VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University under section 3 of UGC Act, 1956)

NAAC ACCREDITED WITH 'A' GRADE

M.E

CONSTRUCTION ENGINEERING AND MANAGEMENT

Curriculum and Syllabus

(Based on Choice based Credit System)

Effective from the Academic year

2021-2022

Department of Civil Engineering

School of Engineering

VISION OF THE CIVIL ENGINEERING DEPARTMENT

To achieve national and international recognition by becoming a collaborative centre for learning & innovation and preparing the engineers to be stewards of a sustainable society by enhancing their innovative spirit, developing their professional and leadership qualities to face the challenges of the society and provide sustainable solutions

MISSION OF THE CIVIL ENGINEERING DEPARTMENT

i. To train the students by disseminating the knowledge of engineering, science and technology through in plant trainings, internships, value added courses and industrial visits
ii. To assist the students in discovering their talents and skills to become experts/entrepreneurs in solving the contemporary issues of civil engineering
iii. To equip the students with relevant sustainable and engineering approaches to the built and natural environment by raising their professional and leadership qualities for creating a sustainable society
iv. To motivate the students to pursue higher education and compete at the global level
v. To collaborate with leading industrial organizations and educational institutions in India and abroad for creating centers of excellence in emerging areas of Civil engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Eduactional Objectives (PEOs) of M.E Construction Engineering and Management are

PEO 1 Train and enrich students with efficient and effective knowledge in project formulation, planning, scheduling techniques and quality construction management techniques for the construction projects

PEO 2 Employ contemporary methods, procedures, modern tools and techniques to solve the real life construction management problem.

PEO 3 Develop cost-effective solutions for a sustainable environment with deep insight in societal and ecological issues by exhibiting team work and adhering to ethics and professionalism

PEO 4 Engage in lifelong learning for career enhancement and to excel in research and development

PROGRAM OUTCOMES (PO):

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

PO 1 Identify and define problems, gather data related to the problem, generate and prioritize a set of alternative solutions, and select and implement the best alternative incorporating the recommendations of relevant codes of practice.

PO 2 Analyze, design, conduct numerical experiments, and interpret data of complex construction technology management problems

PO 3 Apply construction management practices and principles to a project and lead the team for efficient project management considering economical and financial factors

PO 4 Analyze the impact of engineering solutions on environment and the need for sustainable development

PO 5 Use the techniques, skills, advanced modern engineering tools, instrumentation and software packages necessary for engineering practice

PO 6 Acquire competent technical knowledge to practice construction profession and develop ideas to amalgamate the existing and contemporary knowledge

PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program Specific Objectives of the M.E. Construction Engineering 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

PSO 3 Develop cost-effective solutions for a sustainable environment with deep insight in societal and ecological issues by adhering to professionalism

BOARD OF STUDIES

S.No	Name	Affiliation	Role
1	Dr. T. Ilango	*Associate Professor and Head* Dept. of Civil Engineering VISTAS, Chennai	Chairman
2	Dr. P. Purusothaman	*Associate Professor* Dept. of Civil Engineering SRM Institute of Science & Technology, Chennai	Academic Expert
3	Mr. K Gurusamy	*Project Manager* Rapid Rail Transit System L&T Metro, Chennai	Industrial Expert
4	Mrs R Janani	*Assistant Professor* Dept. of Civil Engineering VISTAS, Chennai	Internal Member
5	Mrs S Durgalakshmi	*Assistant Professor* Dept. of Civil Engineering VISTAS, Chennai	Internal Member
6	Dr. R Jino	*Assistant Professor* Dept. of Civil Engineering VISTAS, Chennai	Internal Member

M.E. CONSTRUCTION ENGINEERING AND MANAGEMENT DEGREE COURSE

COURSES OF STUDY AND SCHEME OF ASSESSMENT

(MINIMUM CREDITS TO BE EARNED: 80)

		Hours/Week				Maximum Marks		
Category	Course Title	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER I								
Program Core	Construction Planning Scheduling and Control	3	1	0	4	40	60	100
Program Core	Modern Materials of Construction	3	1	0	4	40	60	100
Foundation Course	Statistical Methods and Queuing Theory	3	1	0	4	40	60	100
Program Elective	Program Elective I	3	1	0	4	40	60	100
Program Core	Construction Planning and Scheduling Laboratory - I	0	0	4	2	40	60	100
Program Core	Computing Lab in Construction Management - I	0	0	4	2	40	60	100
Mandatory courses	Research Methodology and IPR	2	0	0	2	40	60	100
Audit Course	Technical Seminar I	0	0	0	0	40	60	100
		14	**4**	**8**	**22**			

		Hours/Week				Maximum Marks		
Category	Course Title	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER II								
Program Core	Advanced Construction Techniques	3	1	0	4	40	60	100
Program Core	Quality Control and Assurance in Construction	3	1	0	4	40	60	100
Program Elective	Program Elective II	3	1	0	4	40	60	100
Program Elective	Program Elective III	3	1	0	4	40	60	100
Program Core	Construction Planning and Scheduling Laboratory - II	0	0	4	2	40	60	100
Program Core	Computing Lab in Construction Management - II	0	0	4	2	40	60	100
Program Core	Mini Project	0	0	4	2	40	60	100
Audit Course	Technical Seminar II	0	0	0	0	40	60	100
		12	**4**	**12**	**22**			

		Hours/Week				Maximum Marks		
Category	Course Title	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER III								
Program Elective	Program Elective IV	3	1	0	4	40	60	100
Open Elective	Open Elective I	3	1	0	4	40	60	100
Internship	Internship	0	0	4	2	40	60	100
Project	Dissertation I	0	0	20	10	40	60	100
		6	**2**	**24**	**20**			

		Hours/Week				Maximum Marks		
Category	Course Title	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER IV								
Project	Dissertation II	0	0	32	16	40	60	100
		0	**0**	**32**	**16**			

LIST OF PROGRAM CORE COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	**T**utorial	**P**ractical	
21METC11	Construction Planning Scheduling and Control	3	1	0	4
21METC12	Modern Materials of Construction	3	1	0	4
21METC13	Construction Planning and Scheduling Laboratory - I	0	0	4	2
21METC14	Computing Lab in Construction Management - I	0	0	4	2
21METC21	Advanced Construction Techniques	3	1	0	4
21METC22	Quality Control and Assurance in Construction	3	1	0	4
21METC23	Construction Planning and Scheduling Laboratory - II	0	0	4	2
21METC24	Computing Lab in Construction Management - II	0	0	4	2
21METC25	Mini Project	0	0	4	2

