Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

CURRICULUM & SYLLABUS (PT)

MASTER OF TECHNOLOGY
CONSTRUCTION ENGINEERING AND MANAGEMENT

DEPARTMENT OF
CIVIL ENGINEERING

Department Vision

To achieve the pinnacle of success in the area of sustainable constructions and green technologies, thus stimulating economic growth and making the society a better place to live in

Department Mission

The mission of the Department of Civil Engineering is:

M1: To produce graduates who possess technical competence in their chosen specialtyarea of Civil Engineering with integrity and commitment

M2: To prepare them to serve and contribute as innovators, professional engineers, andleaders in the global community

Program Educational Objectives

The Educational Objectives of the Civil Engineering program are designed to produce skilled Engineers who could effectively contribute to the Civil Engineering profession with an ability to meet its current andfuture challenges

PEO 1: To apply fundamental technical knowledge and skills to find creative solutions to technologicalchallenges and problems in various areas of basic sciences and engineering.

PEO 2: To analyze, design and use skills in order to formulate and solve Civil Engineering problems.

PEO 3: To practice civil engineering in a responsible, professional and ethical manner and implementeco- friendly sustainable technologies for the benefit of industry and society.

PEO 4: To create knowledge through research and development in Civil Engineering and allied fields andmodernize the teaching levels.

PEO 5: To make students professionally competent by enhancing their communication skills, team spirit,and leadership and also to prepare them for lifelong learning through innovative and research activities.

PROGRAM SPECIFIC OBJECTIVES

PSO1: Acquiring sound knowledge on entire spectrum of activities associated with construction technology & management and develops ability to, evaluate analyze and integrate existing knowledge with the innovative knowledge.

PSO2: Understand the importance of societal, health, safety, legal and cultural considerations incarrying out construction projects

PSO3: Ability to use advanced software tools in Construction Project management.

PROGRAM OUTCOMES OF CONSTRUCTION ENGINEERING AND MANAGEMENT

PO1	Having an ability to design required man, material, equipment, cost and time as per needsand Specifications
PO2	Demonstrate an ability to visualize and work on laboratory using latest technology
PO3	Graduate will demonstrate skills to use modern construction engineering tools software and equipment.
PO4	Shaping managerial skills to become good decision makers, strategists and entrepreneurs
PO5	Functioning as a team in an ethical manner emphasizing on solving environmental, socialand global challenges
PO6	Functioning as a team in an ethical manner emphasizing on solving environmental, social and global challenges
PO7	Function effectively as an individual and as member or leader in diverse teams and in multidisciplinary settings
PO8	Demonstrate knowledge and understanding of the engineering and management principles and apply these to once own work as a member and leader in a team to manage projects and multidisciplinary environments
PO9	Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

Mapping of Mission with PEO's

Mission/PEOs	PEO1	PEO2	PEO3	PEO4	PEO5
M1	1	3	2	3	2
M2	2	2	1	3	3

Mapping of PEOs with POs

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
PEO1	3	3	3	2	2	1	2	2	1
PEO2	2	2	3	3	3	2	1	1	1
PEO3	2	2	3	2	1	2	2	3	1
PEO4	2	3	2	1	2	2	2	1	2
PEO5	2	3	2	1	1	2	2	2	1

Mapping of PEOs with PSOs

PEO/PSO	PSO1	PSO2	PSO3
PEO1	2	3	2
PEO2	2	2	3
PEO3	2	3	2
PEO4	3	2	2
PEO5	3	2	2

Correlation Strength: - 3: High, 2: Medium, 1: Low

Faculty of Engineering and Technology

M. TECH. CONSTRUCTION ENGINEERING AND MANAGEMENT

Regulation 2022 – Framework

Total Credits: 68
Credit for I to VI Semester: 68 Credits

Program Components

• Basic Science (Mathematics) include according to program - 1		
• Program Core theory	-	4
• Program Core Laboratory	-	4
• Program Elective	-	5
• Open Elective	-	1
• Open Lab	-	0
• Management paper	-	0
• Foreign Language	-	0
• Audit course	-	2
• Universal Human values	-	0
• Inter disciplinary theory	-	1
• Inter disciplinary Lab	-	0
• ETL	-	0
• Technical Skills	-	3
• Soft skill	-	0
• Project /mini project	-	2

Table 1: Credit Distribution For M.Tech-Construction Engineering Management

(Part Time)

S. No	CATEGORY	Description	No.of Courses	Credits	Total	Credit Weightage	Contact hours
1	CORE COURSES	Core Theory	5	18	26	38.23	270
		Core Lab	4	8			240
2	ELECTIVE COURSES	Department Core Electives/ Skill enhancement electives	5	15	15	22.05	225
3	OPEN ELECTIVES	Open Elective theory	1	3	3	4.41	45
		Open Elective Lab	0	0			0
4	INTERDISCIPLINARY / ALLIED COURSES	Theory	3	3	3	4.41	105
		Lab	0	0			0
5	HUMANITIES & SOCIAL SCIENCES , LIFE SKILLS &SOFT SKILLS	Language 1 & 2	0	0	0	0	0
		English 1 & 2	0	0			0
		Soft Skills	0	0			0
		Life Skill	0	0			0
		Foreign Language	0	0			0
		Environmental Studies	0	0			0
		Management Papers	0	0			0
		Entrepreneurship Development	0	0			0
6	PROJECTS/INTERNSHIP/ CORE SKILL	Project	2	15	17	25	90
		Core Skills	1	2			120
		Internship / NSS / NCC	0	0			0
7	ENGINEERING SCIENCES		1	4	4	5.88	60
8	ANY OTHER		-	-	-	-	-
Total			**38**		**68**	**100**	**1155**

Table 2: **Revision/modification done in syllabus content:**

S.No	Course (Subject) Code	Course (Subject) Name	Concept/ topic if any, removed in current curriculum	Concept/ topic added in the new curriculum	% of Revision/ Modification done
1	EMCE22E03	SHORING, SCAFFOLDING AND FORMWORK	FORMWORK FOR BUILDINGS AND FAILURES TOPIC REMOVED	-	20%
2	EMCE22E05	ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION	REMOVED INTRODUCTION PART	ADDED ENERGY RESOURCES AS A NEW UNIT	20%

Table 3:

List of New courses/value added courses/life skills/Electives/interdisciplinary/courses focusing on employability/ entrepreneurship/ skill development.

S.No	**New courses (Subjects)**	**Value added courses**	**Life skill**	**Electives**	**Inter Disciplinary**	**Focus on employability/ entrepreneurship/ skill development**
1	TQM in Construction	Research Publication		Advanced Concrete Technology	Research Publication Ethics	Open Elective (NPTEL/SWAYAM/Any MOOC Online courses approved by AICTE/UGC)
2	Modern Construction Materials lab			Resource Management and Control in Construction		Term Paper
3	Construction Software Laboratory			Shoring, Scaffolding and Formwork		Summer internship
4	Structural Health Monitoring (PART TIME Program)			Construction Equipment		

5				Energy Conservation Techniques in Building Construction		
6				Management Information System		
7				Economics and Finance Management in Construction		
8				Construction Personnel Management		
9				Contract Laws and Regulations		
10				Maintenance And Rehabilitation of Structures		
11				Prefabrication and Construction Techniques		
12				Modern Construction Materials		
13				Construction Planning, Scheduling and Control		
14				Project Safety Management		
15				TQM in Construction		

	SEMESTER-I							
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	**EMMA22003**	Applied Mathematics for Construction Engineers	Ty	3	1/0	0/0	4	BS
2	**EMCE22001**	Project Formulation and Appraisal	Ty	3	1/0	0/0	4	PC
3	**EMCE22L01**	Computer application Lab	Lb	0	0/0	4/0	2	PC
4	**EMCC22001**	Research Methodology and IPR	Ty	3	0/0	0/0	3	ID
5	**EMCC22IXX**	Audit Course - I	IE	2	0/0	0/0	0	ID
TOTAL				**11**	**2**	**4**	**13**	

Credits Sub Total: 13

SEMESTER - II								
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	**EMCE22002**	Advanced Construction Techniques	Ty	3	1/0	0/0	4	PC
2	**EMCE22EXX**	Program Elective I	Ty	3	0/0	0/0	3	PE
3	**EMCE22EXX**	Program Elective II	Ty	3	0/0	0/0	3	PE
4	**EMCE22L03**	Advanced Construction EngineeringLaboratory	Lb	0	0/0	4/0	2	PC
5	**EMCC22IXX**	Audit Course - II	IE	2	0/0	0/0	0	ID
		TOTAL		**11**	**1**	**4**	**12**	

Credits Sub Total: 12

SEMESTER-III								
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1.	**EMCE22003**	Computer Applications in Construction Engineering and Planning	Ty	3	0/0	0/0	3	PC
2	**EMCE22EXX**	Program Elective III	Ty	3	0/0	0/0	3	PE
3	**EMCE22EXX**	Program Elective IV	Ty	3	0/0	0/0	3	PE
4	**EMCE22L04**	Construction Software Laboratory	Lb	0	0/0	4/0	2	PC
		TOTAL		**9**	**0**	**4**	**11**	

Credits Sub Total: 11

SEMESTER-IV								
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1	**EMCE22004**	Construction Project Management	Ty	3	0/0	0/0	3	PC
2	**EMCE22EXX**	Program Elective V	Ty	3	0/0	0/0	3	PE
3	**EMCE22L02**	Modern Construction materials Laboratory	Lb	0	0/0	4/0	2	PC
4	**EMCE22I01**	Term paper	IE	0	0/0	0/4	2	PC
		TOTAL		**6**	**0**	**8**	**10**	

Credits Sub Total: 10

	SEMESTER V							
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1.	**EMCE22005**	Structural Health Monitoring	Ty	3	1/0	0/0	4	PC
2.	**EMCC22OEX**	Open Elective	Ty	3	0/0	0/0	3	ID
3.	**EMCE22L05**	Dissertation Phase I	Lb	0	0/0	0/10	5	P
		TOTAL		**6**	**1**	**10**	**12**	

Credits Sub Total: 12

SEMESTER-VI								
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T/SLr**	**P/R**	**C**	**Category**
1.	**EMCE22L06**	Dissertation Phase II	Lb	0	0/0	10/10	10	P
		TOTAL		**0**	**0**	**20**	**10**	

Credits Sub Total: 10

TOTAL CREDITS = 13+ 12 + 11+ 10+12+10 = 68

LIST OF ELECTIVES

S.No	Course Code	Course Title	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
ELECTIVE I								
1.	**EMCE22E01**	Advanced Concrete Technology	Ty	3	0/0	0/0	3	PE
2.	**EMCE22E02**	Resource Management and Control inConstruction	Ty	3	0/0	0/0	3	PE
3.	**EMCE22E03**	Shoring, Scaffolding and Formwork	Ty	3	0/0	0/0	3	PE

S.No	Course Code	Course Title	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
ELECTIVE II								
1.	**EMCE22E04**	Construction Equipments	Ty	3	0/0	0/0	3	PE
2.	**EMCE22E05**	Energy Conservation Techniques in Building Construction	Ty	3	0/0	0/0	3	PE
3.	**EMCE22E06**	Management Information System	Ty	3	0/0	0/0	3	PE

S.No	Course Code	Course Title	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
ELECTIVE III								
1.	**EMCE22E07**	Economics and Finance Management in Construction	Ty	3	0/0	0/0	3	PE
2.	**EMCE22E08**	Construction Personnel Management	Ty	3	0/0	0/0	3	PE
3.	**EMCE22E09**	Contract Laws and Regulations	Ty	3	0/0	0/0	3	PE

S.No	Course Code	Course Title	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
ELECTIVE IV								
1.	**EMCE22E10**	Maintenance and Rehabilitation of Structures	Ty	3	0/0	0/0	3	PE
2.	**EMCE22E11**	Prefabrication and Construction Techniques	Ty	3	0/0	0/0	3	PE
3.	**EMCE22E12**	Modern Construction Materials	Ty	3	0/0	0/0	3	PE

