Information Systems - Organisation and Technology, 11th Edition, Prentice Hall, 2008.
2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, 21st Reprint, McGraw Hill, 2008.
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.

18MET120 GIS IN CONSTRUCTION ENGINEERING AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:

- To introduce the students to the basic concepts and principles of various components of remote sensing.
- To provide an exposure to GIS and its practical applications

COURSE OUTCOME:

CO –1: To understand the DataTypes, Spatial and Non-Spatial.

CO –2: Elaborate the concept on Raster and Vector Data Structure and its application.

CO –3: To clearly explain the concept of Maps, Graphs, Charts, Plots, Reports – Printers, Plotters.

CO –4: Elaborate the concept on Fields of application with Case study

CO –5: To understand the data structure and data management

UNIT I INTRODUCTION 9

GIS - Definition - Components of GIS -Maps - Definition - Types of Maps - Characteristics of Maps - Map Projections -- Hardware, Software and Organizational Context - GIS software

UNIT II DATA INPUT 9

Data Types - Spatial and Non-Spatial - Spatial Data - Points, Lines and areas- Non-spatial data - Nominal, Ordinal, Interval and Ratio - Digitizer - Scanner - Editing and Cleaning - Geo reference data

UNIT III DATA STRUCTURE 9

Raster and Vector Data Structure - Raster data storage - Run length, Chain and Block Coding - Vector Data Storage - Topology - Topological Models - Arc Node Structure - Surface Data – Digital Elevation Model - Grid Digital Elevation Model and Triangulated Irregular Network structure- Applications of Digital Elevation Model

UNIT IV DATA MANAGEMENT 9

Reclassification - Measurement - Buffering - Overlaying – Structured Query Language for Queries - Neighbourhood and zonal operations - Data Quality - Components of data quality - Sources of errors in GIS - Meta dataOutput - Maps, Graphs, Charts, Plots, Reports - Printers – Plotters.

UNIT V APPLICATIONS 9

Fields of application - Natural Resource Management, construction management-Parcel based, Amplitude Modulation /Frequency Modulation applications examples - Case study

TOTAL: 45 h

REFERENCE BOOKS

1. Burrough P.A., “Principles of GIS for Land Resources Assessment”, Oxford Publication, 1998
2. Robert Laurini and Derek Thompson, “Fundamentals of Spatial Information Systems”, Academic Press, 1996
3. Anji Reddy, “Remote Sensing and Geographical Information Systems” , BS Publications 2001
4. Srinivas M.G., “Remote Sensing Applications”, Narosa Publishing House, 2001
5. Rhind, D., “Understanding of GIS”, The ARC / INFO Method, ESRI Press. 1990

SYLLABUS

GENERIC ELECTIVE COURSES

18MET151 FUNDAMENTALS OF ENTREPRENEURSHIP 3 0 0 3

COURSE OBJECTIVE:

- To provide awareness about entrepreneurship
- To develop idea generation, creative and innovative skills
- To self-motivate the students by making aware of different opportunities and successful growth stories
- To learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.

COURSE OUTCOME:

CO –1: To explain entrepreneurial project and its essential elements.

CO –2: To consider legal and financial conditions as well as the importance of the entrepreneurial infrastructure for starting a business venture.

CO –3: To evaluate the effectiveness of different entrepreneurial strategies.

CO –4: To be well versed in feasibility analysis.

CO –5: To understand clearly about the financing methods and to start the business.

UNIT I INTRODUCTION TO ENTREPRENEURSHIP 9

Understanding the Meaning of Entrepreneur; Characteristics and Qualities of an Entrepreneur; Entrepreneurs Vs Intrapreneurs and Managers; Classification of Entrepreneurs; Factors Influencing Entrepreneurship; Entrepreneurial Environment; Entrepreneurial Growth; Problems and Challenges of Entrepreneurs; Entrepreneurial Scenario in India

.

UNIT II MICRO, SMALL AND MEDIUM ENTERPRISES 9

MSMEs – Definition and Significance in Indian Economy; MSME Schemes, Challenges and Difficulties in availing MSME Schemes, Forms of Business; Women Entrepreneurship; Rural Entrepreneurship; Family Business and First, Generation Entrepreneurs.

UNIT III IDEA GENERATION AND FEASIBILITY ANALYSIS 9

Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.