LIST OF PROGRAM ELECTIVE COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21METE01	Construction Equipments and Methods	3	1	0	4
21METE02	Contract Laws and Regulations	3	1	0	4
21METE03	Advanced Concrete Technology	3	1	0	4
21METE04	Value Engineering in Construction	3	1	0	4
21METE05	Computer Application in Construction Planning	3	1	0	4
21METE06	Energy Conservation Techniques in Building Construction	3	1	0	4
21METE07	Economics and Finance Management in Construction	3	1	0	4
21METE08	Material Management	3	1	0	4
21METE09	Resource Management and Control in Construction	3	1	0	4
21METE10	Design of Energy Efficient Buildings	3	1	0	4
21METE11	Green Building Techniques	3	1	0	4
21METE12	Project Formulation and Appraisal	3	1	0	4
21METE13	Repair and Rehabilitation of Structures	3	1	0	4
21METE14	System Integration in Construction	3	1	0	4
21METE15	Advanced Construction Technology	3	1	0	4

21METE16	Building Acoustics, Light and Ventilation engineering	3	1	0	4
21METE17	Building Services and maintenance	3	1	0	4
21METE18	Construction Personnel Management	3	1	0	4
21METE19	Construction Project Management	3	1	0	4
21METE20	Project Safety Management	3	1	0	4
21METE21	Management Information System	3	1	0	4
21METE22	GIS in Construction Engineering and Management	3	1	0	4
21METE23	Shoring, Scaffolding and Formwork	3	1	0	4
21METE24	Structural Health Monitoring	3	1	0	4

LIST OF OPEN ELECTIVE COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	**T**utorial	**P**ractical	
21MEGE01	Disaster Preparedness, Planning & Mitigation	3	1	0	4
21MEGE02	Total Quality System and Engineering	3	1	0	4
21MEGE03	Environmental Impact Assessment	3	1	0	4
21MEGE04	Fundamentals of Entrepreneurship	3	1	0	4
21MEGE05	E – Commerce	3	1	0	4
21MEGE06	Global Warming and Climate Change	3	1	0	4

LIST OF FOUNDATION COURSES

Code No.	**Course**	**Hours / Week**			**C**redits
		Lecture	**T**utorial	**P**ractical	
21MEFC01	Statistical Methods and Queuing Theory	3	1	0	4

LIST OF MANDATORY COURSES

Code No.	**Course**	**Hours / Week**			**C**redits
		Lecture	**T**utorial	**P**ractical	
21MEMC01	Research Methodology and IPR	2	0	0	2

LIST OF INTERNSHIP COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21MEIT01	Internship	0	0	4	2

LIST OF PROJECT COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21METR01	Dissertation - I	0	0	20	10
21METR02	Dissertation - II	0	0	32	16

LIST OF AUDIT COURSES

Code No.	Course	Hours / Week			Credits
		Lecture	Tutorial	Practical	
21META01	Technical Seminar - I	0	0	0	0
21META02	Technical Seminar - II	0	0	0	0

SYLLABUS

CORE COURSES

21METC11 CONSRUCTION PLANNING SCHEDULING AND CONTROL 3 1 0 4

COURSE OBJECTIVES:

At the end of this course the student is expected to

- Apply the network diagrams and prepare a schedule for the activities
- Learn to create cash flows and enhance the overall quality of the construction

UNIT I CONSTRUCTION PLANNING 9

Basic concepts in the development of construction plans-choice of Technology and Construction method - Defining Work Tasks - Definition - Precedence relationships among activities-Estimating Activity Durations - Estimating Resource Requirements for work activities - coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 15

Relevance of construction schedules-Bar charts – The critical path method-Calculations for critical path scheduling-Activity float and schedules - Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling - Scheduling with resource constraints and precedences - Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost tradeoffs - Improving the Scheduling process – Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 12

The cost control problem-The project Budget-Forecasting for Activity cost control – financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 12

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 12

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

Total: 60 Hours

COURSE OUTCOMES:

CO 1: Plan construction projects and carry out the estimation

CO 2: Schedule the construction activities using network diagrams

CO 3: Determine the cost of the project and control the cost of the project by creating cash flows and budgeting

CO4: Determine the quality control of the project using statistical variables

CO 5: Apply the project information as a decision making tool

REFERENCES

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “PERT and CPM Priniples and Applications “, Affiliated East West Press, 2001
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
4. Moder.J., C.Phillips and Davis, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
5. Willis., E.M., “Scheduling Construction projects”, John Wiley and Sons 1986.
6. Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York, 1985.

WEBLINKS

1. https://www.cmu.edu/cee/projects/PMbook/10_Fundamental_Scheduling_Procedures.html
2. https://www.educba.com/project-scheduling-techniques/

21METC12 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.

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 – Constituents – 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 Hours

COURSE OUTCOME:

CO 1: Understand the roll of metals, composites and smart materials in construction projects

CO 2: Evaluate the different types of composites with its properties and behavior in construction

CO 3: Analyze the different types of smart and modern materials with its usages

CO 4: Apply the materials for maintaining the indoor thermal comfort and indoor air quality

CO 5: Apply the appropriate smart and intelligent materials in construction Industry

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.

WEBLINKS

1. https://elemental.green/10-eco-building-materials-revolutionizing-home-construction/

21METC13 CONSRUCTION PLANNING AND SCHEDULING LABORATORY - 0 0 4 2

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COURSE OBJECTIVES:

At the end of this course the student is expected to

- Apply the scheduling principles and develop a critical path
- Demonstrate the quality control tests

List of Exercises:

1. Schedule a management plan for foundation
2. Schedule the activities for construction of a security cabin
3. Finding critical path for sequence of activities
4. Estimate activity duration for a smaller construction project
5. Develop a schedule for a construction project
6. Determine critical path using Critical Path Method (CPM)
7. Compare and contrast manual scheduling with scheduling done using software
8. Quality control tests on fresh concrete
9. Quality control tests on hardened concrete
10. NDT tests on concrete

Total: 30 Hours

COURSE OUTCOMES:

CO 1: Schedule a management plan

CO 2: Evaluate the time duration for a scheduled event

CO 3: Plot the critical path for a project

CO4: Develop the schedule for a project

CO 5: Perform quality control tests on concrete

REFERENCES

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “PERT and CPM Priniples and Applications “, Affiliated East West Press, 2001
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.