S.No	Course Code	Course Title	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
ELECTIVE V								
1.	**EMCE22E13**	Construction Planning, Scheduling and Control	Ty	3	0/0	0/0	3	PE
2.	**EMCE22E14**	Project Safety Management	Ty	3	0/0	0/0	3	PE
3.	**EMCE22E15**	TQM in Construction	Ty	3	0/0	0/0	3	PE

AUDIT COURSE 1&2								
Sl.No	**Course Code**	**Course Title**	**Ty/Lb/ETL/IE**	**Teaching Scheme**				**Category**
				L	**T/SLr**	**P**	**C**	
1	**EMCC22I01**	English for Research paper Writing	IE	2	0/0	0/0	0	ID
2	**EMCC22I02**	Disaster Management	IE	2	0/0	0/0	0	ID
3	**EMCC22I03**	Sanskrit for Technical Knowledge	IE	2	0/0	0/0	0	ID
4	**EMCC22I04**	Value Education	IE	2	0/0	0/0	0	ID
5	**EMCC22I05**	Constitution of India	IE	2	0/0	0/0	0	ID
6	**EMCC22I06**	Pedagogy Studies	IE	2	0/0	0/0	0	ID
7	**EMCC22I07**	Stress Management by Yoga	IE	2	0/0	0/0	0	ID
8	**EMCC22I08**	Personality Development through Life Enlightenment Skills	IE	2	0/0	0/0	0	ID
9	**EMCC22I09**	Research Publication Ethics	IE	2	0/0	0/0	0	ID

OPEN ELECTIVE								
S.No	Course Code	**Course Title**	**Ty/Lb/ETL/IE**	**L**	**T**	**P**	**C**	**Category**
1	EMCC22OE1	Business Analytics	Ty	3	0/0	0/0	3	ID
2	EMCC22OE2	Industrial Safety	Ty	3	0/0	0/0	3	ID
3	EMCC22OE3	Cost Management of Engineering Projects	Ty	3	0/0	0/0	3	ID
4	EMCC22OE4	Composite Materials	Ty	3	0/0	0/0	3	ID
5	EMCC22OE5	Waste to Energy	Ty	3	0/0	0/0	3	ID

SEMESTER-I

Course Code **EMMA22003**	**Course** Name **: APPLIED MATHEMATICS FOR CONSTRUCTION ENGINEERS**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: UG level Statistics and Optimization Techniques	TY	3	1/0	0/0	4
	L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab					

OBJECTIVES	The student should be made to: Describe and analyze the statistical methods To provide adequate background of Mathematics to deal with Civil Engineering Problems
	COURSE OUTCOMES (COs) :
CO1	To be able to understand Random variable
CO2	To be able to understand Estimation theory
CO3	To Understand the relation between probability and statistics
CO4	To analyze Design of Experiments
CO5	To be able to solve Queuing theory problems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	2	3	2	2	3	1	1	2	2			
CO2	3	2	1	2	2	2	2	2	3			
CO3	3	3	1	2	2	3	1	1	2			
CO4	3	2	2	2	1	2	2	2	1			
CO5	3	3	1	2	1	1	2	1	2			

COs / PSOs	PSO1	PSO2	PSO3	
CO1	2	2	2	
CO2	2	2	2	
CO3	2	2	2	
CO4	2	2	2	
CO5		2	2	

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
	√											

Course Code **EMMA22003**	Course Name: **APPLIED MATHEMATICS FOR CONSTRUCTION ENGINEERS**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: UG level Statistics and Optimization Techniques	TY	3	1	0	4
	L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab					

UNIT I RANDOM VARIABLES 12 hrs

Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Exponential, and normal distributions – Functions of a Random variable.

UNIT II ESTIMATION THEORY 12 hrs

Unbiased estimators – Method of moments –Maximum likelihood estimation – Curve fitting by Principle of least squares.

UNIT III TESTING OF HYPOTHESIS 12 hrs

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

UNIT IV DESIGN OF EXPERIMENTS 12 hrs

Analysis of Variance – One way classification – Two way classification – Design of Experiments – Completely Randomized Block Design – Randomized Block Design – Latin Square Design.

UNIT V QUEUING 12 hrs

Elementary concepts – Pure Birth and Death process – Single server Markovian models with infinite and finite capacity – Multi server Markovian models with infinite and finite capacity.

Total no. of hrs: 60

Reference Books:

1) Richard Johnson A., *Miller & Freund's Probability and statistics for Engineers (8th ed)*, Prentice Hall of India, (2009).
2) Richard Johnson A., Wichern .D.W, *Applied Multivariate Statistical Analysis (6th ed)*, Prentice Hall of India, (2007).
3) Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand & Co., (2007).
4) Soong T.T., *Fundamentals of Probability and Statistics for Engineers*, John Wiley & Sons, (2004).
5) Hamdy A. Taha, *Operations Research: An Introduction (9th ed.)*, Pearson, (2010).
6) Hillier, Lieberman, *Introduction to Operations Research (8th ed.) (IAE)*, Tata McGraw Hill Publishing Co., (2005)

Course Code: EMCE22001	Course Name: PROJECT FORMULATION AND APPRAISAL	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To study the project financing, costing and payback period in construction project

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding formulation concepts, and assess the costing of construction projects
CO2	Be familiar with appraisal and understand various financing techniques
CO3	Understanding risk analysis and its implications to projects
CO4	To know the role of private sector participation in construction Industry.
CO5	Learn to formulate a project in a sustainable way

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	2	1	2	3	1	3	3	2	2			
CO2	2	2	2	3	2	3	3	2	2			
C03	2	2	2	3	1	3	3	2	2			
CO4	2	3	2	3	2	3	3	2	2			
CO5	2	3	2	3	1	1	3	2	2			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	3	2	1				
CO2	3	2	1				
C03	3	2	1				
CO4	3	3	1				
CO5	3	3	1				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Approval	

Course Code: EMCE22001	Course Name: PROJECT FORMULATION AND APPRAISAL	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I: PROJECT FORMULATION **12 Hrs**

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

UNIT II: PROJECT COSTING **12 Hrs**

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

UNIT III: PROJECT APPRAISAL **12 Hrs**

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 Hrs**

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

UNIT V: PRIVATE SECTOR PARTICIPATION **12 Hrs**

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

Total No. of Hours: 60 Hrs

REFERENCES

1. *Prasanna Chandra, Projects – Planning Analysis Selection Implementation & Review FourthEdition, Tata McGraw-Hill Publishing Company Ltd., New Delhi., 1995*
2. *Joy P.K., Total Project Management - The Indian Context (Chapters 3 - 7), New Delhi, Macmillan India Ltd., 1992*
3. *United Nations Industrial Development Organisation (UNIDO) Manual for the preparationofIndustrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987*
4. *Barcus, S.W. and Wilkinson. J.W., Hand Book of Management Consulting Services,McGraw Hill,New York, 1986.*

Course Code: EMCE22L01	Course Name: COMPUTER APPLICATION LAB	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basic computer Skill for Engineers	Lb	0	0/0	4/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: This course gives an exposure to students in utilizing the sophisticated Spread sheets programs, Estimation Software and other package programs.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know the basics of MS office
CO2	To have hands on experience on Spreadsheet
CO3	Understanding basics MS Access
CO4	To understand the basics about –software & Hardware
CO5	To Educate about QEPRO

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	2	3	3	2	3	2	3	1	2			
CO2	2	3	3	2	3	2	3	1	2			
C03	2	3	2	2	3	2	3	1	2			
CO4	2	3	3	2	3	2	3	1	2			
CO5	2	3	3	2	3	2	3	1	2			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		3		2							
CO2	3		3		2							
C03	3		3		2							
CO4	3		3		2							
CO5	3		3		2							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
									✓			
Approval												

Course Code: EMCE22L01	Course Name: COMPUTER APPLICATION LAB	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basic computer Skill for Engineers	Lb	0	0/0	4/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

LIST OF EXPERIMENTS

1. Introduction about –software & Hardware.
2. Use of management software
3. Construction scheduling with software
4. Building Information Modeling (BIM)

Total No. of Hours: 60

REFERENCES

1. *Feigenbaum ., L.," Construction scheduling with primavera project planner" Prentice Hall Inc.,1999.*
2. *Paulson, B.R, "Computer Applications in construction,"McGraw-hill, 1995.*

Course Code: EMCC22001	**Course Name:** Research Methodology and IPR	**Ty/Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
	Prerequisite: core subjects	Ty	3	0/0	0/0	3

Ty/Lb/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab

OBJECTIVE: The goal is to emphasize the importance of innovation and creativity by understanding the research concepts and ethics which will aid to build the nation IPR status.

COURSE OUTCOMES (COs) : By doing this course students will

CO1	Understand research problem formulation by Analyzing research related information and its execution by following research ethics
CO2	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO3	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO4	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	2	3	3	3	3	2	3	3	2	2
CO2	2	3	3	3	3	2	3	3	2	2
CO3	2	3	3	3	3	2	3	3	2	2
CO4	2	3	3	3	3	2	3	3	2	2

COs / PSOs	**PSO1**	**PSO2**	
CO1	3	3	
CO2	3	3	
CO3	3	3	
CO4	3	3	

3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

Course Code	Subject Name	Ty/Lb/ETL	L	T/SLr	P/R	C
EMCC22001	Research Methodology and IPR	Ty	3	0/0	0/0	3

UNIT 1: SELECTION, ANALYSIS AND STATEMENT OF THE RESEARCH PROBLEM; 9 hrs

Literature Review and Formulation of Objectives – using the following Critical thinking Skills – Drawing a Concept map, Oral Communication, Debating, Questioning, Collaborating, Evaluation and Reasoning.

UNIT 2: RESEARCH DESIGN 9 hrs

Types of Study, Types of Data, Measures of Variablility, Setting up the Hypotheses, data collection techniques and tools, sampling, Describing data – Charts and graphs ; Data processing – Categorization, coding, summarization.

UNIT 3: DATA ANALYSIS AND REPORT WRITING: 9 hrs

Statistical measures, Regression and correlation, significance test; Report writing – Purpose, format, content, editing and evaluation. Using Citation tools; Report for specific purposes – Theses, Journals, Grant application. Oral presentation to an audience; use of project management digital tools and plagiarism checking.

UNIT 4: INTRODUCTION TO INTELLECTUAL PROPERTY 9 hrs

Types of intellectual property rights – Patent, Copyright, Trade Mark, Industrial Design, Geographical Indication, Trade Secrets - Traditional Knowledge. Elements of Patentability - Novelty, Non Obviousness (Inventive Steps), Industrial Application – Non patentable inventions – Process of patenting – National and International – Form and Fees for IP India

UNIT 5: PRIOR ART SEARCH, PATENT DRAFTING 9 hrs

Drafting patent Claims – Types of claims - Registration Procedure, Rights and Duties of Patentee; Patent infringement; Licensing – Franchising - Joint ventures; Non-Disclosure Agreements (NDAs) - Material Transfer Agreements (MTAs).