UNIT IV BUSINESS MODEL AND PLAN IN RESPECTIVE INDUSTRY 9

Business model – Meaning, designing, analyzing and improvising; Business Plan – Meaning, Scope and Need; Financial, Marketing, Human Resource and Production/Service Plan; Business plan Formats; Project report preparation and presentation; Why some Business Plan fails?

UNIT V FINANCING AND HOW TO START UP BUSINESS? 9

Financial opportunity identification; Banking sources; Non banking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise.

TOTAL: 45 h

REFERENCE BOOKS:

1. Jayshree Suresh, “Entrepreneurial Development”, Margham Publishers,Chennai , 2011.
2. Poornima M Charantimath, “Entrepreneurship development small business enterprises”, Pearson, 2013.
3. Raj Shankar, “Entrepreneurship: Theory And Practice”, Vijay Nicole imprints ltd in collaboration with Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012
4. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, “Entrepreneurship”, 8th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012
5. Martin Roger, “The Design of Business”, Harvard Business Publishing, 2009
6. Roy Rajiv, “Entrepreneurship”, Oxford University Press, 2011
7. Drucker.F, Peter, “Innovation and Entrepreneurship”, Harper business, 2006.

18MET152 INTELLECTUAL PROPERTY RIGHTS 3 0 0 3

COURSE OBJECTIVE:

- To protect the rights of the University, its innovators, inventors, research sponsors and the public.
- To eliminate the infringement, improper exploitation and abuse of the University's intellectual assets belonging to the University or the other persons.
- To optimize the environment and incentives for research and for the creation of new knowledge.

COURSE OUTCOME:

CO –1: To clearly understand the rights of the University, its innovators, inventors, research sponsors and the public.

CO –2: To clearly explain entrepreneurial project and its essential elements.

CO –3: To consider legal and financial conditions as well as the importance of the entrepreneurial infrastructure for starting a business venture.

CO –4: To be well versed in global perspective.

CO –5: To understand clearly about the latest trends in IP.

UNIT I INTRODUCTION 9

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance –Need for IPR- Protection of IPR - IPR in India – Genesis and Development IPR in abroad - some important examples of IPR – Basic types of property: Movable Property - Immovable Property and - Intellectual Property- Competing Rationales for Protection of Intellectual Property Rights

UNIT II APPLICATIONS OF IP 9

IP – Patents- Procedure for Opposition- Revocation of Patents - Ownership and Maintenance of Patents- Assignment and licensing of Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits –Protection of Geographical Indications at national and International levels – Application Procedures -

UNIT III IP ESSENTIALS 9

International convention relating to Intellectual Property – Establishment of WIPO –Mission and Activities – History – General Agreement on Trade and Tariff (GATT) –TRIPS Agreement- Copyright and Related Rights- Trademarks - Geographical Indications - Industrial Designs - Layout-Designs (Topographies) of Integrated Circuits - Protection of Undisclosed- The text of the TRIPS Agreement.

UNIT IV GLOBAL PERSPECTIVE 9

Indian Position Vs WTO and Strategies – Economics of intellectual property- Other intellectual property conventions - Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy –Present against unfair competition- TRIPS work in the WTO - WTO bodies - IPR Enforcement - Global Value of Digital Piracy.

UNIT V TRENDS IN IP 9

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications– Protection against unfair competition- India's IP regime –Development- Legislation- International Searching Authority and International Preliminary Examining Authority- IPR on Internet.

TOTAL: 45 h

REFERENCE BOOKS:

1. Subbaram N.R. "Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. 3rd Edition 2006**.**
2. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
3. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
4. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.

18MET153 E- COMMERCE 3 0 0 3

COURSE OBJECTIVE:

- To understand the nature of e-Commerce and recognize the business impact and potential of e-Commerce.
- To explain the technologies required to make e-Commerce viable and discussed about the current drivers and inhibitors facing the business world in adopting and using e-Commerce.
- To make them aware of the economic consequences of e-Commerce.

COURSE OUTCOME:

CO –1: The students will be familiar with traditional commerce and e-commerce.

CO –2: To familiar with supply chain management.

CO –3: To familiar with internet utility programmes and data analysis software.

CO –4: To understand the intelligent agents and its history

CO –5: To understand the strategies of marketing.

UNIT I INTRODUCTION 9

Traditional commerce and E commerce - Categories of Electronic commerce – Business models – Revenue models – Business processes. Internet and WWW – role of WWW – value chains – strategic business – Revenue Strategy issues - Industry value chains - supply chain management – role of E commerce.