21METC14 COMPUTING LAB IN CONSTRUCTION MANAGEMENT - I 0 0 4 2

COURSE OBJECTIVES:

At the end of this course the student is expected to

- Prepare the project schedules
- Apply planning software in project planning and scheduling

List of Exercises:

1. Getting familiarized with MS Project
2. Creating a project with MS Project
3. Initiate and Implement a project in MS Project
4. Create a Work Breakdown Structure (WBS) in MS Project
5. Prepare a Gantt diagaram and Network Diagram in MS Project
6. Assign resources (human and material resources) to WBS in MS Project
7. Find the critical path and create a custom report in MS Project
8. Determining the project cost using MS Project
9. Setting up a project in PRIMAVERA
10. Create Organizational Breakdown Structure (OBS) in PRIMAVERA

Total: 30 Hours

COURSE OUTCOMES:

CO 1: Create a project and WBS

CO 2: Apply the resources to WBS

CO 3: Determine the actual cost, cost variance and remaining cost

CO4: Determine the critical path

CO 5: Create a project and OBS

WEBLINKS

1. https://zbook.org/primavera-lab-manual-tumcivil-com_MzMzMjAw.html
2. https://manual.eg.poly.edu/index.php/Microsoft_Project_Skill_Builder

21METC21 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

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 Hours

COURSE OUTCOME:

CO 1: Develop knowledge of various techniques involved in piling.

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

CO 4: Apply knowledge of repair and maintenances of foundation and dismantling techniques

CO 5: Apply knowledge of construction techniques in tall structures and offshore structures

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.

WEBLINKS

1. https://www.uceb.eu/DATA/Books/THE%20CIVIL%20ENGINEERING%20HANDBOOK.pdf

21METC22 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.

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 Hours

COURSE OUTCOME:

CO 1: Acquire knowledge on quality systems and quality documents

CO 2: Understand the elements of quality planning and the implication of quality planning

CO 3: Analyze the various factors influencing the quality of construction

CO 4: Dissect the various failure mode analysis

CO 5: Design the safety programmes and contractual obligations.

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.

WEBLINKS

1. https://glencar.com/wp-content/uploads/2021/02/Quality-Manual-July19.pdf

21METC23 CONSRUCTION PLANNING AND SCHEDULING LABORATORY - II 0 0 4 2

COURSE OBJECTIVES:

At the end of this course the student is expected to

- Design a construction schedule for construction project
- Design a mix for a grade of concrete

List of Exercises:

1. Plan and schedule for foundation of a residential building
2. Schedule the resource activities for a construction project
3. Estimate duration of activities for brick masonry construction
4. Determine the total float, free float and project float for an activity
5. Determine the early start and early finish for a construction project
6. Find the critical path using Critical Path Method (CPM)
7. List all the paths, float and duration for a residential building construction
8. Correct and control a project schedule
9. Design a mix for M40 grade of concrete
10. Determine the strength of concrete using NDT

Total: 30 Hours

COURSE OUTCOMES:

CO 1: Develop a plan for a construction activity

CO 2: Estimate duration for a construction activity

CO 3: Determine the critical path for an activity

CO4: Create a design mix for higher grades of concrete

CO 5: Evaluate strength of concrete using NDT

REFERENCES

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “PERT and CPM Priniples and Applications “, Affiliated East West Press, 2001
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.

21METC24 COMPUTING LAB IN CONSTRUCTION MANAGEMENT - II 0 0 4 2

COURSE OBJECTIVES:

At the end of this course the student is expected to

- Prepare the project schedules
- Apply planning software in project planning and scheduling

List of Exercises:

1. Create a project schedule in PRIMAVERA
2. Create a Work Breakdown Structure (WBS) for a project in PRIMAVERA
3. Creating an activity in a project using PRIMAVERA
4. Initiate and Implement a relationship in PRIMAVERA
5. Analyze the relationships and constraints in a project using PRIMAVERA
6. Demonstrate a critical path analysis in PRIMAVERA
7. Perform a schedule process on the construction project using PRIMAVERA
8. Find the critical path and create a custom report using PRIMAVERA
9. Assign resources like labour and labour cost to a project in PRIMAVERA
10. Assign a baseline and publish the status of project in PRIMAVERA
11. Publish and report a construction project in PRIMAVERA

Total: 30 Hours

COURSE OUTCOMES:

CO 1: Create a project and WBS in PRIMAVERA

CO 2: Apply the resources to WBS in PRIMAVERA

CO 3: Perform the schedule process in PRIMAVERA

CO4: Determine the critical path of a construction project

CO 5: Publish a report in PRIMAVERA

WEBLINKS

1. https://zbook.org/primavera-lab-manual-tumcivil-com_MzMzMjAw.html

SYLLABUS

PROGRAM ELECTIVE COURSES

21METE01 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**.**

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 Hours

COURSE OUTCOME:

CO 1: Analyze the techniques of erection of construction units.

CO 2: Demonstrate basic knowledge about construction equipment and machineries.

CO 3: Examine the various hauling and conveying equipment and select the most appropriate one.

CO 4: Identify and manage the various equipments with respect to time, their motion and movements.

CO 5: Inspect the equipments used for aggregate and concreting and select the optimum one .

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.

WEBLINKS

1. http://www.assakkaf.com/courses/ence420/lectures/chapter0.pdf

21METE02 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 study the tenders, arbitration, legal requirement, and labour regulations.
- To study the tenders, arbitration, legal requirement, and labour regulations.
- To understand the concept on tenders.

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 Hours

COURSE OUTCOME:

CO 1: Compare the procedures for preparing a contract for various agencies

CO 2: Interpret the elements of concluding, and administering contracts

CO 3: Examine the procedure of arbitrations and legal requirements.

CO 4: Dissect the impact of labour regulations in managing of contracts

CO 5: Categorize the vital points in various labour regulation acts enacted by the government

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.

WEBLINKS

1. https://legislative.gov.in/sites/default/files/A1872-09.pdf

21METE03 ADVANCED CONCRETE TECHNOLOGY 3 1 0 4

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

UNIT I CONCRETE INGREDIENTS 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Select proper choice of retarders, air entraining agents, plasticizers and other admixtures that should be used in concrete.

CO 2: Choose proper testing methods and aware of codes available for aggregates.

CO 3: Execute mix proportioning of concrete and become aware of influence of addition of fibre on concrete properties.