Total : 45

References:

- C. Vijayalakshmi and C. Sivapragasam (2011) Research Methods – Tips and Techniques, , MJP Publishers
- Deboraj Rumsey (2010) Statistics Essentials for Dummies, Wiley Publishing Incorporated
- Bouchoux (2013) Intellectual Property, DELMAR CENGAGE Learning, USA
- V K Ahuja (2017) Law Relating to Intellectual Property Rights, LexisNexis Butterworths India

IMPORTANT WEB LINKS

- https://www.wipo.int/portal/en/index.html
- http://ipindia.nic.in/
- https://www.epo.org
- https://www.uspto.gov

SEMESTER-II

Course Code: EMCE22002	Course Name: ADVANCED CONSTRUCTION TECHNIQUES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Techniques	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To study and understand the latest construction techniques applied to engineering Construction.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding the various techniques involved in sub structure construction.
CO2	Understanding the basics and different techniques involved in super structure construction.
CO3	To know the modern construction techniques involved in construction of special structures
CO4	To understand basics of rehabilitation techniques and interpret and analyze them.
CO5	Understanding latest demolition and dismantling techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	2	2	3	1	3	3	2	1			
CO2	3	2	2	3	1	3	3	2	1			
C03	3	2	2	3	1	3	3	2	1			
CO4	3	2	2	3	1	3	3	2	1			
CO5	3	2	2	3	1	3	3	2	1			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	3	2	3				
CO2	3	2	3				
C03	3	2	3				
CO4	2	2	2				
CO5	2	2	3				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								

Approval	

Course Code: EMCE22002	Course Name: ADVANCED CONSTRUCTION TECHNIQUES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Techniques	Ty	3	1/0	0/0	4
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I: SUB STRUCTURE CONSTRUCTION **9 Hrs**

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

UNIT II: SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS **9 Hrs**

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 – insitu prestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures –

UNIT III: CONSTRUCTION OF SPECIAL STRUCTURES **9 Hrs**

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 in offshore construction practice – 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 **9 Hrs**

Mud jacking grout through slab foundation – Micro piling for strengthening floor and shallow profile – pipeline laying-protecting sheet piles, screw anchors -Sub grade water proofing under pining

UNIT V: DEMOLITION **9 Hrs**

Advanced techniques and sequence in demolition and dismantling. Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

Total No. of Hours: 45

REFERENCES

1. *Robertwade Brown, Practical foundation engineering hand book, McGraw-Hill Publications, 1995*
2. *Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992 Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984*

Course Code: EMCE22L03	Course Name: ADVANCED CONSTRUCTION ENGINEERING LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Lab	Lb	0	0/0	4/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To study and understand the latest construction techniques applied to engineering Construction.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To design a high performance concrete mix as per codal provisions
CO2	To assess the workability of normal concrete
CO3	To analyses the concrete for permeability and strength through non-destructive testing methods
CO4	To assess the workability of Self Compacting Concrete
CO5	To assess the effect of minerals and chemical admixtures in concrete

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	3	3	3	2	2	1	1			
CO2	2	3	3	3	3	2	2	1	1			
C03	3	3	2	3	3	2	2	1	1			
CO4	3	3	3	3	3	2	2	1	1			
CO5	3	2	3	3	2	2	2	1	1			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	2	1						
CO2	3	2	3						
C03	3	2	1						
CO4	2	2	1						
CO5	1	2	3						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								
Approval												

Course Code: EMCE22L03	Course Name: ADVANCED CONSTRUCTION ENGINEERING LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Lab	Lb	0	0/0	4/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. Mix design of concrete as per IS, ACI & BS methods for high performance concrete.
2. Flow Characteristics of Self Compacting concrete.
3. Effect of minerals and chemical admixtures in concrete at fresh and hardened state withrelevance to workability, strength and durability.
4. Permeability of Concrete.
   a. Rapid chloride Penetration Test,
   b. Freeze and Thaw test,
   c. Acid test
   d. Alkali aggregate reaction test
   e. VCC testing for fire resistance
   f. Autoclaving
5. Non Destructive Testing Of Concrete.
   a. Ultra Sonic Pulse velocity Test,
   b. Rebound Hammer test
   c. Cover Meter
   d. Concrete Analyzer

Total No. of Hours: 60 Hrs

REFERENCES

1. *Purushothaman, P, Reinforced Concrete Structure Structural Elements :Behaviour Analysisand Design , Tata McGraw Hill, New Delhi 1986.*
2. *Varghese, P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India New Delhi,1995.*
3. *Krishna Raju, N.Advanced Reinforced Concrete Design, CBS Publishers and New Delhi Distributors, 1986.*
4. *Neville, A.M., Properties of Concrete , Pitman Publishing Limited, London.*
5. *Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi.*

SEMESTER-III

Course Code:	Course Name: COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
EMCE22003	Prerequisite: Construction Planning and Scheduling	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: To study and understand the hardware and software requirements of computer, Programming and scheduling techniques applied to construction engineering.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know about the preliminaries of the computer applications for management problems
CO2	To understand the optimization techniques
CO3	To understand the development of software for inventory problems
CO4	To assess the progress of a construction project via scheduling techniques like PERT, CPM
CO5	Understanding other simulation models used in construction

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	3	2	3	3	3	3	-	-	3		
CO2	3	3	2	3	3	3	3	-	-	3		
C03	3	3	2	3	3	3	3	-	-	3		
CO4	3	3	2	3	3	3	3	-	-	3		
CO5	3	2	2	3	2	3	3	-	-	3		
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		3		2							
CO2	3		3		2							
C03	3		3		2							
CO4	3		3		2							
CO5	3		3		2							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								
Approval												

Course Code:	Course Name: COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
EMCE22003	Prerequisite: Construction Planning and Scheduling	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I: INTRODUCTION **9 Hrs**

Introduction to System Hardware-Languages-Database Management-Spread Sheets-Applications

UNIT II: OPTIMIZATION TECHNIQUES **9 Hrs**

Linear, Dynamic and Integer Programming-Branch and Bound Techniques-Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems- Software Development

UNIT III: INVENTORY PROBLEMS **9 Hrs**

Deterministic and Probabilistic Inventory Models-Software Development

UNIT IV: SCHEDULING APPLICATIONS **9 Hrs**

PERT and CPM-Software Development - Use of Management Software

UNIT V: OTHER PROBLEMS **9 Hrs**

Decision Making-Bayes Theory-Simulation Models

Total No. of Hours: 45

REFERENCES

1. *Bily E. Gillet., "Introduction to Operation 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 Primevera Project Planner", Prentice HallInc., 1999.*

Course Code: EMCE22L04	Course Name: CONSTRUCTION SOFTWARE LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Lb	0	0/0	4/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : This course gives an exposure to students in Scheduling Software's

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know the basics of scheduling software
CO2	To have hands on experience on scheduling software like MSP
CO3	Understanding basics of Primavera
CO4	To understand the basics of Building Information Modelling Techniques
CO5	Ability to apply Building Information Modelling Techniques in project management

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	2	3	-	-	-	-	3	1			
CO2	3	2	3	-	-	-	-	3	1			
C03	3	2	2	-	-	-	-	3	1			
CO4	3	2	3	-	-	-	-	3	1			
CO5	3	2	3	-	-	-	-	3	1			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	3	2	3				
CO2	3	2	3				
C03	3	2	3				
CO4	3	3	3				
CO5	3	3	3				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
									✓			
Approval												

Course Code: EMCE22L04	Course Name: CONSTRUCTION SOFTWARE LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Lb	0	0/0	4/0	2
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

LIST OF EXPERIMENTS

1. Scheduling f a small construction project using Primavera scheduling systems including reports and tracking.
2. Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.
3. Simulation models for project risk analysis.
4. Building Information Modeling (BIM)

Total No. of Hours: 60

REFERENCES

1. *Feigenbaum ., L.," Construction scheduling with primavera project planner" Prentice Hall Inc., 1999.*
2. *Paulson, B.R, "Computer Applications in construction,"Mc Graw-hill, 1995*.

SEMESTER-IV

Course Code: EMCE22004	Course Name: CONSTRUCTION PROJECT MANAGEMENT	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Management	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

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

COURSE OUTCOMES (COs) : (3- 5)

CO1	To identify and analyze the role of contractors and project managers
CO2	To implement suitable planning techniques and different delivery method ofproject.
CO3	To plan suitable management methods for construction projects
CO4	Understanding project scheduling for resource management
CO5	Ability to arrive at various estimates involved in a project

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	3	3	3	3	3	2	3	1			
CO2	3	2	3	3	3	3	2	3	3			
C03	2	3	2	3	2	3	2	3	1			
CO4	2	3	3	3	2	3	3	3	1			
CO5	2	3	2	3	2	3	3	3	1			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	3	1						
CO2	2	1	1						
C03	2	1	1						
CO4	3	1	3						
CO5	2	3	3						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill compo	Practical / Project			
				✓								
Approval												

Course Code: EMCE22004	Course Name: CONSTRUCTION PROJECT MANAGEMENT	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Management	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I: THE OWNERS' PERSPECTIVE **9Hrs**

Introduction - Project Life Cycle Types of Construction - Selection of Professional Services- ConstructionContractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers.

UNIT II: ORGANIZING FOR PROJECT MANAGEMENT **9Hrs**

Project Management - Trends in Modern Management - Strategic Planning and Project Programming - 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 - Interpersonal Behavior in Project Organizations - Perceptions of Owners and Contractors

UNIT III: DESIGN AND CONSTRUCTION PROCESS **9Hrs**

Design and Construction as an Integrated System - Innovation and Technological Feasibility -Innovation and economic Feasibility - Design Methodology - Functional Design - Physical Structures-Geo- technical Engineering Investigation - Construction Site Environment - Value Engineering - Construction Planning - Industrialized Construction and Pre-fabrication - Computer-Aided Engineering

UNIT IV : LABOR, MATERIAL AND EQUIPMENT **9Hrs**

Historical Perspective - Labor Productivity - Factors Affecting Job-Site Productivity - Labor 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 utilization .Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks

UNIT V: COST ESTIMATION **9Hrs**

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of ConstructionCost 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 - Allocation of Construction Costs Over Time - Computer Aided Cost Estimation - Estimation of Operating Costs.

Total No. of Hours: 45

REFERENCES

1. *Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.*
2. *Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.*
3. *Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.*
4. *Choudhury, S, Project Management, Tata McGraw-Hill Publishing Company, New Delhi, 1988.*
5. *Ernest E. Ludwig, Applied Project Engineering and Management, Gulf Publishing Company,*

Course Code: **EMCE22L02**	**Course Name: Modern Construction material Laboratory**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Construction Materials	Lb	0	0/0	4/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To develop skills in Modern Construction material

COURSE OUTCOMES (COs) : (3- 5)

CO1	Be able to understand the Concept of Special Concrete – Foam Concrete, Pervious Concrete, Translucent Concrete
CO2	To design a concrete mix – Special Concrete
CO3	To assess Modern material characteristics for both concrete and metals

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	3	3	2	3	3	1	-	-			
CO2	3	3	2	2	2	3	1	-	-			
CO3	3	3	3		3	3	1	-	-			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	3	2	1				
CO2	3	2	1				
CO3	3	2	1				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
									✓			
Approval												

Course Code: EMCE22L02	Course Name: Modern Construction material Laboratory	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Materials	Lb	0	0/0	4/0	2

LIST OF EXPERIMENTS

Special Concrete – Foam Concrete, Pervious Concrete, Translucent Concrete

1. Basic test on material for special Concrete
2. Mix design of Special concretes.
3. Behavioral Characteristics of Special concrete

- Workability test
- Slump test
- Strength of concrete

4. As per IS 1789 Metals- testing of rods-Steel, Aluminum, Alloys

- Bend Test
- Proof Stress
- Elongation test

5. Case studies on any one modern materials

Total No. of Hours: 60

REFERENCES

1. *Ganapathy, C. "Modern Construction Materials", Eswar Press, 2215.*
2. *Shan Somayaji, Civil Engineering Materials, 2nd Edition, Prentice Hall Inc., 2201*
3. *Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc.,1999*
4. *Derucher, K. Korfiatis.G. and Ezeldin, S., Materials for Civil and Highway Engineers, 4th Edition, PrenticeHall Inc., 1999*
5. *Aitkens, High Performance Concrete, McGraw-Hill, 1999*

Course Code : EMCE22I01	**Course Name:** TERM PAPER	**T / L/ ETP/IE**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite : Nil	IE	0	0/0	0/2	2
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab						

A term paper is an elaborate research-based work on a particular topic in the domain of study. The student must choose a topic of his interest from the domain of study for a term paper. The term paper can be an original research article or review article. In case of review article, the student must refer at least 50 research/review articles and critically review other researcher's work. The term paper may be 10 -20 pages in length. The general guidelines for writing the term paper as follows:

1. Abstract
2. Introduction to explain about the broad and general statement on the topic chosen.
3. Aim /Objective of the term paper.
4. Description of methodology, concepts and arguments.
5. Identify the research gap and suggest possible future works.
6. Conclusion

Three reviews will be conducted to monitor the progress of the work. At the end of the semester, presentation must be made by the student and Viva-Voce examination will be conducted by the internal Examiner duly appointed by the Head of the department and the students will be evaluated.