UNIT II INFRASTRUCTURE FOR E COMMERCE 9

Packet switched networks – Routing packets. TCP/IP protocol script: IP Addressing – Domain names – E-mail protocols. Internet utility programs – SGML, HTML and XML – web client and servers – Web client/server architecture – intranet and extranets – Public and private networks – Virtual private network.

UNIT III WEB BASED TOOLS FOR E COMMERCE 9

Web server: Server computers – performance evaluation – Hardware architectures. web server software feature sets – web server software and tools – Internet Utility programs – Data analysis software – Link checking utilities. web protocol – search engines – intelligent agents –EC software – web hosting – cost analysis.

UNIT IV SECURITY 9

Computer security classification – copy right and Intellectual property – electronic commerce threats: Secrecy threats – Integrity threats – Necessity threats Encryption solutions. Protecting client computers

– electronic payment systems – electronic cash – strategies for marketing – sales and promotion – cryptography – authentication.

UNIT V INTELLIGENT AGENTS 9

Definition and capabilities – limitation of agents – History of software agents – Characteristics and properties aof agents – Telescript Agent Language – safe-Tcl – security – web based marketing – search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.

TOTAL: 45 h

REFERENCE BOOKS:

1. Ravi Kalakota, Andrew B. Whinston " frontiers of Electronic Commerce", Pearson Education, 2008.
2. Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.
3. Manlyn Greenstein and Miklos "Electronic commerce" McGraw-Hill, 2002.
4. Efraim Turvan J.Lee, David kug and chung, "Electronic commerce" Pearson Education Asia 2001.
5. Brenda Kienew E commerce Business Prentice Hall, 2001.

18MET154 FUNDAMENTALS OF NANOSCIENCE 3 0 0 3

COURSE OBJECTIVE:

- To learn the basic concepts of nano science and nanotechnology and their applications in various fields of Science and Engineering.
- To understand the scope of nano-materials potential use in products manufactured by various industries.

COURSE OUTCOME:

CO –1: The students will be familiar with the basics of nanotechnology, tools used for characterizing nano-materials and specific applications of nanotechnology.

CO –2: To understand the underlying reasons for the unique properties associated with nano materials

CO –3: To import the knowledge of nano science in construction industry.

CO –4: To know about the nano science devise and its usages

CO –5: To understand and characterize the techniques on nano science.

UNIT I INTRODUCTION 9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 9

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes,Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 9

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wetetching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 9

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL: 45 h

REFERENCE BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000
3. G Timp (Editor), “Nanotechnology”, AIP press/Springer, 2012.
4. Akhlesh Lakhtakia (Editor), “The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

18MET155 GLOBAL WARMING AND CLIMATE CHANGE 3 0 0 3

COURSE OBJECTIVE:

- To clearly understand the causes of global warming.
- To develop idea of weather and climate.
- To understand how the global warming have impacts on people and nature.
- To learn to save energy and to develop alternative sources of energy.

COURSE OUTCOME:

CO –1: To understand the physical basis of natural greenhouse effect, including the meaning of the term radioactive forcing.

CO –2: To know something of the way various human activities are increasing Climate change, and the extent of anthropogenic influence

CO –3: To clearly explain the mcontributing to sulphate aerosols in the troposphere.

CO –4: To understand the current warming in relation to climate changes throughout the Earth's history.

CO –5: To explain factors forcinodel and apply the techniques of 'measuring' the Earth's temperature.

UNIT I EARTH'S CLIMATE SYSTEM 9

Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect, Radiative Effects of Greenhouse Gases-The Hydrological Cycle-Green House Gases and Global Warming – Carbon Cycle.

UNIT II ATMOSPHERE AND ITS COMPONENTS 9

Importance of Atmosphere-Physical Chemical Charcterestics of Atmosphere- Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.

UNIT III IMPACTS OF CLIMATE CHANGE 9

Causes of Clmate change : Change of Temperature in the environmen-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV OBSERVED CHANGES AND ITS CAUSES 9

Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol- Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India .

UNIT V CLIMATE CHANGE AND MITIGATION MEASURES 9

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding.Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.

TOTAL: 45h

REFERENCE BOOKS:

1. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007.
2. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge, 2006.
3. Atmospheric Science, J.M. Wallace and P.V. Hobbs, Elsevier / Academic Press 2006.
4. Jan C. van Dam, Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2003.