CO 4: Examine the mechanical properties of concrete

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

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

WEBLINKS

1. http://kec.edu.np/wp-content/uploads/2017/06/Advanced-Concrete-Technology.pdf
2. http://www.j-act.org/

21METE04 VALUE ENGINEERING IN CONSTRUCTION 3 1 0 4

Course Objectives:

- Estimation of project budget using capitalized income approach
- Analyse a building using LCC methodology

UNIT – I INTRODUCTION 9

Introduction to value engineering (VE), definition, objectives of value engineering, reasons for unnecessary costs, VE techniques and methodology, interface with the other programs

UNIT – II PROJECT BUDGETING 12

Elements of the project budget, need for cost control, meaning of capitalization, capitalization process, and capitalized income approach to construction project budgeting.

UNIT – III LIFE CYCLE COST 15

Life cycle cost (LCC) and building costs, LCC technology and examples, LCC methodology, LCC formats and analysis and weighted evaluation – application of LCC to buildings.

UNIT – IV VALUE ENGINEERING 12

Value engineering and total project management, level of effort, team selection, value engineering job plan, and work plan phases.

UNIT – V PROJECT LEVEL FUNCTION 12

Classifying function, defining function, project level function system technique (fast) diagram, creativity and fixation, interpersonal skills, generation of ideas, brainstorming, rules for brainstorming, Delphi technique, application of Delphi technique to civil engineering projects.

Total: 60 Hours

Course Outcomes:

CO 1: Establish value engineering techniques and methodology
CO 2: Outline the capitalized income approach to project budgeting
CO 3: Apply Life Cycle Cost (LCC) analysis to buildings
CO 4: Draw value engineering job plan and work plan phases
CO 5: Examine the concept of Delphi techniques and rules for brainstorming

Reference Books:

1. Tenah, K.A. (1985). "The Construction Management Process", Reston Publishing Company, Inc. Virginia
2. Dell'Isola, Alphonse (1997). "Value Engineering: Practical Applications." R.S. Means Company, Inc: Kingston, MA.
3. Oberiender, G. D. (1993). "Project Management for Engineering and Construction". *McGraw-Hill, Inc*.: New York.

21METE05 COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING 3 1 0 4

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.

UNIT I INTRODUCTION 12

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 12

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 12

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

UNIT IV SCHEDULING APPLICATION 12

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 12

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: 60 Hours

COURSE OUTCOMES:

CO 1: Relate the various optimization techniques in construction engineering.

CO 2: Apply the branch and bound techniques in scheduling.

CO 3: Examine the various inventory models

CO 4: Prepare a detailed report based on resource allocation.

CO 5: Apply CPM in evaluation of a project

CO 6: Propose an estimate for a construction project

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

21METE06 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION 3 1 0 4

Course Objectives:

At the end of the course, students will be able to

- Examine the different sources of energy and conservation of energy
- Design a building by adopting appropriate design methodology in construction.

UNIT I FUNDAMENTALS OF ENERGY 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

UNIT II ENERGY AND RESOURCE CONSERVATION 9

Energy and resource conservation. Design of green buildings -Evaluation tools for building energy - Embodied and operating energy .Peak demand-Comfort and indoor air quality -Visual and acoustical quality -Land, water and materials –Airborne emissions and waste management.

UNIT III DESIGN CONSIDERATION 12

Natural building design consideration. Energy efficient design strategies -Contextual factor -Longevity and process Assessment -Renewable Energy Sources and design - advanced building Technologies. Smart buildings –Economics and cost analysis

UNIT IV ENERGY IN BUILDING DESIGN 15

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 15

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- Waste heat recovery. Steam plants and distribution systems- Improvement of boiler efficiencies-Frequency of blow down -Steam leakage-steam Flash and condensation

Total: 60 Hours

Course Outcomes:

CO 1: Outline the challenges faced in conservation of energy in buildings

CO 2: Identify the design strategies employed in energy efficient buildings

CO 3: Examine the various factors affecting the energy in design of buildings

CO 4: Perform an energy audit and prepare a energy flow diagram

CO 5: Discover various energy management techniques and select the optimum one

REFERENCE BOOKS:

1. Moore F., “Environmental Control system”, Mc Graw Hill, Inc. 2004
2. Brown, GZ Sun, “Wind and Light: Architectural design strategies”, John Wiley 2005. Cook. J Award –“Winning passive Solar Design”, Mc-Graw Hill- 2004.
3. Waters J.R, “Energy Conversation in Building: A Guide to part of the building regulations”, Black well publishing, 2003

21METE07 ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION 3 1 0 4

Course Objectives:

At the end of the course, students will be able to

- Demonstrate various interest formula methods namely present, future, annual worth method, rate of return method and break even analysis for the comparison of alternatives.
- Understand various methods of depreciation, tax and cost analysis of construction equipments followed by cost estimating.

UNIT I BASIC PRINCIPLES 12

Time Value of Money – Cash Flow diagram – Nominal and effective interest - continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)–Problem time zero (PTZ)-equation time zero (ETZ). Constant increment to periodic payments –Arithmetic Gradient(G), Geometric Gradient (C).

UNIT II COMPARING ALTERNATIVES PROPOSALS 12

Comparing alternatives-Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT III EVALUATING ALTERNATIVE INVESTMENTS 12

Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation

UNIT IV FUNDS MANAGEMENT 12

Project Finance –Sources of finance - Long-term and short-term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management - foreign currency management.

UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING 12

Management accounting, Financial accounting principles-basic concepts, Financial statements –accounting ratios -funds flow statement – cash flow statement.

Total: 60 Hours

Course Outcomes:

CO 1: Illustrate the various types of payments done in construction project

CO 2: Compare and Contrast the pros and cons of various analysis

CO 3: Examine the various reasons behind selecting the best suited analysis

CO 4: Relate the concept of deprecation, VAT and Inflation to a construction project

CO 5: Prepare a cash flow statement for any construction project

REFERENCE BOOKS:

1. Blank, L.T., and Tarquin,a.J (1988) Engineering Economy,4th Edn. Mc-Graw Hill Book Co.
2. Collier C and GlaGola C (1998) "Engineering Economics & Cost Analysis", 3nd Edn. Addison Wesley Education Publishers.
3. Patel, B M (2000) "Project management-strategic Financial Planning, Evaluation and Control", Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shrivastava,U.K., (2000)"Construction Planning and Management",2ndEdn. Galgotia Publications Pvt. Ltd. New Delhi.
5. Steiner, H.M. (1996) "Engineering Economic principles", 2nd Edn. Mc-Graw Hill Book

21MET1C08 MATERIALS MANAGEMENT 3 1 0 4

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.