SEMESTER-V

Course Code : **EMCE22005**	Course Name: **STRUCTURAL HEALTH MONITORING**	**T/L**	**L**	**T**	**P**	**C**
	Prerequisite: Static and Dynamic distress/ Repair and Rehabilitation	**T**	**3**	**1/0**	**0/0**	**4**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: CreditsT/L/ETL : Theory / Lab / Embedded Theory and Lab

COURSE OUTCOMES (Cos) : (3 – 5) At the end of the course, students will be able to

CO1	Ability to learn about the health of structure using static field methods and dynamic field tests
CO2	Diagnosis the distress in the structure understanding the causes and factors.
CO3	Students to know about repairs and rehabilitation measures of the structure
CO4	Ability to investigation structural related problems
CO5	Suggest repairs and rehabilitation measures of the structure

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**			
CO1	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**			
CO2	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**			
C03	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**			
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**			
CO5	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**			
COs / PSOs	**PSO1**		**PSO2**		**PSO3**							
CO1	**3**		**3**		**3**							
CO2	**3**		**3**		**3**							
C03	**3**		**3**		**3**							
CO4	**3**		**3**		**3**							
CO5	**3**		**3**		**3**							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
				✓								
Approval												

Course Code : **EMCE22005**	Course Name: **STRUCTURAL HEALTH MONITORING**	**T/L**	**L**	**T**	**P**	**C**
	Prerequisite: Static and Dynamic distress/ Repair and Rehabilitation	**T**	**3**	**1/0**	**0/0**	**4**
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: CreditsT/L/ETL : Theory / Lab / Embedded Theory and Lab						

UNIT I: STRUCTURAL HEALTH 9 Hrs

Factors affecting Health of Structures - Causes of Distress - Regular Maintenance.

UNIT II: STRUCTURAL HEALTH MONITORING 9 Hrs

Concepts - Various Measures -Structural Safety in Alteration - Structural Audit - Assessment of Health ofStructure - Collapse and Investigation - Investigation Management - SHM Procedures.

UNIT III TESTING 9 Hrs

Testing: Static Field Testing – Dynamic field testing - Stress history data - Dynamic load allowance tests - Ambient vibration tests - Forced Vibration Method - Dynamic response methods.

UNIT VI DYNAMIC FIELD TESTING 9 Hrs

Types of Dynamic Field Test- Stress History Data- Dynamic Response Methods- Hardware for RemoteData Acquisition Systems- Remote Structural Health Monitoring.

UNIT V INTRODUCTION TO REPAIRS AND REHABILITATIONS OF STRUCTURES

9 Hrs

Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanicalimpedance (EMI) technique, adaptations of EMI technique.

Total No of Hours: 45

REFERENCES:

1. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006

2. Health Monitoring of Structural Materials and Components_Methods with Applications,Douglas E Adams, John Wiley and Sons, 2007.

3.Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. DDuan,Taylor and Francis Group, London, UK, 2006.

4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc,2007

Course Code: EMCE22L05	Course Name: DISSERTATION -PHASE I	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Ug Level Project	Lb	0	0/0	0/10	5

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process forthe benefit of the society.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Work in a team and develop multidisciplinary, research skills
CO2	Identifying the challenges and issues of the industry
CO3	Explore innovative ideas in civil engineering field
CO4	Develop projects based on industrial and field requirements
CO5	Develop design projects based on industrial requirements.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	2	3	2	3	3	3	2	3	3			
CO2	2	3	2	3	3	3	2	2	3			
C03	1	3	2	3	3	3	-	3	3			
CO4	1	3	2	3	3	3	-	2	3			
CO5	1	3		3	3	3	3	2	3			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	2	3						
CO2	2	3	1						
C03	3	3	1						
CO4	2	3	1						
CO5	3	2	1						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					
Approval												

Course Code: EMCE22L05	Course Name: DISSERTATION -PHASE I	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Ug Level Project	Lb	0	0/0	0/10	5
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

OBJECTIVE

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

M.Tech projects should be socially relevant and research oriented ones. Each student is expected to do anindividual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only ifhe / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers /publishers.

SEMESTER-VI

Course Code: EMCE22L06	Course Name: DISSERTATION - PHASE II	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: DISSERTATION - PHASE I	Lb	0	0/0	10/10	10

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process forthe benefit of the society.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Work in a team and develop multidisciplinary ,research skills
CO2	Identifying the challenges and issues of the industry
CO3	Explore innovative ideas in civil engineering field
CO4	Develop projects based on industrial and field requirements
CO5	Develop design projects based on industrial requirements.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	2	3	3	2	3	3	3	1			
CO2	1	1	3	1	2	3	3	3	1			
C03	3	2	3	3	2	3	2	1	3			
CO4	3	3	1	3	3	3	2	2	1			
CO5	1	3	3	3	3	3	2	2	3			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	1	2	3						
CO2	1	2	3						
C03	3	2	1						
CO4	3	3	1						
CO5	2	3	1						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
									✓			
Approval												

Course Code: EMCE22L06	Course Name : DISSERTATION - PHASE II	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: DISSERTATION - PHASE I	Lb	0	0/0	10/10	10

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

M.Tech projects should be socially relevant and research oriented ones. Each student is expected to do an individual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only ifhe / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers /publishers.

PROGRAM ELECTIVE -I

Course Code: EMCE22E01	Course Name: ADVANCED CONCRETE TECHNOLOGY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

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

COURSE OUTCOMES (COs) : (3- 5)

CO1	To interpret the properties of cement, aggregates and other admixtures used in concrete
CO2	To assess the properties of fresh and hardened concrete
CO3	To perform durability tests on concrete and have an insight about special concretes
CO4	To study properties of special types of concrete.
CO5	To study the properties of constituent elements of concrete

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	2	1	2	3	2	1	2			
CO2	3	1	2	1	2	1	2	1	2			
C03	3	2	1	2	1	2	2	2	1			
C04	3	1	1	3	1	2	3	1	1			
C05	3	2	1	1	2	1	3	2	1			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	1	2						
CO2	3	1	2						
C03	3	1	2						
C04	3	1	2						
C05	3	1	2						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✔							
Approval												

ELECTIVE – I

Course Code: EMCE22E01	Subject Name: ADVANCED CONCRETE TECHNOLOGY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

UNIT I: CONCRETE INGREDIENTS 9 Hrs

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 Shape and Mechanical Properties – Absorption and Physical Durability – Chemical Stability – Packing Characteristics

UNIT II: FRESH CONCRETE 9 Hrs

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

UNIT III: HARDENED CONCRETE 9 Hrs

Interfacial Transition Zone – Fracture Strength – Mechanical Properties – High Strength Concrete – Shrinkage – Creep – Other Properties

UNIT IV: DURABILITY OF CONCRETE 9 Hrs

Basic Consideration – Stability of Constituents – Chemical Attack – Corrosion of Reinforcing Steel

UNIT V : SPECIAL CONCRETES 9 Hrs

Manipulation of Strength of Concrete – Fibre Reinforced Concrete – Self Compacting Concrete – PolymerConcrete – Super Plasticized Concrete.

Total No. of Hours: 45

***Note: (Use of approved data books permitted)**

REFERENCES

1. *Nevile, A.M., Properties of Concrete, 4th edition, Longman, 1995.*
2. *Metha P.K.and Montreio P.J.M., ConcreteStructure Properties andMaterials, 2nd edition, Prentice Hall, 1998.*
3. *Mindass and Young, Concrete, Prentice Hall, 199*

Course Code: EMCE22E02	Course Name: RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Planning and Scheduling	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study the management of various resources involved in construction.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To plan, utilize and manage the resources effectively
CO2	To make optimum decision in handling materials, equipment and time
CO3	To understand the concept of resource allocation and levelling
CO4	To study and evaluate the resources - material, equipment, labor and time.
CO5	To plan and manage the resources studied above using various tools and techniques like allocation, leveling critical path measurement.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	2	1	2	3	2	1			
CO2	3	1	1	2	1	2	1	2	1			
C03	3	1	2	1	2	1	2	2	2			
CO4	3	1	1	1	3	1	2	3	1			
CO5	3	1	2	1	1	2	1	3	2			

COs / PSOs	PSO1	PSO2	PSO3					
CO1	1	2	1					
CO2	1	2	1					
C03	2	1	2					
CO4	1	1	3					
CO5	2	1	1					

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – I

Course Code: EMCE22E02	Course Name: RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Planning and Scheduling	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I: RESOURCE PLANNING 9 Hrs

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

UNIT II: RESOURCE MANAGEMENT AND UTILISATION 9 Hrs

Systems approach in resource management, Characteristics of resources, Resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.

UNIT III: MATERIALS AND EQUIPMENT 9 Hrs

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 9 Hrs

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects. Cost control: Cash flow and cost control, objectives of cost, Time and quality.

UNIT V: RESOURCE ALLOCATION AND LEVELLING 9 Hrs

Time-cost trade of, Computer application in resource leveling examples, resource list, resource allocation graph, Resource loading, Cumulative cost ETC - Value Management.

Total No. of Hours: 45

REFERENCES

1. *Andrew,D., Szilagg, Hand Book of Engineering Management, 1982.*
2. *Glenn, A., Sea's and Reichard.H Clough, Construction Project Management, John Wiley and Sons,Inc. 1979.*
3. *Harvey, A., Levine, Project Management using Micro Computers, Obsorne-McGraw-Hill C.A. Publishing Co., Inc. 1988.*
4. *James.A., Adrain ,Quantitative Methods in Construction Management, American Elsevier Publishing Co., Inc., 1973.*

Course Code: EMCE22E03	Course Name: SHORING, SCAFFOLDING AND FORMWORK	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: To study and understand the various types of scaffolding, formworks, shoring methods and techniques.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To select appropriate form materials and site equipment
CO2	To analyze the stresses on formwork and design for the same
CO3	To understand the different types of forms and its failure mechanisms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	1	2	1	2	3	3			
CO2	3	1	1	1	2	1	2	1	1			
C03	3	1	1	2	1	2	1	2	2			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		1		2							
CO2	3		1		2							
C03	3		2		1							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

Course Code: EMCE22E03	Course Name: SHORING, SCAFFOLDING AND FORMWORK	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

UNIT I: PLANNING, SITE EQUIPMENT AND PLANT FOR FORM WORK 9 Hrs

Planning – Standard units – Schedule for column formwork – Formwork elements – Planning at Tender stage, Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms. Crane arrangement – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales – Scaffold frames - Form accessories
– Vertical transport table form work.

UNIT II: FORM MATERIALS AND PRESSURES ON FORMWORK 9 Hrs

Lumber – Types – Finish – Sheathing boards - Working stresses – Repetitive member stress – Plywood – Types andgrades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminum Form lining materials – Hardwareand fasteners – Nails in Plywood – Bolts lag screw and connectors – Bolt loads. Pressures on Formwork - Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic Adjustment for non-standard condition.

UNIT III : SHORES AND FORM DESIGN 9 Hrs

Simple wood stresses – Slenderness ratio – Allowable loads – Tubular steel shores - Patented shores – Site Preparation - Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multistoried
– More concentrated shore loads - T-heads – Two tier wood shores – Ellis shores – Dayton sure grip and Baker Roosshores – Safway Symons shores – Beaver Advance shores - Dead shores – Raking and Flying shores Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam form – Ties, Anchors and Hangers – Column forms – DOKA forms -Examples in each.