UNIT I MATERIAL CLASSIFICATION 12

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 variety reduction of materials

UNIT II MATERIAL PURCHASING 12

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 12

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

UNIT IV STORE MANAGEMENT 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Outline the meaning of materials management and are able to plan and manage material flows.

CO 2: Identify the need for coordination of planning, sourcing, purchasing, moving, storing and controlling of materials.

CO 3: Minimize procurement costs and improves opportunities for reducing the overall project costs.

CO 4: Illustrate the various waste management techniques in construction.

CO 5: Develop a suitable method of disposal of construction wastes adhering to the rules and regulation

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

21METC09 RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION 3 1 0 4

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.

UNIT I RESOURCE PLANNING 12

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 12

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 12

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 12

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 12

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

Total: 60 Hours

COURSE OUTCOME:

CO 1: Illustrate the various tools employed for measurement of resources

CO 2: Select the optimum choice of materials with respect to time, cost and other factors .

CO 3: Determine the critical path in managing a project

CO 4: Outline the cash flow control measures to be adopted for a project

CO 5: Incorporate the time cost trade off and respond to changes in resource utilization.

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.

21METC10 DESIGN OF ENERGY EFFICIENCT BUILDINGS 3 1 0 4

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

UNIT I ENERGY REQUIRED FOR BUILDING 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME

CO 1: Apply psychromtery chart and measure the lateral and sensible heat

CO 2: Plan a site considering the influence of various factors influencing it

CO 3: Utilize passive heating and passive cooling techniques for better design of buildings

CO 4: Design a building in accordance to its thermal performance for varying climatic conditions

CO 5: Examine the factors adversely affecting the energy efficiency of a building in a energy audit

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.

21METE11 GREEN BUILDING TECHNIQUES 3 1 0 4

COURSE OBJECTIVES:

- Exposure to the green building technologies and their significance.
- Educate about the Sun-earth relationship and its effect on climate.
- Enhance awareness of end-use energy requirements in the society.

UNIT I ENERGY USAGE 12

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications

UNIT II INDOOR MANAGEMENT 12

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality – Air-conditioning requirement – Visual perception - Illumination requirement - Auditory requirement.

UNIT III ENERGY IMPACT 12

Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT IV ENERGY UTILIZATION 12

End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT V ENERGY MANAGEMENT 12

Energy management options - Energy audit and energy targeting - Technological options for energy management

Total: 60 Hours

COURSE OUTCOMES:

CO 1: Infer the fundamentals of energy use and energy processes in building.

CO 2: Identify the energy requirement and its management.

CO 3: Interpret the Sun-earth relationship vis-a-vis its effect on climate.

CO 4: Estimate the overall energy use of a building.

CO 5: Interpret the audit procedures of energy and set the energy targets

REFERENCE BOOKS:

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila.
3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi.

21METE12 PROJECT FORMATION AND APPRAISAL 3 1 0 4

COURSE OBJECTIVES:

At the end of the course, the students will be able to

- Study and understand the formulation of projects.
- Analyze the costing of construction projects, appraisal, finance and private sector participation.

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 9

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

UNIT III PROJECT APPRAISAL 15

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

UNIT IV PROJECT FINANCING 12

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

UNIT V PRIVATE SECTOR PARTICIPATION 12

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

Total: 60 Hours

COURSE OUTCOMES:

CO 1: Develop pre feasibility report, economic feasibility report and detailed project report.

CO 2: Compare and Contrast the various assessment methods .

CO 3: Assess the different methods and select the best one.

CO 4: Summarize the various financial indicators.

CO 5: Compare the different private sector participation techniques

REFERENCE BOOKS:

1. Barcus, S.W. and Wilkinson.J.W., "Hand Book of Management Consulting Services", McGraw Hill, New York, 1986.
2. Joy P.K., "Total Project Management -The Indian Context", New Delhi, Macmillan India Ltd., 1992
3. Prasanna Chandra, "Projects –Planning, Analysis, Selection, Implementation Review", McGraw Hill Publishing Company Ltd., New Delhi. 2006.

21METE13 REPAIR AND REHABILITATION OF STRUCTURES 3 1 0 4

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.

UNIT I MAINTENANCE AND REPAIR STRATEGIES 12

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 12

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 12

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 12

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 12

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

Total: 60 Hours

COURSE OUTCOME:

CO 1: Summarize the assessment procedure for evaluation of a damaged structure

CO 2: Evaluate the durability properties of concrete

CO 3: Outline the effects of various factors on concrete

CO 4: Identify the various materials and techniques for corrosion protection

CO 5: Examine the effect of strengthening and stabilization techniques on repair

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.

21METE14 SYSTEM INTEGRATION IN CONSTRUCTION 3 1 0 4

COURSE OBJECTIVE:

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

UNIT I STRUCTURAL INTEGRATION 12

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

UNIT II ENVIRONMENTAL FACTORS 12

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 12

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

UNIT IV MAINTENANCE 12

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 12

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

Total: 60 Hours

COURSE OUTCOME:

CO 1: Outline the materials selection for system integration,

CO 2: Analyze the effect of various factors on environmental quality

CO 3: Identify the advanced materials in plumbing, electricity and ventilation

CO 4: Plan a system with materials that require least maintenance

CO 5: Propose a system for having hazard free construction

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.

21METE15 ADVANCED CONSTRUCTION TECHNOLOGY 3 1 0 4

COURSE OBJECTIVE:

- Describe various pile foundation and select the most suited one for a given scenario
- Discuss purpose, types, materials, design issues, and erection of temporary structures for construction activities.

UNIT I PILE FOUNDATIONS 12

Introduction, uses, selection of pile, types of piles, pile spacing, group of piles, efficiency of group of piles, pile cap and pile shoe, load tests on piles, pile driving, pulling of piles, loads on piles, causes of failures of piles, pile driving formulas

UNIT II COFFER DAMS 12

Definition, uses, selection of coffer dams, types of coffer dams, design, features of coffer dams; leakage prevention, economic height

UNIT III CAISSONS 12

Definition, uses, construction material, types of caissons, loads on caisson, design features of caissons, floating of caissons, cutting edges, sinking of caisson, tilting of caisson, caisson diseases.