UNIT IV: FORMWORK FOR BUILDINGS AND FAILURES 9 Hrs

Location of job mill – Storage – Equipment – Footings – Wall footing – Column footings Sloped footings – Slab ongrade and paving work – Highway and airport paving – Curb and Gutter forms – Wall forms – External vibration – Prefabricated panel systems – Giant forms curved wall forms – wall openings joints – Tolerance for walls – Erectionpractices – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Suggested Tolerances –

UNIT V: DOME FORMS, TUNNEL FORMS, SLIPFORMS AND SAFETY PRACTICESFORSCAFFOLDS 9 Hrs

Shells of translation and revolution - Hemispherical – Parabolic - Barrel vaults - Hyperbolic Paraboloid Shells – Conoidal Shells - Folded plates – Shell form design – Building the form – Placing concrete – Strength requirements – Tunnel forming components – Curb and Invert forms – Arch and Wall forms - Telescopic forms– Concrete placement methods – Cut and Cover construction – Continuous Advancing slope method - Bulk head method – General design considerations influence of placing equipment – Tolerances – Form construction for Shafts. Slipforms – Principles – Types – Advantage – Functions of various components – Planning of Slipform operations – Desirable characteristics of concrete – Common problems faced – Safety in slip forms - Special structures built with SlipformTechnique – Codal provisions – Types of scaffolds – Putlog and Independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties - Plan Bracing – Knots – Safety nets – General safety requirements – Precautions againstparticular hazards – Truss, Suspended – Gantry and system scaffolds.

Total No. of Hours: 45

REFERENCES

1. *Robert L. Peurifoy and Garold D. Oberlender, "Formwork for Concrete Structures", Third Edition McGraw-Hill, 1996.*
2. *Hurd, M.K., "Formwork for Concrete", Special Publication No. 4 Sixth Edition, American Concrete Institute, Detroit, 1995.*
3. *Michael P. Hurst, "Formwork", Construction Press, London and New York, 1997.*
4. *Austin, C.K., "Formwork for Concrete", Cleaver – Hume Press Ltd., London 1996.*
5. *Tudor Dinescu and Constantin Radulescu, "Slipform Techniques", Abacus Press, Turn Bridge Wells, Kent, 1992.*
6. *"Guide for Concrete Formwork", American Concrete Institute Detroit, Michigan, 1996.*

PROGRAM ELECTIVE –I

Course Code: EMCE22E04	Course Name: CONSTRUCTION EQUIPMENTS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE: To study the various construction equipment in construction field.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To manage the various construction equipment and to understand the concept of depreciation andcost control
CO2	To understand the components and operation of earthwork tunneling, drilling, dewatering andpiling equipment
CO3	To know the work of material handling, aggregate and concreting equipment
CO4	To introduce various construction equipment for earthwork, material handling and other miscellaneous purposes.
CO5	To study the working of the equipment mentioned above and apply scientific principles for effectively utilizing them.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	2	1	2	3	2	1	2			
CO2	3	1	2	1	2	1	2	1	2			
C03	3	2	1	2	1	2	2	2	1			
CO4	3	1	1	3	1	2	3	1	1			
CO5	3	2	1	1	2	1	3	2	1			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	1	2	1						
CO2	1	2	1						
C03	2	1	2						
CO4	1	1	3						
CO5	2	1	1						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Approval	

ELECTIVE – II

Course Code: EMCE22E04	Course Name: CONSTRUCTION EQUIPMENTS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT I CONSTRUCTION EQUIPMENTS AND MANAGEMENT **9 Hrs**

Identification – Planning of equipment – Selection of Equipment - Equipment Management in Projects - Maintenance Management – Equipment cost – Operating cost – Cost Control of Equipment - Depreciation Analysis – Replacementof Equipment- Replacement Analysis - Safety Management

UNIT II EQUIPMENT FOR EARTHWORK **9 Hrs**

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment.

UNIT III OTHER CONSTRUCTION EQUIPMENT **9Hrs**

Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Equipment for Demolition.under water concreting equipments

UNIT IV ASPHALT AND CONCRETE PLANTS **9Hrs**

Aggregate production- Different Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Pumping Equipment – Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment

UNIT V MATERIALS HANDLING EQUIPMENT **9 Hrs**

Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes- Industrial Trucks.

Total No. of Hours: 45

REFERENCES

1. *Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment and Methods, 5th Edition, McGraw-Hill, Singapore, 1995*
2. *Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.*
3. *Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.*
4. *Dr.Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi. 1983.*

Course Code: EMCE22E05	Course Name: ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: UG Energy Conservation Techniques	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE: To study the various energy saving and management techniques applied to building and constructionwith relevance to environment.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To Possess knowledge on basic energy conservation systems
CO2	To Design energy efficient buildings
CO3	To do energy audit and identify conservative measures
CO4	To study the sources of energy and energy production in relation to heating, ventilating and air conditioning.
CO5	To study the concepts underlying energy management by adopting appropriate design methodology in providing energy related services

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	1	1	1	2	1	2	3	2	1			
CO2	1	1	1	2	1	2	1	2	1			
CO3	1	1	2	1	2	1	2	2	2			
CO4	1	1	1	1	3	1	2	3	1			
CO5	1	1	2	1	1	2	1	3	2			

COs / PSOs	PSO1	PSO2	PSO3									
CO1	1	2	1									
CO2	1	2	1									
CO3	2	1	2									
CO4	1	1	3									
CO5	2	1	1									

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – II

Course Code: EMCE22E05	Course Name: ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Energy Conservation Techniques	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

UNIT I: ENERGY RESOURCES **9 Hrs**

Energy and Development, Units and Measurements, Conventional and Non-Conventional Sources of Energy, Fossil and Mineral Energy Resources, Details of Coal, Peat, Oil, Natural Gas and Nuclear Resources, Recovery of Fossil Fuels, Classification and Characterization of Fossil fuels, Basic of Solar, Wind, Bio, Hydro, Tidal, Ocean Thermal and other Renewable Energy Sources, Impact of Energy on Environment, Flow of Energy in Ecological System, Environmental Degradation due to energy, Control of Pollution from Energy.

UNIT II: ENVIRONMENTAL **9 Hrs**

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 **9 Hrs**

Natural building design consideration – Energy efficient design strategies – Contextual factors – Longevity and process Assessment – Renewable Energy Sources and design – Advanced building Technologies – Smart buildings – Economies and cost analysis.

UNIT IV: SERVICES **9 Hrs**

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 programe.

UNIT V: ENERGY MANAGEMENT **9 Hrs**

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 conditioningsystems – Applications – Facility operation and maintenance – Facility modifications – Energy recovery dehumidifier – Waster heat recovery – Steam plants and distribution systems – Improvement of boiler efficiency – Frequency of blow down – Steam leakage – steam Flash and condense return.

Total No. of Hours: 45

REFERENCES

1. *Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.*
2. *Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons,1985.*
3. *Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.*
4. *J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations,Blackwell Publishing, 2203.*

Course Code: EMCE22E06	Course Name: MANAGEMENT INFORMATION SYSTEM	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE: To study the concepts of information systems and their general applications.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the evolution of information systems
CO2	To bring about an exposure to information systems in a formal manner
CO3	To study the development of information systems
C04	To study the means of applying information systems models to project management
C05	To introduce system audit and to study its features.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	2	1	2	3	2	1			
CO2	3	1	1	2	1	2	1	2	1			
CO3	2	1	2	1	2	1	2	2	2			
CO4	3	1	1	1	3	1	2	3	1			
CO5	3	1	2	1	1	2	1	3	2			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	1	2	1				
CO2	1	2	1				
CO3	2	1	2				
CO4	1	1	3				
CO5	2	1	1				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE –II

Course Code: EMCE22E06	Course Name: MANAGEMENT INFORMATION SYSTEM	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab						

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UNIT I: INTRODUCTION 9 Hrs

Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolutionof Information Systems.

UNIT II: SYSTEM DEVELOPMENT 9 Hrs

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

UNIT III: INFORMATION SYSTEMS 9 Hrs

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

UNIT IV: IMPLEMENTATION AND CONTROL 9 Hrs

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

UNIT V: SYSTEM AUDIT 9 Hrs

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 No. of Hours: 45

REFERENCES

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

PROGRAM ELECTIVE III

Course Code: EMCE22E07	Subject Name: ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To understand financing and managing principles

COURSE OUTCOMES (COs) : (3- 5)

CO1	To study the basic concepts of Construction Economic and Finance such as time value of money, cash flow diagram
CO2	To compare alternatives, proposals and evaluate alternative investments
CO3	To manage funds, and understand the fundamentals of management accounting
C04	To study the elements of construction economics
C05	To study the need for financial management and means of achieving the same

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	3	3	3	3	3	3			
CO2	3	1	1	3	3	3	3	3	3			
C03	3	1	1	3	3	3	3	3	3			
C04	3	1	1	3	3	3	3	3	3			
C05	3	1	1	3	3	3	3	3	3			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		2		3							
CO2	3		2		3							
C03	3		2		3							
C04	3		2		3							
C05	3		2		3							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							

Approval	

ELECTIVE – III

Course Code: EMCE22E07	Subject Name: ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

UNIT I BASIC PRINCIPLES **9 Hrs**

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 **9 Hrs**

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, BreakEven Analysis.

UNIT III EVALUATING ALTERNATIVE INVESTMENTS **9 Hrs**

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

UNIT IV FUNDS MANAGEMENT **9 Hrs**

Balance sheet - 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 **9 Hrs**

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

Total No. of Hours: 45

REFERENCES

1. *1.Blank, L.T., and Tarquin,a.J Engineering Economy,4th Edn. Mc-Graw Hill Book Co., 1988*
2. *Collier C and GlaGola C Engineering Economics & Cost Analysis, 3nd Edn. Addison WesleyEducation Publishers.,1998.*
3. *Patel, B M Project management- strategic Financial Planning, Evaluation and Control, VikasPublishing House Pvt. Ltd. New Delhi, 2200*
4. *Shrivastava,U.K., Construction Planning and Management,2nd Edn. Galgotia Publications Pvt.Ltd. New Delhi., 2201.*
5. *Steiner, H.M. Engineering Economic principles, 2nd Edn. Mc-Graw Hill Book, 199*

Course Code: EMCE22E08	Course Name: CONSTRUCTION PERSONNEL MANAGEMENT	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study the various aspects of manpower management in construction.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know the various processes in manpower planning, and evaluate organizational parameters
CO2	To understand human behavior on an organization and develop welfare measures
CO3	To develop appraisal and assessment techniques for improving productivity of human resources
CO4	To bring about awareness on fundamentals of human behavior under varying stress conditions.
CO5	To apply the studied behavior pattern to manpower planning in organizational setups To study the means of management of construction personnel and utility of training as a tool for improvement.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	2	1	2	3	2	1			
CO2	3	1	1	2	1	2	1	2	1			
C03	3	1	2	1	2	1	2	2	2			
CO4	3	1	1	1	3	1	2	3	1			
CO5	3	1	2	1	1	2	1	3	2			

COs / PSOs	PSO1	PSO2	PSO3				
CO1	3	2	1				
CO2	3	2	1				
C03	3	2	1				
CO4	3	2	1				
CO5	3	2	1				

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – III

Course Code: EMCE22E08	Course Name: CONSTRUCTION PERSONNEL MANAGEMENT	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT I: MANPOWER PLANNING **9 Hrs**

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

UNIT II: ORGANISATION **9 Hrs**

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

UNIT III: HUMAN BEHAVIOUR AND ORGANISATIONAL BEHAVIOUR **9Hrs**

Basic individual psychology – Approaches to job design and job redesign – Self managing work teams – Intergroup – Conflict in organizations – Leadership-Engineer as Manager – al aspects of decision making – Significance of human relation and organizational – Individual in organization – Motivation – Personality and creativity – Group dynamics, Team working – Communication and negotiation skills.