UNIT IV TEMPORARY WORKS 12

Form work for R.C.C. wall, slab, beam and column, Centering for arches of large spans and dams, design features for temporary works, Slip formwork, False work for bridges, Specialty form work

UNIT V EARTHQUAKE RESISTANT BUILDINGS AND SPECIAL STRUCTURES 12

Planning of earthquake resistant building, Construction of walls –provision of corner reinforcement, Construction of beams and columns. Base isolation, Tall structures, Spatial structures, Pre-stressed structures

Total: 60 Hours

COURSE OUTCOME:

CO 1: Justify the use of pile foundation for a given situation based on tests and failure criterion

CO 2: State the leakage points and suggest leakage prevention in coffer dams

CO 3: State the problems and suggest suitable solutions in well sinking

CO 4: Propose a design system for erection of temporary works

CO 5: Identify the construction procedure of earthquake resistant buildings

REFERENCE BOOKS:

1. S.P. Arora & S.P. Bindra, A Text Book of Building Construction, Dhanpat Rai &Sons, New Delhi.
2. S.K. Sarkar and S. Saraswati, Construction Technology, Oxford University Press,New Delhi.
3. B.C. Punamia, Building Construction, Laxmi Publications, New Delhi

21METE16 BUILDING ACOUSTICS, LIGHT AND VENTILATION ENGINEERING **3 1 0 4**

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.

UNIT I INTRODUCTION **12**

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

UNIT II NOISE MEASUREMENT **12**

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 **12**

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 **12**

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.

UNIT V APPLICATIONS **12**

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: 60 Hours

COURSE OUTCOME:

CO 1: Select the most appropriate material for noise absorption

CO 2: Identify the assessment procedures for noise and sound insulation and its remedial measures. in buildings.

CO 3: Incorporate the elements of sound and noise, and their control, the design of constructional measures to control acoustics

CO 4: Demonstrate the principles of acoustical design of a building

CO 5: Design an open air theatres, cinemas, lecture halls with better acoustics.

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

21METE17 BUILDING SERVICES AND MAINTENANCE 3 1 0 4

. **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.

UNIT I WATER SUPPLY 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Illustrate the water purification, treatment and rain water harvesting system

CO 2: Demonstrate the arrangement of sewerage systems, piping systems in housing.

CO 3: Propose a system for modern electrical installations and wiring systems in the buildings.

CO 4: Outline a system for protection against fire

CO 5: Analyze the safety regulations and its importance in design of intelligent buildings.

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.

21METE18 CONSTRUCTION PERSONNEL MANAGEMENT 3 1 0 4

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.

UNIT I MANPOWER PLANNING 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Summarize the extent of factors influencing supply and demand of human resources.

CO 2: Apply the organization chart and staffing plan in development of human resources.

CO 3: Elaborate the concept on field of people management and intergroup behavior and conflict in organizations.

CO 4: Identify the needs of the personnel and select the appropriate training

CO 5: Categorize the welfare measures for employees.

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.

21METE19 CONSTRUCTION PROJECT MANAGEMENT 3 1 0 4

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

UNIT I THE OWNERS' PERSPECTIVE 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Choose the modern trends for strategic planning on risk management

CO 2: Develop a methodology for integration system.

CO 3: Identify the factors affecting site productivity and rectify the problems caused

CO 4: Analysis the construction process and identify the resource bottlenecks.

CO 5: Evaluate the various methods of cost estimation.

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.

21METE20 PROJECT SAFETY MANAGEMENT 3 1 0 4

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

UNIT I CONSTRUCTION ACCIDENTS 12

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

UNIT II SAFETY PROGRAMMES 12

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

UNIT III CONTRACTUAL OBLIGATIONS 12

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

UNIT IV DESIGNING FOR SAFETY 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Outline the human factors in construction accidents and legal Implications.

CO 2: Summarize the elements of an Effective Safety Programme.

CO 3: Elaborate the concept on Safety in Construction Contracts.

CO 4: Propose a method for developing safety culture in construction site

CO 5: Identify the role of owners' and designers in ensuring safety

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.

21METE21 MANAGEMENT INFORMATION SYSTEM 3 1 0 4

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.

UNIT I INTRODUCTION 12

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

UNIT II SYSTEM DEVELOPMENT 12

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

UNIT III INFORMATION SYSTEMS 12

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 12

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

UNIT V SYSTEM AUDIT 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Summarize the System Development Life Cycle and Structured Methodologies.

CO 2: Compare the concept on DSS, EIS, and ES.

CO 3: Outline the concepts of international management system

CO 4: Perform cost benefit analysis and assess the risk

CO 5: Develop the software matrices and perform validation of software cycle models

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.

21METE22 GIS IN CONSTRUCTION ENGINEERING AND MANAGEMENT 3 1 0 4

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

UNIT I INTRODUCTION 12

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 12

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 12

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 12

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 12

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

Total: 60 Hours

COURSE OUTCOME:

CO 1: Classify the various data inputs like Spatial and Non-Spatial.

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

CO 3: Apply the digital elevation model in building a data structure

CO 4: Analyze the source of errors in data management.

CO 5: Apply GIS for construction project management

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

21METE23 SHORING, SCAFFOLDING AND FORMWORK 3 1 0 4

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.

UNIT I PLANNING, SITE EQUIPMENT & PLANT FOR FORM WORK 12

Introduction -Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety -Development of a Basic System -Key Areas of cost reduction -Planning examples. Overall Planning -Detailed planning –Standard units -Corner units -Pass units -Calculation of labour constants -Formwork hours -Labour Requirement -Overall programme -Detailed programme -Costing - Planning crane arrangements -Site layout plan -Transporting plant -Formwork beams -Scaffold frames - Framed panel formwork -Formwork accessories.

UNIT II MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURES 12

Lumber -Types -Finish -Sheathing boards working stresses -Repetitive member stress -Plywood -Types and grades -Jointing Boarding -Textured surfaces and strength -Reconstituted wood -Steel -Aluminum - Hardware and fasteners -Nails in Plywood -Allowable withdrawal load and lateral load. Pressures on formwork -Examples -Vertical loads for design of slab forms -Uplift on shores -Laterals loads on slabs and walls.

UNIT III DESIGN OF FORMS AND SHORES 12

Basic simplification -Beam formulae -Allowable stresses -Deflection, Bending -Lateral stability -Shear, Bearing -Design of Wall forms -Slab forms -Beam forms -Column forms -Examples in each. Simple wood stresses -Slenderness ratio -Allowable load vs length behaviour of wood shores -Form lining Design Tables for Wall formwork -Slab Formwork -Column Formwork -Slab props -Stacking Towers -Free standing and restrained -Rosett Shoring -Shoring Tower -Heavy Duty props.