UNIT IV: WELFARE MEASURES **9 Hrs**

Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.

UNIT V: MANAGEMENT AND DEVELOPMENT METHODS **9 Hrs**

Compensation -Wages and Salary, Employee benefits, Employee appraisal and assessment – Employee services – Safety and Health Management – Special Human resource problems – Productivity in human resources – Innovativeapproach to designing and managing organization – Managing New Technologies – Total Quality Management – Concept of quality of work life – Levels of change in the organizational Development – Requirements of organizational Development – System design and methods for automation and management of operations – Developing policies, practices and establishing process pattern – Competency upgradation and their assessment – New methods of training and development – Performance Management.

Total No. of Hours: 45

REFERENCES

1. *Carleton Counter II and Jill Justice Coutler, The Complete Standard Handbook of Construction PersonnelManagement, Prentice-Hall, Inc., New Jersey, 1989.*
2. *Memoria,C.B., Personnel Management, Himalaya Publishing Co., 1992.*
3. *Josy. J. Familaro, Handbook of Human Resources Administration, McGraw-Hill International Edition,1987.*
4. *Pringle Charles, Management Longenecker Emerricle Publishing Company, 1981.*
5. *R.S. Dwivedi, Human Relations and Organisational Behaviour, BH – 1987.*

Course Code: EMCE22E09	Course Name: CONTRACT LAWS AND REGULATIONS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study the various types of construction contracts and their legal aspects and provisions

COURSE OUTCOMES (COs) : (3- 5)

CO1	To compare and analyze different types of contracts in construction
CO2	To achieve awareness on arbitrations and legal procedures
CO3	To understand the legal requirements and labor regulations involved in the execution of a construction project
CO4	To study the elements of concluding, and administering contracts
CO5	To study labor regulations and their impact on managing of contracts

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	2	1	2	3	2	1			
CO2	3	1	1	2	1	2	1	2	1			
C03	3	1	2	1	2	1	2	2	2			
C04	3	1	1	1	3	1	2	3	1			
C05	3	1	2	1	1	2	1	3	2			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	2	1						
CO2	3	2	1						
C03	1	2	2						
C04	1	2	1						
C05	2	1	2						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – III

Course Code: EMCE22E09	Course Name: CONTRACT LAWS AND REGULATIONS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

UNIT I: CONSTRUCTION CONTRACTS 9 Hrs

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 9 Hrs

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 – Tamil nadu Transparency in Tenders Act.

UNIT III: ARBITRATION 9 Hrs

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

UNIT IV: LEGAL REQUIREMENTS 9 Hrs

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 9 Hrs

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 No. of Hours: 45

REFERENCES

1. *Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi Priva te Ltd.,Bombay, 1982*
2. *Tamilnadu PWD Code, 1986*
3. *Jimmie Hinze, Construction Contracts, 2nd Edition, McGraw-Hill, 2201*
4. *Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, 6th Edition,McGraw-Hill, 2200*

PROGRAM ELECTIVE – IV

Course Code: EMCE22E10	Subject Name: MAINTENANCE AND REHABILITATION OF STRUCTURES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Repair and Rehabilitation of Structures	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study the maintenance and repairing techniques used for rehabilitation of structures

COURSE OUTCOMES (COs) : (3- 5)

CO1	To suggest maintenance and repair strategies
CO2	To assess the durability of concrete due to various climatic conditions
CO3	To suggest the suitable materials for repair, rehabilitation and retrofitting techniques
CO4	To study about Durability of Different Types of Buildings and about the Techniques for Repair and Strengthening Measures
CO5	To know about the Phases of Maintenance

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	1	1	3	3	2	3	3	3	3			
CO2	1	1	3	3	2	3	3	3	3			
C03	1	1	3	3	2	3	3	3	3			
CO4	1	1	3	3	2	3	3	3	3			
CO5	1	1	3	3	2	3	3	3	3			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	2	3						
CO2	3	2	3						
C03	3	2	3						
C04	3	2	3						
C05	3	2	3						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – IV

Course Code: EMCE22E10	Subject Name: MAINTENANCE AND REHABILITATION OF STRUCTURES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Repair and Rehabilitation of Structures	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT I: GENERAL 9 Hrs

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking.

UNIT II: INFLUENCE ON SERVICEBILITY AND DURABILITY 9 Hrs

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosionresistant steels, coatings, cathodic protection.

UNIT III: MAINTENANCE AND REPAIR STRATEGIES 9 Hrs

Definitions:Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.

UNIT IV : MATERIALS FOR REPAIR 9 Hrs

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

UNIT V : TECHNIQUES FOR REPAIR 9 Hrs

Rust eliminators and polymers coating for rebars during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Total No. of Hours: 45

REFERENCES

1. *Denison Campbell, Allen and Harold Roper, "Concrete Structures", Materials, Maintenance and Repair,Longman Scientific and Technical UK, 1991.*
2. *R.T.Allen and S.C.Edwards, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.*

Course Code: EMCE22E11	Course Name: PREFABRICATION AND CONSTRUCTION TECHNIQUES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Prefabricated Structures	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : At the end of this course the student shall be able to understand modular construction, Industrialized construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the concept of modular coordination and pre cast construction techniques
CO2	To Learn about the curing techniques and applications of precast elements
CO3	To assess the quality of pre-cast elements and suggest suitable repair techniques
CO4	To understand aspects of quality in construction
CO5	To study about precast application

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	1	1	3	3	3	3	3	3	3			
CO2	1	1	3	3	3	3	3	3	3			
CO5	1	1	3	3	3	3	3	3	3			
CO3	1	1	3	3	3	3	3	3	3			
CO4	1	1	3	3	3	3	3	3	3			
CO5	2	2	2	2	3	1	1	1	1			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		1		3							
CO2	3		1		3							
CO5	3		1		3							
CO3	3		1		3							
CO4	3		1		3							
CO5	2		2		2							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✔							
Approval												

ELECTIVE – IV

Course Code: EMCE22E11	Course Name: PREFABRICATION AND CONSTRUCTION TECHNIQUES	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Prefabricated Structures	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT-I INTRODUCTION 9 Hrs

Materials - Modular co-ordination, standardization and tolerances-system for prefabrication. Pre-cast concrete manufacturing techniques, Moulds –construction design, maintenance and repair.

UNIT-II PRE-CASTING TECHNIQUES 9 Hrs

Pre-casting techniques - Planning, analysis and design considerations - Handling techniques -Transportation Storageand erection of structures.

UNIT-III CURING AND TESTING 9 Hrs

Joints -Curing techniques including accelerated curing such as steam curing, hot air blowing etc., -Test on precast elements - skeletal and large panel constructions - Industrial structures.

UNIT-IV PRE-CAST APPLICATION 9 Hrs

Pre-cast and pre-fabricating technology for low cost and mass housing schemes. Small pre-cast products like doorframes, shutters, Ferro-cement in housing - Water tank service core unit - Pre Engineered Building (PEB)

UNIT-V QUALITY CONTROL 9 Hrs

Quality control - Repairs and economical aspects on prefabrication.

Total No. of Hours: 45

REFERENCES:

1. *Levitt. M., Precast concrete - Materials, Manufacture Properties and Usage, Applied Science Publs. 1982,*
2. *Konex.T., Handbook of Pre-cast Construction, Vol.1.2&3.*
3. *Richardson,J.G., Pre-cast concrete Production, Cement and Concrete Association, London, 1973.*
4. *Madhava Rao.A-G., Modern Trends in Housing in Developing Countries, Oxford & UBH Publishing co.,1985. -*
5. *Lewicki.B., Building with Large Pre-fabrications, Elsevier Publishers.*
6. *Large Panel Prefabricated Constructions, Proc. of Advance Course conducted by SERC, Madras.*
7. *Bruggeling.A.S.G., & Huyghe.G.F., Prefabrication with Concrete, A.s.A., Balkema Publishers, Netherland,1991.*

Course Code: EMCE22E12	Subject Name: MODERN CONSTRUCTION MATERIALS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Technology	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study and understand the latest construction materials in engineering Construction

COURSE OUTCOMES (COs) : (3- 5)

CO1	To know the different types of concrete and metals used in the field
CO2	To understand the basics of composite and waterproofing materials
CO3	To analyse the use of smart and intelligent materials in construction field
CO4	To know about smart and intelligent materials
CO5	To Study about different materials used in construction

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	3	3	1	3	3	3	3			
CO2	3	1	3	3	1	3	3	3	3			
C03	3	1	3	3	1	3	3	3	3			
CO4	3	1	3	3	1	3	3	3	3			
CO5	3	1	3	3	1	3	3	3	3			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		3		3							
CO2	3		3		3							
C03	3		3		3							
CO4	3		3		3							
CO5	3		3		3							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

ELECTIVE – IV

Course Code: EMCE22E12	Subject Name: MODERN CONSTRUCTION MATERIALS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete Technology	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT I: SPECIAL CONCRETES **9 Hrs**

Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Alternate Materials to concreteon high performance & high Strength concrete.

UNIT II METALS **9 Hrs**

Types of Steels – Manufacturing process of steel – Advantages of new alloy steels –Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

UNIT III COMPOSITES **9 Hrs**

Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.

UNIT IV OTHER MATERIALS **9 Hrs**

Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.

UNIT V SMART AND INTELLIGENT MATERIALS **9 Hrs**

Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.

Total No. of Hours: 45

REFERENCES

1. *Ganapathy, C. "Modern Construction Materials", Eswar Press, 2215.*
2. *Shan Somayaji, Civil Engineering Materials, 2nd Edition, Prentice Hall Inc., 2201*
3. *Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc.,1999*
4. *Derucher, K. Korfiatis.G. and Ezeldin, S., Materials for Civil and Highway Engineers, 4th Edition, PrenticeHall Inc., 1999*
5. *Aitkens, High Performance Concrete, McGraw-Hill, 1999*

PROGRAM ELECTIVE – V

Course Code: EMCE22E13	Subject Name: CONSTRUCTION PLANNING,SCHEDULING AND CONTROL	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Management	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study and understand the concept of scheduling and the techniques necessary for construction project

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the strategies for construction planning and scheduling
CO2	To know the concepts of cost control and quality control in construction
CO3	To use project formulation techniques in an organization
CO4	To study the elements of quality control and safety of construction projects
CO5	To study the elements of construction planning and scheduling and to apply appropriate tools and techniques like networks and coding systems.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	2	3	3	2	3	3	3	3			
CO2	3	2	3	3	2	3	3	3	3			
CO3	3	2	3	3	2	3	3	3	3			
CO4	3	2	3	3	2	3	3	3	3			
CO5	3	2	3	3	2	3	3	3	3			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		2		3							
CO2	3		2		3							
CO3	3		2		3							
CO4	3		2		3							
CO5	3		2		3							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✔							
Approval												

ELECTIVE – V

Course Code: EMCE22E13	Subject Name: CONSTRUCTION PLANNING, SCHEDULING AND CONTROL	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Construction Management	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I: CONSTRUCTION PLANNING 9 Hrs

Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships Among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems

UNIT II: SCHEDULING PROCEDURES AND TECHNIQUES 9 Hrs

Relevance of Construction Schedules - The Critical Path Method - 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 Constraintsand Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations –Crashing and Time/Cost Tradeoffs -

UNIT III: COST CONTROL, MONITORING AND ACCOUNTING 9 Hrs

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 9 Hrs

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 with Sampling by Variables - Safety

UNIT V: ORGANIZATION AND USE OF PROJECT INFORMATION 9 Hrs

Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use ofInformation - Organizing Information in Databases - Relational Model of Databases - Other Conceptual Models of Databases - Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow.