UNIT IV BUILDING AND ERECTING THE FORMWORK 12

Carpentry Shop and job mill -Forms for Footings -Wall footings -Column footings -Sloped footing forms - Strap footing -Stepped footing -Slab form systems -Sky deck and Multiflex -Customized slab table -Standard Table module forms -Swivel head and uniportal head -Assembly sequence -Cycling with lifting fork -Moving with table trolley and table prop. Various causes of failures -ACI -Design deficiencies -Permitted and gradual irregularities.

UNIT V FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS 12

Hemispherical, Parabolic, Translational shells -Typical barrel vaults Folded plate roof details -Forms for Thin Shell roof slabs design considerations -Building the forms -Placing concrete -Form removed - Strengthrequirements -Tunnel forming components -Curb forms invert forms -Arch forms -Concrete

placement methods -Cut and cover construction -Bulk head method -Pressures on tunnels -Continuous Advancing Slope method -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 -Types of scaffolds -Putlog and independent scaffold -Single pole scaffolds -Truss suspended -Gantry and system scaffolds.

Total: 60 Hours

COURSE OUTCOME:

CO 1: Outline the overall site planning requirements and labour requirement.

CO 2: Compare the various materials to be used as shores.

CO 3: Apply the design principles for design of forms

CO 4: Analyze the causes of failures and design deficiencies in erection of formwork

CO 5: Compare the form construction techniques

REFERENCE BOOKS:

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

21METE24 STRUCTURAL HEALTH MONITORING 3 1 0 4

COURSE OBJECTIVES:

At the end of the course, the students will be able to.

- Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
- Use an appropriate health monitoring technique and demolition technique.

UNIT I INTRODUCTION 6

Introduction to SHM: An Overview of Structural Health Monitoring and Smart Materials

UNIT II FINITE ELEMENT FORMULATION 15

Vibration Control for SHM: Vibration Control using SHM – Introduction to FE formulation, Constitutive Relationship, Element Stiffness Matrix for High Precision Finite Element, Element Mass Matrix for High Precision Finite Element, Developing Actuator and Sensor Influence Matrix, Estimating Sensor Voltage, Active Control of Damping, A Case study of Performance Estimation for Different Patches, SHM of Ribbon Reinforced Composite Laminate

UNIT III LAMINATES 15

SHM using Piezo and Magnteostrictive Layers: Delamination Sensing using Piezo Sensory Layer, Voltage Response from Piezopatch, Electrical Impedance Method basic theory, A Case Study: Results and Discussions, SHM using Magnetostrictive Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer, Constitutive relationship with composite relationship, MS Layer in symmetric Laminate, MS Layer Away from the Mid plane in Asymmetric Laminate, Case Studies related to MS Layer based SHM

UNIT IV ANALYSIS OF LDV 12

SHM using LDV: Experimental Modal Analysis using LDV – Introduction, What is LDV?, Velocity and Displacement Measurement using LDV, Case Study for Symmetric Laminate, Case Study for Cross-ply

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 Hours

COURSE OUTCOMES:

CO 1: Examine the various vibration-based techniques for structural health monitoring.

CO 2: Apply the fiber-optic and piezoelectric sensors for structural health monitoring.

CO 3: Analyze the influence of MS layer in structural health monitoring

CO 4: Determine the effects of LDV in structural health monitoring

CO 5: Apply the appropriate smart and intelligent materials in construction Industry

REFERENCE BOOKS:

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, John Wiley and Sons, 2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
3. J.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006.
4. Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.

SYLLABUS

OPEN ELECTIVE COURSES

21MEGE01 DISASTER PREPAREDNESS, PLANNING & MITIGATION 3 1 0 4

COURSE OBJECTIVE:

At the end of the course, the students will be able

- To identify the various types of disaster and its management process.
- To understand the importance of the mitigation and other agencies.

UNIT I INTRODUCTION 6

Introduction - Concepts and definitions: disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation).

UNIT II TYPES OF DISASTERS 15

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III DISASTER IMPACTS 12

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV MITIGATION 15

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V ENVIRONMENTAL EFFECTS 12

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Total: 60 Hours

COURSE OUTCOMES:

CO 1: Compare and contrast the manmade and natural disasters.

CO 2: Outline the impacts of disaster on various aspects.

CO 3: Examine the influence of climate change on disasters.

CO 4: Summarize the various mitigation measures to be adopted by all the stakeholders

CO 5: Apply the concepts of awareness during Environmental Effects

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

21MEGE02 TOTAL QUALITY SYSTEM AND ENGINEERING 3 1 0 4

COURSE OBJECTIVE:

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION 12

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 12

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen – Supplier, partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 12

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 12

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM –Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 12

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM, implementation in manufacturing and service sectors including IT.

Total: 60 Hours

COURSE OUTCOMES:

CO 1: Outline the basic concepts of TQM and dimensions of service quality

CO 2: Develop leadership qualities through strategic quality planning and quality statements

CO 3: Identify the tools required for manufacturing process and reasons for bench mark

CO 4: Assess the quality circles through quality deployment function and improvement needs

CO 5: Examine the document containing the quality data with reference to codal provisions

REFERENCE BOOKS:

1. Dale H. Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, 3rd Edition, Indian Reprint (2006).
2. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2008.
3. Oakland, J.S., “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2012.
4. Suganthi, L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.
5. Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

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21MEGE03 ENVIRONMENTAL IMPACT ASSESSMENT 3 1 0 4

COURSE OBJECTIVE:

At the end of the course, the students will be able

- To impart knowledge on the elements of managing solid wastes from Municipal and industrial sources including the related engineering principles, design criteria, methods and equipments.
- To educate the students about the different types of waste disposal techniques.

UNIT I INTRODUCTION 12

Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA –.EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA-EIA Consultant Accreditation.

UNIT II IMPACT INDENTIFICATION AND PREDICTION 12

Matrices – Networks – Checklists –Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment

UNIT III SOCIAL IMPACT ASSESSMENT AND EIA DOCUMENTATION 9

Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 12

EIA Report preparation. Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies

UNIT V ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT 15

Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipath way exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs

Total: 60 Hour

COURSE OUTCOMES:

CO 1: Interpret the legal and regulatory aspects and process of EIA.

CO 2: Apply the mathematical model for impact prediction

CO 3: Assessing the social impact of EIA

CO 4: Prepare a EIA report.

CO 5: Identify the appropriate tools for environment risk assessment.