Total No. of Hours: 45

REFERENCES

1. *Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.*
2. *Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction:An Encyclopedia of terms and Applications, Wiley, New York, 1995.*
3. *Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts forOwners,Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2200.*
4. *Moder, J., C. Phillips and E. Davis, Project Management with CPM, PERT and Precedence* Diagramming, Van Nostrand Reinhold Company, Third Edition, 1983.
5. *Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.*
6. *Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & S*

Course Code: EMCE22E14	Course Name: PROJECT SAFETY MANAGEMENT	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE: To study and understand the various safety concepts, requirements applied to construction projects.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To analyze the cause of construction accidents and evaluate the safety programs required for it
CO2	To assess the safety in construction contracts and design for safety procedures
CO3	To understand the role of owners and designers for ensuring project safety
CO4	To Estimate the various safety concepts
CO5	To Know about Contractual Obligations in safety industries

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	2	2	3	3	3	3	3	3			
CO2	3	2	2	3	3	3	3	3	3			
C03	3	2	2	3	3	3	3	3	3			
C04	3	2	2	3	3	3	3	3	3			
C05	3	2	2	3	3	3	3	3	3			

COs / PSOs	PSO1	PSO2	PSO3						
CO1	3	3	3						
CO2	3	3	3						
C03	3	3	3						
C04	3	3	3						
C05	3	3	3						

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
					✓							
Approval												

Course Code:	Course Name: PROJECT SAFETY MANAGEMENT	Ty/Lb/	L	T / S.Lr	P/ R	C

EMCE22E14		**ETL**				
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

UNIT I : CONSTRUCTION ACCIDENTS **9 Hrs**

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

UNIT II : SAFETY PROGRAMMES **9 Hrs**

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

UNIT III : CONTRACTUAL OBLIGATIONS **9 Hrs**

Safety in Construction Contracts – Substance Abuse – Safety Record Keeping

UNIT IV: DESIGNING FOR SAFETY **9 Hrs**

Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Subcontractual Obligation – Project Coordination andSafety Procedures – Workers Compensation

UNIT V : OWNERS' AND DESIGNERS' OUTLOOK **9 Hrs**

Owner's responsibility for safely – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document.

Total No. of Hours: 45

REFERENCES

1. *Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997*
2. *Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, PrenticeHall Inc., 2201*
3. *Tamilnadu Factory Act*

Course Code: EMCE22E15	Course Name: TQM IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Total Quality Management	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab

OBJECTIVE : To study and understand the various types of concept of quality in construction and to have exposure to challenges in Quality Improvement Programs

COURSE OUTCOMES (COs) : (3- 5)

CO1	To realize the importance of significance of quality
CO2	Manage quality improvement teams
CO3	Identify requirements of quality improvement programs
CO4	To Train for achieving quality aspects in construction
CO5	To Enhance the knowledge of about six sigma in TQM

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9			
CO1	3	1	1	3	2	3	3	3	3			
CO2	3	1	1	3	2	3	3	3	3			
C03	3	1	1	3	2	3	3	3	3			
CO4	3	1	1	3	2	3	3	3	3			
CO5	3	1	1	3	2	3	3	3	3			
COs / PSOs	PSO1		PSO2		PSO3							
CO1	3		3		3							
CO2	3		3		3							
C03	3		3		3							
CO4	3		3		3							
CO5	3		3		3							

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project			
							✓					
Approval												

ELECTIVE – V

Course Code: EMCE22E15	Course Name: TQM IN CONSTRUCTION	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Total Quality Management	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/EmbeddedTheory and Lab						

UNIT I : **Concept of Quality:** 9 Hrs

Definition of quality as given by Deming, Juran, Crosby, difference between Quality control, Quality Assurance (QA/QC). Total quality control (TQC) and Total Quality Management (TQM), Need for TQM in construction industry. Organization necessary for implementation of quality, Quality manual-Contents, data required, preparation, responsibility matrix, monitoring for quality- PDCA Cycle. Quality aspects in every phase in the life cycle of Construction project.

UNIT II : **Quality Control tools and statistical quality Control:** 9 Hrs

Histogram, Pareto diagram, Fishbone diagram, Quality control chart-Testing required for quality control of construction material used in RCC Work- destructive and Non destructive Test (NDT) Statistical Quality Control-Necessity, Benchmarking, Application of dispersion methods in quality control of construction activity.

UNIT III : Training and development of Human Resources **9 Hrs**

Training needs assessment, technical and managerial competencies necessary for achieving quality, preparation for training. Training on Project Rework Reduction Tool (PRRT) software- training for preparation of checklist necessary for RCC work, for commonly used formats.

UNIT IV: Six Sigma **9 Hrs**

Definition of six sigma, evolution – Historical aspects, probability distribution Six sigma ratings, Six sigma training, six sigma as an effective tool in TQM.

UNIT V: Study of ISO 9004- Quality System Standards **9Hrs**

Purpose of ISO Standards. Difference between ISO 9001 and ISO 9004.Certification process for ISO 9001. Certification bodies involved. Eight Principles of ISO-Basic meaning, applying these principles for an effective quality process in the organization. Management support and commitment necessary for achieving implementation for quality system standards.

Total No. of Hours: 45

Reference Books

1. International Standards Organization – ISO 9001 and ISO 9004
2. Mantri Handbook – A to Z of Construction – Mantri Publications
3. Juran‘s Quality Handbook – Joseph M. Juran, A. Blanton. Godfrey – Mcgraw Hill International Edition (1998)
4. Probability and Statistics for Engineers – Miller, Freund-Hall, Prentice India Ltd.

Quality Control and Total Quality Management, P.L.Jain, Tata Mcgraw Hill Publ.

Dr. M.G.R.
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Audit Course I & II

Audit Course I & II							
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme			
				L	T/S.Lr	P/R	C
1	EMCC22I01	English for Research paper Writing	IE	2	0/0	0/0	0
2	EMCC22I02	Disaster Management	IE	2	0/0	0/0	0
3	EMCC22I03	Sanskrit for Technical Knowledge	IE	2	0/0	0/0	0
4	EMCC22I04	Value Education	IE	2	0/0	0/0	0
5	EMCC22I05	Constitution of India	IE	2	0/0	0/0	0
6	EMCC22I06	Pedagogy Studies	IE	2	0/0	0/0	0
7	EMCC22I07	Stress Management by Yoga	IE	2	0/0	0/0	0
8	EMCC22I08	Personality Development through Life Enlightenment Skills	IE	2	0/0	0/0	0
9	EMCC22I09	Research Publication Ethics	IE	2	0/0	0/0	0

Course Code: EMCC22I01	Course Name: ENGLISH FOR RESEARCH PAPER WRITING	Ty/Lb/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To know the art of writing the research paper and thesis
To Ensure the good quality of paper at very first-time submission.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I01	Course Name: ENGLISH FOR RESEARCH PAPER WRITING	Ty/Lb/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I **5 Hrs**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit II **5 Hrs**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts .Introduction

Unit III **5 Hrs**

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit IV **5 Hrs**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction,
skills needed when writing a Review of the Literature

Unit V **5 Hrs**

Skills are needed when writing the Methods, skills needed when writing
the Results, skills are needed when writing the Discussion, skills areneeded when writing the Conclusions

Unit VI **5 Hrs**

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL HOURS: 30

Reference Books:

1. Goldbort R (2016) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2016) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (2018), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2017

Course Code: EMCC22I02	Course Name: DISASTER MANAGEMENT	Ty/Lb/IE	L	T/S .Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO2	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO3	Understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I02	Course Name: DISASTER MANAGEMENT	Ty/Lb/IE	L	T/S .Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						
Objectives: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.						

Unit I

Introduction **5 Hrs**

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit II **5 Hrs**

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods,Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills,Outbreaks Of Disease And Epidemics, War And Conflicts.

Unit III **5 Hrs**

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards withSpecial Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit IV **5 Hrs**

Disaster Preparedness And Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard;Evaluation of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental AndCommunity Preparedness.

Unit V **5 Hrs**

Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Unit VI **5 Hrs**

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation,Programs Of Disaster Mitigation in India.

TOTAL HOURS: 30

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall OfIndia, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

Course Code: EMCC22I03	Course Name : SANSKRIT FOR TECHNICAL KNOWLEDGE	Ty/Lb/IE	L	T/S.Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To get a working knowledge in illustrious Sanskrit, the scientific language in the world Learning of Sanskrit to improve brain functioning, to develop the logic in mathematics, science & other subjects enhancing the memory power. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Understanding basic Sanskrit language
CO2	Ancient Sanskrit literature about science & technology can be understood
CO3	Being a logical language will help to develop logic in students

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I03	Course Name : SANSKRIT FOR TECHNICAL KNOWLEDGE	Ty/Lb/IE	L	T/S.Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I **10 hrs**

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit II **10 hrs**

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit III **10 hrs**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL HOURS: 30

Reference Books:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Code: EMCC22I04	Course Name : VALUE EDUCATION	Ty/Lb/IE	L	T/ S.L r	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives:

- Students will be able to
- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Knowledge of self-development
CO2	Learn the importance of Human values
CO3	Developing the overall personality

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I04	Course Name : VALUE EDUCATION	Ty/Lb/IE	L	T/S .Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit 1: **6 Hrs**

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments

Unit 2: 8 **Hrs**

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit 3: 8 **Hrs**

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs. suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

Unit 4: 8 **Hrs**

Character and Competence –Holy books vs Blind faith. Self-management and Good health .Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TOTAL HOURS : 30

Reference:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course Code: EMCC22I05	Course Name : CONSTITUTION OF INDIA	Ty/Lb/ IE	L	T/S .Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to know

CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	
CO4	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I05	Course Name : CONSTITUTION OF INDIA	Ty/Lb/ IE	L	T/S .Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit 1: **6 hrs**

History of Making of the Indian Constitution:

History Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble Salient Features

Unit 2: **6 hrs**

Contours of Constitutional Rights & Duties:

Fundamental Rights, Right to Equality , Right to Freedom , Right against Exploitation, Right to Freedom of Religion , Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy and Fundamental Duties.

Unit 3: **6 hrs**

ORGANS OF GOVERNANCE:

Parliament Composition, Qualifications and Disqualifications, Powers and Functions Executive President, Governor Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions.

Unit 4: **6 hrs**

Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit 4: **6 hrs**

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL HOURS: 30

Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Code: EMCC22I06	Course Name : PEDAGOGY STUDIES	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives Students will be able to: 4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. 5. Identify critical evidence gaps to guide the development.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to know

CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I06	Course Name : PEDAGOGY STUDIES	Ty/Lb/ETL	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I: Introduction and Methodology: **6 hrs**

Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit II: Thematic overview: **6 hrs**

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit III: Evidence on the effectiveness of pedagogical practices **6 hrs**

Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit IV: Professional development: **6 hrs**

Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

Unit V: Research gaps and future directions: **6 hrs**

Research design, Contexts, Pedagogy, Teacher education, Curriculum and Assessment, Dissemination and research impact.