REFERENCE BOOKS:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
3. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York,1996.
4. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003
5. Raghavan K. V. and Khan A A. , Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

21MEGE04 FUNDAMENTALS OF ENTREPRENEURSHIP 3 1 0 4

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.

UNIT I INTRODUCTION TO ENTREPRENEURSHIP 12

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

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UNIT II MICRO, SMALL AND MEDIUM ENTERPRISES 12

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 12

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 12

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? 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Identify the elements and qualities of an entrepreneur.

CO 2: Outline the various schemes available for starting an entrepreneurship.

CO 3: Conduct various feasibility studies for starting an entrepreneurship

CO 4: Examine the various business models and analyze their effectiveness.

CO 5: Summarize about the financing methods available to start a business

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.

21MEGE05 **E- COMMERCE** **3 1 0 4**

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.

UNIT I INTRODUCTION 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO –1: Summarize the role of internet and WWW.

CO –2: Examine the influence of value chains and supply chain management.

CO –3: Outline the internet utility programs.

CO –4: Inspect the role of data analysis software for e-commerce

CO –5: Utilize the security and intelligent agents for protecting the business

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.

21MEGE06 GLOBAL WARMING AND CLIMATE CHANGE 3 1 0 4

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.

UNIT I EARTH'S CLIMATE SYSTEM 12

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 12

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 12

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 12

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 12

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: 60 Hours

COURSE OUTCOME:

CO 1: Summarize the radioactive effects of green house gases on hydrological and carbon cycle

CO 2: Examine the temperature inversion due to pollution dispersion

CO 3: Illustrate the damage due to climate change.

CO 4: Analyze the risk of irreversible changes due to climate change

CO 5: Outline the various protocols and their significance

CO 6: Analyze the mitigation technologies and practices to be adopted

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. Jan C. van Dam, Impacts of “Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2003.

SYLLABUS

FOUNDATION COURSES

21MEFC01 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.

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 Hours

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

SYLLABUS

MANDATORY COURSES

21MEMC01 RESEARCH METHODOLOGY AND IPR 2 0 0 2

COURSE OBJECTIVE:

To impart scientific, statistical and analytical knowledge for carrying out research work effectively.

UNIT I INTRODUCTION TO RESEARCH 6

The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

UNIT II EXPERIMENTAL DESIGN 6

Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.

UNIT III DATA COLLECTION METHODS 6

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and nonprobabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.

UNIT IV RESEARCH REPORT 6

Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

UNIT V PRINCIPLES OF IPR, COPYRIGHT LAW AND PRACTICES 6

Introduction to Intellectual Property Rights, Concept and Theories Kinds of Intellectual Property Rights, Economic analysis of Intellectual Property Rights, Advantages and Disadvantages of IPR, Copyright and Neighboring Rights, Concept and Principles, Historical background and Development of Copyright Law, Leading International Instruments, Berne Convention, Universal Copyright Convention

Total: 30 Hours

COURSE OUTCOME:

CO-1: Propose research problem

CO-2: Select to carry out research analysis

CO-3: Classify to follow data collection methods

CO-4: Implement to understand multivariate statistical techniques

CO-5: Represent to understand about research report.

REFERENCE BOOKS:

1. C.R.Kothari, Research Methodology, Wishva Prakashan, New Delhi, 2001
2. Donald H.McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002
3. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property Eastern Book Company, Lucknow, 2009

SYLLABUS

INTERNSHIP COURSES

21MEIT01	INTERNSHIP	0 0 4 2

The students are undergoing an internship work in the construction company/ any civil company for the duration of 4 weeks or 40 hours (Minimum).

There shall be two reviews (each 100 Marks) during the semester by the review committee. The student will be making the presentation on the techniques, ideas, methodologies learnt by him / her during the internship period before the committee. The total marks obtained in the two reviews shall be **reduced for 30 marks** and rounded to the nearest integer, 10 **marks** shall be given for Student's Assessment by Faculty.

The internship project report shall carry a maximum 20 marks, presentation by the student will carry 20 marks and the viva-voce examination shall carry 20 marks. (Marks are awarded to each student of he project group based on the individual performance during the presentation and in the viva-voce examination).

SYLLABUS

PROJECT COURSES

21METR01	DISSERTATION – I	0	0	20	10

The students are doing a project work for the duration of 4 months.

There shall be three reviews (each 100 Marks) during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be **reduced for 30 marks** and rounded to the nearest integer, 10 **marks** shall be given for Student's Assessment by Faculty.

The project report shall carry a maximum 20 marks, presentation by the student will carry 20 marks while the viva-voce examination shall carry 20 marks. (Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination and their presentation).

21METR02	DISSERTATION – II	0	0	32	16

The students are doing a project work for the duration of 4 months.

There shall be three reviews (each 100 Marks) during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be **reduced for 30 marks** and rounded to the nearest integer, 10 **marks** shall be given for Student's Assessment by Faculty.

The project report shall carry a maximum 20 marks, presentation by the student will carry 20 marks while the viva-voce examination shall carry 20 marks. (Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination and their presentation).

SYLLABUS

AUDIT COURSES

21META01 **TECHNICAL SEMINAR I** **0 0 0 0**

The students are presenting 10 topics of contemporary techniques, methods and ideas of construction industry for a period of 2 ½ months or 40 hours (Minimum).

There shall be 10 presentations made by each student during the semester and the presentation will be monitored by the review committee. The student will be making their presentation on the techniques, ideas, methodologies learnt by him / her before the committee.

The report shall carry a maximum of 20 marks, technical content and ideas in the presentation will carry 20 marks, presentation by the student will carry 20 marks and the viva-voce examination shall carry 40 marks. (Marks are awarded to each student based on the individual performance during the presentation and in the viva-voce examination). This is an audit course for the students of M.E Construction Engineering and Management

21META02 **TECHNICAL SEMINAR II** **0 0 0 0**

The students are presenting 10 topics of contemporary techniques, methods and ideas of construction industry for a period of 2 ½ months or 40 hours (Minimum).

There shall be 10 presentations made by each student during the semester and the presentation will be monitored by the review committee. The student will be making their presentation on the techniques, ideas, methodologies learnt by him / her before the committee.

The report shall carry a maximum of 20 marks, technical content and ideas in the presentation will carry 20 marks, presentation by the student will carry 20 marks and the viva-voce examination shall carry 40 marks. (Marks are awarded to each student based on the individual performance during the presentation and in the viva-voce examination). This is an audit course for the students of M.E Construction Engineering and Management