TOTAL HOURS: 30

Reference Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher Education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

- www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Code: EMCC22I07	Course Name: STRESS MANAGEMENT BY YOGA	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite : **Basic Knowledge of Yoga**	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives

To Understand the Basic Concepts of Yoga

To Gain knowledge on Ashtanga yoga

To Acquire knowledge of Techniques and Practice of Yogasanas

To Understand stress and the causes. To Attain the knowledge about stress busting through yoga

CO1	Understand the Basic Concepts of Yoga
CO2	Gain knowledge on Ashtanga yoga
CO3	To Understand stress and the causes
CO4	Acquire knowledge of Techniques and Practice of Yogasanas
CO5	Attain the knowledge about stress busting through yoga

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	1	1	1	1	
CO4	1	1	1	1	1	3	1	1	1	
CO5	1	1	1	1	1	2	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	1	1	1
CO5	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I07	Course Name: STRESS MANAGEMENT BY YOGA	Ty/Lb /ETL	L	T/S .Lr	P/R	C
	Prerequisite : **Basic Knowledge of Yoga**	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit 1: **6 hrs**

What is stress - Symptoms of stress - Why is stress helpful - Why is stress harmful - Stress versus burnout - Main types of stress - Know your stressors - Tips to Manage Stress

Unit 2: **6 hrs**

Strength, Weaknesses, Opportunities and Threats (SWOT) Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem. Emotional Intelligence, What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions

Unit 3: **6 hrs**

What is Yoga – Definition and Its Branches - Hatha Yoga – Kundalini Yoga – Tantra Yoga – Kriya Yoga – Introduction to Ashtanga Yoga

Unit 4: **6 hrs**

Mechanism of Stress related diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress – physiological aspect of Meditation. Constant stress & strain, anxiety, conflicts resulting in fatigue among Executive. Contribution of Yoga to solve the stress related problems of Executive

Unit 5: **6 hrs**

Meaning and definition of Health – various dimensions of health (Physical, Mental, Social and Spiritual) – Yoga and health – Yoga as therapy. Physical fitness. Stress control exercise – Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage.

TOTAL HOURS: 30

Reference Books:

1. *Andrews, Linda Wasmer., (2005). Stress Control for peace of Mind. London: Greenwich Editions Lalvani, Vimla., (1998). Yoga for stress. London: Hamlyn*
2. *Nagendra, H.R., and Nagarathana, R., (2004). Yoga perspective in stress management. Bangalore: Swami Vivekananda Yoga Prakashana.*
3. *Nagendra, H.R., and Nagarathana, R., (2004). Yoga practices for anxiety & depression. Bangalore: Swami Sukhabodhanandha Yoga Prakashana.*
4. *Sukhabodhanandha, Swami., (2002). Stress Management. Banglore: Prasanna trust.*
5. Udupa, K.N., (1996). Stress management by Yoga. NewDelhi: Motilal Banaridass Publishers Private Limited

Course Code: EMCC22I08	Course Name : PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	Ty/Lb/ETL	L	T/S.Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To learn to achieve the highest goal happily, To become a person with stable mind, pleasing personality and determination. To awaken wisdom in student

COURSE OUTCOMES (COs) : At the end of this course the students would be able to know

CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing versatile personality of students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	1	1	1	1	1	3	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1

3/2/1 indicates Strength of Correlation 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Course Code: EMCC22I08	Course Name : PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	Ty/Lb/ETL	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	2	0/0	0/0	0
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit 1: **10 hrs**

Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism)Verses- 26,28,63,65 (virtue) Verses-52,53,59(dont's)Verses-71,73,75,78(do's)

Unit 2: **10 hrs**

Approach to day to day work and duties.

Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47, 48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5, 13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

Unit 3: **10 hrs**

Statements of basic knowledge.

Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63.

TOTAL HOURS: 30

Reference Books:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Code: EMCC22I09	Course Name : RESEARCH AND PUBLICATION ETHICS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: core subjects	IE	2	0/0	0/0	2

T/L/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab

OBJECTIVE:

- To understand the philosophy of science and ethics, research integrity and publication ethics.
- To identify research misconduct and predatory publications.
- To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact Factor, etc.).

COURSE OUTCOMES (COs) : By doing this course students will

CO1	Understand the ethical issues related to Research and Publication
CO2	Get to know about different types of plagiarism and ways for avoiding plagiarism
CO3	Know about best practices and guidelines in publication ethics and also learns to avoid Publication misconduct
CO4	Get to know about Violation of publication ethics, authorship and contributor ship and get to identify about Predatory publishers and journals.
CO5	Get to know about various open sources database and research metrics like indexing, citation etc.,

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	
CO1	2	3	3	3	3	2	3	3	2	
CO2	2	3	3	3	3	2	3	3	2	
CO3	2	3	3	3	3	2	3	3	2	
CO4	2	3	3	3	3	3	3	3	3	
CO5	2	3	3	3	3	2	3	3	2	

COs / PSOs	PSO1	PSO2	PSO3
CO1	2	3	3
CO2	2	3	3
CO3	2	3	2
CO4	2	3	3
CO5	2	3	3

1/2/3 indicates Strength of Correlation 3- High, 2- Medium, 1-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit Course
										✔

Course Code: EMCC22I09	Course Name : Research Publication Ethics	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Core subjects	IE	2	0/0	0/0	0
T/L/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab						

Unit 1. Introduction **6 Hrs.**

Introduction to philosophy: Definition, nature and scope, concept, branches - Ethics: Definition, moral philosophy, nature of moral judgments and reactions – Ethics with respect to Science and Research Intellectual honesty and research integrity.

Unit II: Scientific Conduct **6 Hrs.**

Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) Redundant Publications: Duplicate and over lapping publications, salami slicing – Selective reportingand misrepresentation of data.

Unit III: Publication Ethics -I **6 Hrs.**

Publication ethics: Definition, introduction and importance – Best practices/standards setting initiativesand guidelines: COPE, WAME etc. Publication misconduct: definition, Concept, problems that lead to unethical behavior and vice-versa, types.

Unit IV: Publication Ethics – II **6 Hrs.**

Violation of publication ethics, authorship and contributor ship – Identification of publication misconduct, complaints and appeals – Predatory publishers and journals – Subject specific ethical issues, Complaints and appeals: examples and fraud from India and Abroad.

Unit V: Data Bases and Research Metrics **6 Hrs.**

Open Access publication and Initiatives – Indexing databases – Citation databases, Web of Science,Scopus, etc. – Impact factor of journals as per Journal Citation report .SNIP, SJR, IPP, Cite Score - Metrics: h-index,gindex,i10index,altmetrics – Conflict of interest.

TOTAL HOURS: 30

References:

1. Bird A 2006, Philosophy of Science, Routledge
2. MacIntyre &Alasdair, 1967, A Short History of Ethics, London.
3. Chaddah, P20 1 8, Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 9789387480865.
4. On Being a Scientist: A Guide to Responsible Conduct in Research, 2009, National Academy of Sciences, National Academy ofEngineering and Institute of Medicine. 3rd edition, National Academies Press.
5. Resnik, D. B 201 1, what is ethics in research & why is it important. National Institute of Environmental Health Sciences,pp.1—10. https://www.niehs.nih.gov/research/reso_uuces/bioethics/whatis/index.cfm
6. Bcall, J 2012, Predatory publishers are corrupting open access, Nature, Vol. 489, no.7415,pp. 179—179. https://d0i.org/lO.1 03 8/48917%,Ethics in Science Education, 2019Indian National Science Academy (INSA), Research and Governance,

OPEN ELECTIVES

Course Code: EMCC22OE1	Course Name: BUSINESS ANALYTICS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives: Understand the role of business analytics within an organization. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making. To become familiar with processes needed to develop, report, and analyze business data. Use decision-making tools/Operations research techniques. Mange business process using analytical and management tools. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Students will demonstrate knowledge of data analytics. . Students will demonstrate the ability of think critically in making decisions based on data and deep analytics..
CO2	Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to Support business decision-making.
CO3	Students will demonstrate the ability to translate data into clear, actionable insights

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	1	2	2	2	2
CO2	3	3	3	3	3	1	1	1	2	2	2	2
CO3	3	3	3	3	3	1	1	1	2	2	2	2

COs / PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project	Audit course		
						✓						

Course Code: EMCC22OE1	Course Name: BUSINESS ANALYTICS	Ty / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I Business analytics **9hours**

Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit II Trendiness and Regression Analysis **9hours**

Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit III Organization Structures of Business analytics **9hours**

Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit IV Forecasting Techniques **9hours**

Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit V Decision Analysis **9hours**

Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making - Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Total no. of Hours: 45

Suggested reading

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans,Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education

Course Code: EMCC22OE2	Course Name: INDUSTRIAL SAFETY	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives: Understand policies and protections put in place to ensure plant and factory worker protection from hazards that could cause injury.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	The different safety measures followed in the industry
CO2	Understand the fundamentals of safety policy
CO3	To understand the periodic and preventive maintenance

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	1	1	2	2	2	2
CO2	3	3	3	3	3	1	1	1	2	2	2	2
CO3	3	3	3	3	3	1	1	1	2	2	2	2

COs / PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project	Audit course		
						✓						

Course Code: EMCC22OE2	Course Name: INDUSTRIAL SAFETY	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I Industrial safety **9hours**

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit II Fundamentals of maintenance engineering **9hours**

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacementeconomy, Service life of equipment.

Unit III Wear and Corrosion and their Prevention **9hours**

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV Fault tracing **9hours**

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show asdecision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electricalmotors, Types of faults in machine tools and their general causes.

Unit V Periodic and preventive maintenance **9hours**

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machinetools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Total no. of Hours: 45

Suggested reading:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Course Code: EMCC22OE3	Course Name: COST MANAGEMENT OF ENGINEERING PROJECTS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To understand the process of planning and controlling the budget of a project or business.

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	understand Strategic Cost Management Process
CO2	Know Cost concepts in decision-making in their projects
CO3	To familiarize Quantitative techniques for cost management

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	1	2	2	3	2
CO2	3	3	3	3	2	1	1	1	2	2	3	2
CO3	3	3	3	3	2	1	1	1	2	2	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO 5			
CO1	2	2	2					
CO2	2	2	2					
CO3	2	2	2					

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Interdisciplinary	Skill component	Practical / Project	Audit course		
						✓						

Course Code: EMCC22OE3	Course Name: COST MANAGEMENT OF ENGINEERING PROJECTS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I Overview of Cost Management Process **9hours**

Introduction and Overview of the Strategic Cost Management Process

Unit II Concept of Cost **9hours**

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control - Provision of data for Decision-Making.

Unit III Project **9hours**

Meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team:. Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit IV Cost Behavior & Profit **9hours**

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break- even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity- Based Cost Management, -Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control- Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit V Quantitative Techniques **9hours**

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Total no. of Hours: 45

Suggested reading:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of CostAccounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Course Code: EMCC22OE4	Subject Name: COMPOSITE MATERIALS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To understand nature of the composite material and apply them wherever required

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Understand the nature ,types and th applications of composite materials
CO2	Understand the synthesis of different types of metal matrix materials
CO3	Understand the polymeric composite materials and the characteristic feature of composite materials

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	1	2	2	3	2
CO2	3	3	3	3	2	1	1	1	2	2	3	2
CO3	3	3	3	3	2	1	1	1	2	2	3	2

COs / PSOs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2	2	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course		
						✓						

DEPARTMENT OF CIVIL ENGINEERING

Course Code: EMCC22OE4	Subject Name: COMPOSITE MATERIALS	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I Introduction **9hours**

Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Unit II Reinforcements **9hours**

Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Unit III Manufacturing of Metal Matrix Composites **9hours**

Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Unit IV Manufacturing of Polymer Matrix Composites **9hours**

Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Unit V Strength **9hours**

Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Total no. of Hours: 45

Suggested Reading:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2207.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi

Course Code: EMCC22OE5	Subject Name: WASTE TO ENERGY	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab

Objectives To understand the concept of producing energy from the waste material

COURSE OUTCOMES (COs) : At the end of this course the students would be able to

CO1	Understand the different type of waste which can be converted to fuel
CO2	Understand the concepts and methods of biomass pyrolysis, gasification and combustion
CO3	Understand the production and characterization of biogas technology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	1	2	2	3	2
CO2	3	3	3	3	2	1	1	1	2	2	3	2
CO3	3	3	3	3	2	1	1	1	2	2	3	2

COs / PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course		
						✓						

Course Code: EMCC22OE5	Subject Name: WASTE TO ENERGY	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab						

Unit I Introduction **9hours**

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit II Biomass Pyrolysis **9hours**

Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils andgases, yields and applications.

Unit III Biomass Gasification **9hours**

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit IV Biomass Combustion **9hours**

Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit V Biogas **9hours**

Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion

- Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Total no. of Hours: 45

Suggested Reading:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & S