AC-11/7/2022
Item No.-6.19

UNIVERSITY OF MUMBAI

Master of Engineering

in

Civil Engineering with Construction Engineering and Management (CE&M)

(REV- 22 Scheme) from Academic Year 2022 – 2023

Under

FACULTY OF SCIENCE & TECHNOLOGY

Syllabus for Approval

Title of the Course	**:**	M.E. (Construction Engineering and Management)
Eligibility for Admission	**:**	Passed B.E./B.Tech and as per the Ordinance 5134
Passing Marks	**:**	45%
Ordinances / Regulations (if any)	**:**	Ordinance: O.5134
No. of Years / Semesters	**:**	2 years / 4 semesters
Level	**:**	PG
Pattern	**:**	Semester
Status	**:**	Revised 2022
To be implemented from Academic Year	**:**	With effect from Academic Year: 2022-2023

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Semester I

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CEMC101	Statistical Methods in Construction	3	--	--	3	--	--	3
CEMC102	Project Management & Planning in Construction	3		--	3		--	3
CEMPE101X	Program Elective 1	3	--	--	3	--	--	3
CEMPE102X	Program Elective 2	3	--	--	3	--	--	3
CEMIE101X	Institute Elective 1	3	--	--	3	--	--	3
CEML101	Program Lab - I	--	2	--	--	1	--	1
CEMSBL101	Skill Based Lab - I	--	4	--	--	2	--	2
Total		**15**	**06**	**--**	**15**	**03**	**--**	**18**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract / Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
CEMC101	Statistical Methods in Construction	20	20	20	80	3	--	--	100
CEMC102	Project Management & Planning in Construction	20	20	20	80	3	--	--	100
CEMPE101X	Program Elective 1	20	20	20	80	3	--	--	100
CEMPE102X	Program Elective 2	20	20	20	80	3	--	--	100
CEMIE101X	Institute Elective 1	20	20	20	80	3	--	--	100
CEML101	Program Lab - I	--	--	--	--	--	25	25	50
CEMSBL101	Skill Based Lab - I	--	--	--	--	--	50	50	100
Total		**--**	**--**	**100**	**400**	**--**	**75**	**75**	**650**

Semester I

Program Elective 1		Program Elective 2	
Course Code	**Course Name**	**Course Code**	**Course Name**
CEMPE1011	Contract Management	**CEMPE1021**	Urban Transportation Planning
CEMPE1012	Urban Infrastructure Planning	**CEMPE1022**	Resource Management
CEMPE1013	Value Engineering	**CEMPE1023**	Sustainable Construction Practices

Semester – I

Institute Level Optional Courses (ILOC)	
Course Code	**Course Name**
CEMIE 1011	Product Lifecycle Management
CEMIE 1012	Reliability Engineering
CEMIE 1013	Management Information System
CEMIE 1014	Design of Experiments
CEMIE 1015	Operation Research
CEMIE 1016	Cyber Security and Laws
CEMIE 1017	Disaster Management and Mitigation Measures
CEMIE 1018	Energy Audit and Management
CEMIE 1019	Development Engineering

Semester II

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CEMC201	Project Economics and Financial Management	3	--	--	3	--	--	3
CEMC202	Infrastructure Development	3		--	3		--	3
CEMPE201X	Program Elective 3	3	--	--	3	--	--	3
CEMPE202X	Program Elective 4	3	--	--	3	--	--	3
CEMIE201	Institute Elective 2	3	--	--	3	--	--	3
CEML201	Program Lab-II	--	2	--	--	1	--	1
CEMSBL201	Skill Based Lab-II	--	4$	--	--	2	--	2
Total		**15**	**06**	**--**	**15**	**03**	**--**	**18**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract / Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
CEMC201	Project Economics and Financial Management	20	20	20	80	3	--	--	100
CEMC202	Infrastructure Development	20	20	20	80	3	--	--	100
CEMPE201X	Program Elective 3	20	20	20	80	3	--	--	100
CEMPE202X	Program Elective 4	20	20	20	80	3	--	--	100
CEMIE201X	Institute Elective 2	20	20	20	80	3	--	--	100
CEML201	Program Lab-II	--	--	--	--	--	25	25	50
CEMSBL201	Skill Based Lab -II	--	--	--	--	--	50	50	100
Total		**--**	**--**	**100**	**400**	--	**75**	**75**	**650**

Note 1: Skill Based Lab- I and II are focused on the learning through experience. SBL shall facilitate the learner to acquire the fundamentals of practical engineering in his or her specialization in a project-oriented environment. The learning through skill-based labs can be useful in facilitating their research work and hence useful in early completion of their dissertation work.

Semester II

Program Elective 3		Program Elective 4	
Course Code	**Course Name**	**Course Code**	**Course Name**
CEMPE2011	System Approach in Civil Engineering	**CEMPE2021**	Remote Sensing and Geographical Information System
CEMPE2012	Building Services and Repairs	**CEMPE2022**	Advanced Construction Technology
CEMPE2013	Thrust Areas in Project Management	**CEMPE2023**	Quality and Risk Management

Semester - II **Institute Level Optional Courses (ILOC)**	
Course Code	**Course Name**
CEMIE 2021	Project Management
CEMIE 2022	Finance Management
CEMIE 2023	Entrepreneurship Development and Management
CEMIE 2024	Human Resource Management
CEMIE 2025	Professional Ethics and CSR
CEMIE 2026	Research Methodology
CEMIE 2027	IPR and Patenting
CEMIE 2028	Digital Business Management
CEMIE 2029	Environmental Management

Semester III

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CEMMP301	Major Project: Dissertation -I	--	20	--	--	10	--	10
Total		**00**	**20**	**00**	**00**	**10**	**--**	**10**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract/ Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
CEMMP301	Major Project: Dissertation -I	--	--	--	--	--	100	--	100
Total		**--**	**--**	**--**	**--**	**--**	**100**	**--**	**100**

Online Credit Courses

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CEMOCC301	Online Credit Course - I	--	--	--	--	--	--	3
CEMOCC301	Online Credit Course - II	--	--	--	--	--	--	3
Total		**--**	**--**	**--**	**00**	**00**	**00**	**06**

Note 2: It is mandatory to complete the Online Credit Courses (OCC) available on NPTEL / Swayam /MOOC or similar platform approved by UoM. These two courses shall be completed in any semester I or II or III, but not later than end of the Semester III. University shall make a provision that credits earned with OCC- I and OCC-II shall be accounted in the third semester grade-sheet with actual names of courses. The learner shall be allowed to take up these courses from his or her institute or organisation/ industry where his / her major project is carried out. The students shall complete the courses and shall qualify the exam conducted by the respective authorities/ instructor from the platform. The fees for any such courses and the corresponding examination shall be borne by the learner.

Online Credit Course – I

The learner shall opt for the course in the domain of Research Methodology **or** Research & Publication Ethics or IPR. The opted course shall be of 3 credits of equivalent number of weeks.

Online Credit Course –II

The learner shall opt for the course recommended by Faculty Advisor/ Project Supervisor from the institute. The opted course shall be of 3 credits of equivalent number of weeks.

Semester IV

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CEMMP401	Major Project: Dissertation - II	--	32	--	--	16	--	16
Total		**--**	**32**	**--**	**--**	**16**	**--**	**16**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract/ Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
CEMMP401	Major Project: Dissertation - II	--	--	--	--	--	100	100	200
Total		**--**	**--**	**--**	**--**	**--**	**100**	**100**	**200**

Total Credits: 68

Note 3: The Dissertation -II submission shall not be permitted till the learner completes all the requirements of ME course.

Note 4: The contact hours for the calculation of load of the teacher for Major Project are as follows:
Major Project Dissertation I and II - 02 Hour / week / student

Guidelines for Dissertation-I

Students should do literature survey and identify the problem for Dissertation and finalize in consultation with Guide/Supervisor. Students should use multiple literature and understand the problem. Students should attempt solution to the problem by analytical/simulation/experimental methods. The solution to be validated with proper justification and compile the report in standard format. Guidelines for Assessment of Dissertation-I.

Dissertation-I should be assessed based on following points

- Quality of Literature survey and Novelty in the problem
- Clarity of Problem definition and Feasibility of problem solution
- Relevance to the specialization
- Clarity of objective and scope of Dissertation-I should be assessed through a presentation by a panel of Internal examiners and external examiner appointed by the Head of the Department/Institute of respective Program.

Guidelines for Assessment of Dissertation II

Dissertation II should be assessed based on following points:

- Quality of Literature survey and Novelty in the problem
- Clarity of Problem definition and Feasibility of problem solution
- Relevance to the specialization or current Research / Industrial trends
- Clarity of objective and scope
- Quality of work attempted or learner contribution
- Validation of results
- Quality of Written and Oral Presentation

Students should publish at least one Research paper based on the work in referred National / International conference/Journal of repute.

Dissertation II should be assessed by Internal and External Examiners appointed by the University of Mumbai.

Semester-I

Semester I		
Course Code	**Course Name**	**Credits**
CEMC101	**Statistical Methods in Construction**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives
• Develop a basic understanding of probability concepts including: events, sample space, set theory, conditional probability, theory of total probability, Bayes' theory and indicating their application in civil engineering through solving different types of examples and problems. • Understand different types of distribution functions and explore their applications in civil engineering. • Derive meaningful statistical inferences from available data • Co-relate the data set and hence establish inter-relationships between parameters and establish regression relationships • Simulate existing/historical data for predicting futuristic characteristics. • Apply various mathematical tools to optimize construction processes

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I	**Probability** 1.1 Probability theory and its importance in construction processes. 1.2 Definition of probability, Rules of Probability, Casualty v/s Randomness, Conditional probability, Total Probability, Baye's theorem, Combined experiments, Independence, Problems on the above. 1.3 Random variable concept and its application Concept of Theoretical probability Distributions with special focus on application of Binomial, Poissons and Normal Distribution to construction project management	**10**
II	**Sampling** 2.1 Probability and non-probability samples, Random sampling, other sampling schemes and their applications to construction industry 2.2 Application of measures of dispersion to construction industry - concepts	**06**

	of range, mean, coefficient of range, standard deviation, variance, coefficient of variance in quality control of concreting, cost control of projects and similar such activities.	
III	**Correlation Analysis:** 3.1 Correlation types, coefficients, Scatter Diagram 3.2 Application of Karl Pearson's correlation analysis to establish interrelationship between various concrete parameters and similar civil engineering activities 3.3 Application of Spearman's Rank Co-relation analysis in project management and performance appraisal of human resource	**05**
IV	**Regression Analysis** 4.1 Regression and Multivariate Analysis, 4.2 Multiple Linear Regression Analysis 4.3 Use of regression analysis in resources management and prediction of concrete parameters.	**03**
V	**Modeling** 5.1 Use of mathematical models based on probabilistic and statistical methods 5.2. EOQ in civil engineering, problem on frequency of ordering cement bags for infrastructure projects 5.3.Griffi's waiting line model for sizing-matching of construction equipment 5.4 Vendor Rating Indexes based on past performance of suppliers 5.5 Mathematical models for equipment downtime analysis	**09**
VI	**Simulation** 6.1 Simulation – Types, applications 6.2 Simulation in risk identification, analysis and mitigation of project risks 6.3 Numerical on predicting cost of future project 6.4 Simulation of waiting line model (analysis of waiting times of arrivals and idle times of servicing units)	**06**

Course Outcomes

Learners will be able to

- Apply probability theories to construction processes
- Draw meaningful inferences from qualitative and quantitative data using measures of dispersion
- Establish Correlation co-efficient between various civil engineering parameters
- Develop linear regression equation between various civil engineering parameters
- Apply mathematical models to construction processes/systems, so the maximum output from a particular input may be obtained
- Simulate the performance of a particular system, based on past data/performance

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question

2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended books:

1. Probability and Statistics for Engineers –Miller, Freund-Hall, Prentice India Ltd.
2. Applied Mathematics for Engineers and Physicists-pipes and Harvill. McGraw Hill International Edition.
3. Sampling techniques-Cochran, Wiley Series.
4. Statistics-Concepts and Controversies-David S. Moore-Freeman Company, New York.
5. Reliability Principles and practices-Calabro-McGraw Hill Book Company.
6. Applied Statistics and Probability for Engineers---Montgomery and Runger Wiley, India.
7. Shrivastava, Shenoy & Sharma, Quantitative Techniques for Managerial Decisions, Wiley
8. Applied Statistics for Civil and Environmental Engineers by Kottegoda. - Stratford Books
9. Probability, Random Variables and Stochastic Process, Third Edition, Athanasius Papoulis, Third Edition, McGraw-Hill, Inc

Semester I		
Course Code	**Course Name**	**Credits**
CEMC102	**Project Management & Planning in Construction**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**---**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives
• Explain management functions like planning, scheduling, executing & controlling the projects • Describe the project management life cycle with various phases from project initiation through closure. • Gain the Time management Knowledge of a project by proper scheduling using Networking Techniques • Determine the best method of allocating resources to the projects by considering requirements & constraints associated with it. • Understand the concept of updating & develop optimum relationship between time & cost for • construction project • Know the quality & safety measures to be adopted during the execution of Construction projects.

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I	**Basics of Project Management** 1.1 Principles of management, Traditional management and modern scientific management. Theories of Frederick Taylor, Henry Fayol, Elton Mayo, McGregor, Abraham Maslow. 1.2 Definition of a Project, Project Vs Operations, Objectives & Functions of Project Management, Project management in various organization structures.	**04**
II	**Project Planning & Initiating** 2.1 Stages of Planning in projects, Project life cycle, Role of Various agencies involved in Project. 2.2 Project Feasibilities Analysis, Project Selection Models, Project Appraisal Criterias. 2.3 Project sponsor and creating charter, Project proposal. Stages of team	**06**

	development & growth (forming, storming, norming & performing)	
III	**Project Scheduling** 3.1 Introduction to Work Breakdown Structure (WBS) & Bar Chart Method, Project Network Terminologies. 3.2 Project Scheduling using Network Techniques & Analysis- Critical Path Method (CPM), Precedence Diagraming Method (PDM), PERT methods. 3.3 Application of MS-Project & Primavera Software for Project Scheduling.	**08**
IV	**Resource Management & Allocation** 4.1 Material Management- Importance, objectives, functions of material management, Inventory control, A-B-C analysis, E.O.Q. 4.2 Human Resource Management- Manpower planning, recruitment, Selection training, performance evaluation of worker etc. 4.3 Resources Allocation Methods- Resource levelling & resource smoothening	**08**
V	**Project Monitoring & Cost Control** 5.1 Monitoring and Control of project, Classification of Project costs, time cost trade-off in projects, Project Network Crashing Examples 5.2 Project Updating- Purpose of frequency of updating method of updating a network. 5.3 Project Performance Evaluation using Earned Value Management (EVM) techniques	**08**
VI	**Project Quality & Safety Management** 6.1 Project Quality Management: SQC charts, Sampling techniques, Quality circles, ISO 9000, Management aspects. 6.2 Safety in Projects: Safety Requirements, Safety and health codes, Occupational diseases, Economic aspects, Management of accidents, Safety department	**05**

Course Outcomes
After completion of course learners will be able to 1. Apply the knowledge of management functions like planning, scheduling, executing & controlling the projects 2. Explain the project management life cycle and various phases from project initiation through closure. 3. Demonstrate Time management of a project by proper scheduling using Networking Techniques 4. Select the best method of allocating resources to the projects by considering requirements & constraints associated with it. 5. Elaborate the concept of updating & develop optimum relationship between time & cost. **6.** Illustrate the quality & safety measures to be adopted during the execution of Construction projects
Assessment Internal: Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project. **End Semester Theory Examination:** Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in

question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended books:

- A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed, Project Management Institute PA, USA
- Project Management – K Nagrajan – New age International Ltd.
- Project Management-Planning and Control---Rory Burkey 4th ed.—Wiley, Ind
- Project Management – Ahuja H.N. – John Wiely, New York.
- Construction Project Management Theory & practice --- Kumar Neeraj Jha, Pearson
- Construction Engineering and Management: S.Seetharaman.
- Construction Planning & Management – Dr.U.K.Shrivastava.
- Professional Construction Management: Barrie D.S. & Paulson B C, McGraw Hill
- Construction Project Management: Chitkara K K Tata McGraw Hill
- Handbook of Construction Management: P K Joy, Macmillan, India
- Critical Path Methods in Construction Practice: Antill J M &Woodhead R W, Wiley
- Construction Hazard and Safety Handbook: King &Hudson, Butterworths
- Construction Planning & management By P S Gahlot & B M Dhir, New Age International Limited Publishers

Semester - I		
Course Code	**Course Name**	**Credits**
CEMPE1011	**Program Elective 1: Contract Management**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives
• To understand the tendering process in detail. • To gain knowledge of standard & special types of construction contracts & the clauses & conditions associated with it. • To get acquainted with the significance of Indian Contract Act & associated terms • To understand the efficient methods for the resolving disputes arisen in contracting process

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I	**Tendering Process** 1.1 Tender – Definition, Types, Technical sanction Notice inviting Tenders, Submission of tenders, Scrutinization process, Award, acceptance etc. 1.2 Tender documents, Prequalification of bidders. Class & grade of contractors etc. 1.3 Global Tenders 1.4 Bidding strategies	**08**
II	**Contract & Contract documents** 2.1 General & Special types of contracts 2.2 Clauses & conditions of contract as per Ministry of statistics & program Implementation 2.3 EPC Contracts 2.4 FIDIC Contracts 2.5 Contract Documents	**07**
III	**Contract Management** 3.1 Role of specifications in contracting process 3.2 Termination of Contract & Breach of Contract 3.3 Indian Contract Act- 1872 with latest amendments 3.4 Sale of goods Act-1930 with new amendments	**08**

	3.5 Professional ethics to be followed by Contracting Parties	
IV	**Dispute Resolution** 4.1 Claims & disputes Standard methods of resolving disputes 4.2 Standard methods of resolving disputes 4.3 Dispute Resolution Board (DRB) – Necessity, formation, Functioning, Advantages etc. 4.4 Arbitration & conciliation Act -1996 – Arbitration agreement, Arbitration process, duties & powers of an arbitrator, rules of preparing evidences, Publication of an award	**08**
V	**Industrial Acts & Labor laws with latest amendments** 5.1 Indian Trade Union Act- 1926 5.2 Payment of Wages Act-1936 5.3 Minimum Wages Act- 1948 5.4 Workmen's Compensation Act- 1923 5.5 Industrial Dispute Act - 1947	**04**
VI	**Bailment, Pledges, Indemnity & guarantee** 6.1 Definition of Bailment & Roles of agencies involved 6.2 Definition of Pledges & Roles of agencies involved 6.3 Indemnity & guarantee	**04**

Course Outcomes

- Explain the basic procedure of bidding for construction projects.
- Demonstrate the all the types of contract along with their suitability in construction practices.
- Apply the knowledge of Indian Contract Act in construction Industry.
- Select appropriate method for resolving the disputes arisen
- Demonstrate the important terms associated with Indian Contract Act.
- Acquire knowledge of various terms such as Bailment, Pledges, Indemnity & guarantee

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

1) Building & Engineering Contracts – Patil B.S. (Mrs.S.B.Patil Publications)

2. Laws relating to building & engineering contracts in India- G.T.Gajaria (Lexis Nexis India)

3. Bare Acts – (Professional Book Publishers, New Delhi.)

4. Construction contracts" -- Jimmie Hinze 2nd edition. (McGraw hill)

5. Contract management in civil engineering Project – Prakash V.A.(Nicmar Publication)

6. Global perspective on International construction Contracting Technology – K.N.Vaid

Semester I		
Course Code	**Course Name**	**Credits**
CEMPE1012	**Program Elective 1: Urban Infrastructure Planning**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives
• Describe an infrastructure system using accurate terminology • Demonstrate an understanding of the main concepts and principles of infrastructure planning • Identify the key features of a sustainable infrastructure system and explain how they promote sustainable development • Apply analytical tools for infrastructure planning • Critically evaluate infrastructure cases/projects/proposals through the lens of sustainability • Identify the gaps between theoretical principles of sustainable infrastructure and their application in practices

Detailed Syllabus			
Module	**Course Module / Contents**		**Hrs**
I	**Introduction to planning**		**3**
	1.1	Origins and growth of cities, effects of cultural influence on physical form; Human settlements as an expression of civilizations; Basic elements of the city; Concepts of space, time, scale of cities.	
	1.2	Contribution of housing to micro and macro economy, contribution to national wealth and GDP, housing taxation, national budgets, fiscal concessions; need of affordable housing for urban poor, concept of RERA	
II	**Urban Economics**		**6**
	2.1	General introduction to principles of economics and public finance. Importance of economics in Urban Development and Planning	
	2.2	Industrial location policies, any other economic activity base policies and their impact on urban development, Role of land economics in preparation of Urban Development plans. Relevant case studies of Urban Land Economics.	

	2.3	Economic growth and development, quality of life; Human development index, poverty and income distribution, employment and livelihood; Economic principles in land use planning; Policies and strategies in economic planning, balanced versus unbalanced growth, public sector dominance; changing economic policies, implications on land.	
III	**Infrastructure Planning**		**14**
	3.1	Role of Infrastructure in Development, Elements of Infrastructure (physical, social, utilities and services); Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, provision of infrastructure, and land requirements; Principles of resource distribution in space; Types, hierarchical distribution of facilities, Access to facilities, provision and location criteria, Norms and standards, etc.	
	3.2	Zoning, Various growth patterns of town, Housing layouts and road networks in town, Urban aesthetics and landscaping, MRTP and Land Acquisition Acts	
	3.3	Planning and Management of Water, Drainage and Sanitation; Urban Water Demand- Basic requirements for water supply, drainage and sanitation; Present and future demand for Indian cities, Estimation and fulfillment Feasibility and Case studies Administrative and Legal Aspects and Financing: International, national and municipal legal aspects, Administrative structure for drainage planning, Financing for drainage projects, Case studies Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues; Introduction to Drainage Problems in Different Climates: Urbanization - Its effects and consequences for drainage, Interaction between urban and peri-urban areas. Planning concepts and System Planning, Drainage Master Plan: Objectives of urban drainage and planning criteria, Drainage options and system layout, Planning tools and data requirement, Drainage structures, Case studies Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, institutional arrangements, planning provisions and management issues. Storm water – rainfall data interpretation, points of water stagnation, system of natural drains, surface topography and soil characteristics, ground water replenishment, storm water collection and disposal, norms and standards, institutional arrangements, planning provisions and management issues;	
	3.4	Solid Waste Disposal and Management Basic principles, generation, characteristics, collection, disposal, management	
	3.5	Fire and Electrification, and Social Infrastructure Planning for fire protection, services and space standards, location criteria; Planning for Education, health, civic, cultural infrastructure and facilities for transport and other miscellaneous infrastructure services	

	3.6	Planning for Education, health, civic, cultural infrastructure and facilities for transport and other miscellaneous infrastructure services	
IV	**Traffic and transportation Planning**		**6**
	4.1	Evaluation of urban structure: Transport system, infrastructure and management, transport systems and their types, design and operating characteristics, urban road hierarchy, planning, and management criteria for road and junction improvements, arterial improvement techniques.	
	4.2	Traffic management, mass transit system: Problems and prospects. Review of existing traffic management schemes in Indian cities. Case study of various metro rail project envisaged for Mumbai, Navi Mumbai & Pune.	
	4.3	Economic evaluation: pricing and funding of transport services and systems, economic appraisal of highway and transport projects. Techniques for estimating direct and indirect road user costs and benefit value of time	
	4.4	Intelligent transport system (ITS) its types and applications	
V	**Urban Management and Governance**		**6**
	5.1	Introduction to Development Management and Urban Governance- Concept, approaches, components, interface with national goals and political economic system. Urban Development Management Strategies, Tools and Techniques; organizations involved Land and Real Estate Development Economic concepts of land, Land Pricing / valuation; Urban reforms and acts and policies. Overview of Urban Governance Definition, concepts, components, government and governance, hierarchy and structure, forms of governance, process of inclusion and exclusion.	
	5.2	Information System and Urban Reforms Spatial and Non - spatial information systems; Use of GIS in overlaying infrastructure facilities, use of remote sensing in identifying and mapping urban structures.	
	5.3	Present organizations and involved in urban governance with focus on MCGM, TMC and CIDCO. Urban Local Governance and Participatory Processes System, structure, functions, powers, process and resource, performance, interface with NGO's, other agencies.	
VI	**Environmentally safe and Disaster resilient infrastructure**		**4**
	6.1	Frame work, statement prediction and assessment of impacts of air, water, noise, cultural and socio-economic environment. Methods of impact analysis, public participation. Environmental protection international and national agencies and legislation, Environment Impact Assessment. Urban Heat Island Effect, Effect of uncontrolled growth of town	
	6.2	Disaster response planning, roles and responsibilities of various agencies Emergency operation support and management Planning for Disaster Prone Areas, Planning requisites for disaster prone areas and preventive measures, Vulnerability analysis	

Course Outcomes

On completion of this course, the learners will be able to:

- Explain the concepts related to planning of modern cities, GDP contribution, RERA, affordable housing
- Elaborate the economics involved in urban infrastructure planning
- Envisage the various elements required for infrastructure development of a city and describe the concepts, significance and importance of each
- Evaluate technical, social and economic feasibility of transportation projects within cities
- Demonstrate modern tool usage for urban management and governance
- Design environmentally safe and disaster resilient infrastructure

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

1.The Urban and Regional Planning Reader, edited by Eugenie L. Birch, Published by Routledge, 2008; ISBN 978-0-415-319

2. **Housing: The Essential Foundations,** edited by Dr. Paul Balchin, Paul Balchin, Maureen Rhoden, Edition Routledge, DOI https://doi.org/10.4324/9780203010426, eBook ISBN 9780203010426

3. **New Urban Housing by Hilary French**, Publisher: Yale University Press, ISBN0300115784 (ISBN13: 9780300115789)

4.**Sociology: A Brief Introduction**, by Richard T. Schaefer, Publisher: McGraw-Hill Education, ISBN 10:1259425584, ISBN 13: 9781259425585

5. **Sociology: Principles of Sociology with an Introduction to Social Thoughts**, by Rao C.N. Shankar, S. Chand Publication

6. **Introduction to Hydraulics and Hydrology with Applications for Stormwater Management,** by Gribbin, J.E., 2014, Cengage Publications

7. **Projects: Preparation, Appraisal, Budgeting and Implementation** by Prasanna Chandra, Tata McGraw-Hill; ISBN0074516280 (ISBN13: 9780074516287)

8.**Introduction to Transportation Planning**, by B. Bruton, Michael J. Bruton; Published by Hutchinson Radius; ISBN0091580412 (ISBN13: 9780091580414)

9. **Modern Economics by H.L. Ahuja,** 19th Revised Edition, Published by S.Chand (G/L) & Company Ltd.

10. **Principles of Urban Transport Systems Planning,** by B.G. Hutchinson, Publisher: Scripta Book Co.; ISBN0070315396 (ISBN13: 9780070315396)

Semester I		
Course Code	**Course Name**	**Credits**
CEMPE1013	**Program Elective 1: Value Engineering**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives
● To understand the concept of value & its application in engineering. ● To gain knowledge of value engineering job plan & the phases involved in it. ● To know function analysis & the techniques of analysis. ● To understand the concept of creativity & the processes associated with it.

Detailed Syllabus			
Module	**Sub-Modules/ Contents**		**Hrs**
I.	**Value**		**10**
	1.1	Value: Meaning of value, basic and secondary functions. factor contributing to value such as aesthetic, ergonomic, technical, economic etc.	
	1.2	Difference between value engineering, value analysis & value management	
	1.3	Habits, roadblocks, attitudes & their relevance in value engineering	
II.	**Value Engineering Job Plan**		**04**
	2.1	Definition & Terms related to Value Engineering Job Plan	
	2.2	Phases involved in job plan.	
III.	**Function Analysis**		**07**
	3.1	Function- Definition, Role of function in achieving value	
	3.2	Types of function	
	3.3	Function Analysis System Techniques (FAST)	
IV.	**Creative Thinking**		**07**
	4.1	Creative Thinking- Definition & Concept	
	4.2	Characteristics of Creative people	
	4.3	Creative processes	
	4.4	Conducting creative sessions	

V.	**Value Analysis**		**07**
	5.1	Definition & Principles of value analysis.	
	5.2	Benefits & applications of value analysis	
VI.	**Case study**		**04**
	6.1	Case Study of application of Value Engineering & Value Analysis	

Course Outcomes

On completion of the course, the learners will be able to:

- Describe the concept of Value & its significance
- Organize various phases of Value Engineering Job Plan
- Gain knowledge of Function Analysis
- Develop various creative Processes
- Apply value analysis in Construction Practices
- Gain the knowledge of actual studies of Value Engineering

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

1) Zimmerman Larry W., Hart Glen P., (1988) "Value Engineering", CBS Publishers, New Delhi.
2) Iyer S.S., (1996) "Value Engineering", New Age International.
3) Krishnan P., Saxena K.R., (1995) "Value Engineering in Project Management", Oxford and IBH.
4) Vittal M.S., (1993) "Value Engineering", System Consultancy Service, Bangalore.
5) AICTE, "Value Engineering", New-Delhi, 1990.
6) Brown, James, (1992) "Value Engineering", Industrial Press, New York.

Semester I		
Course Code	**Course Name**	**Credits**
CEMPE1021	**Program Elective 2: Urban Transportation Planning**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03		**--**	**03**			**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**				**100**

Course Objectives
• To understand the concept and process of urban transportation planning. • To acquaint with the stages involved in urban transportation planning process. • To analyze the various methods of trip generation & distribution. • To study various modal split models. • To understand various network algorithms used for traffic assignment. • To familiarize with the emerging trends in urban transportation planning.

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I	**Introduction to Urban Transportation Planning** Urbanization, Urban Transportation: Impacts, Behavioral Changes, Urban Transportation problems & Externalities- Congestion, Safety, Emissions, etc. Introduction to Transport planning; Transport Planning Morphology: Problem definition, Solution generation, solution analysis, Evaluation and choice, Implementation Hierarchical levels of Urban Transport Planning: Conceptual Plan, Outline plan, Master plans, statutory or advisory plans, detailed development plans.	**06**
II	**Stages involved in Urban Transportation Planning Process** Overview of traditional four step travel demand forecasting process: Urban Activity forecasts, Trip generation, Trip Distribution, Mode Choice, Traffic assignment Specification, Calibration, Validation and Forecasting; Information needs for Travel Demand Forecasting: Study Area, Urban Activities, Zoning, Urban Activities, Transportation System, Travel information, Types of Movements Data Collection Techniques (Home-interview survey, Commercial vehicle survey, Innovative Commercial Vehicle Tracking Methods, Intermediate Public Transport Survey, Cordon-Line Survey, License Plate Follow-Up Survey.	**06**

III	**Trip Generation & Distribution** **Trip Generation:** Basic considerations in trip generation - amount of urban activity, character of urban activity, other considerations, special generators; Trip classification; Factors affecting trip generation Methods of trip Generation- Regression analysis, trip rate analysis, cross classification analysis; Multiple Linear Regression- Regression analysis concept; The step wise approach with examples **Trip Distribution** Introduction, Basic considerations in Trip Distribution, P-A Matrix to O-D Matrix, Factors affecting trip distribution: Properties of transport network, spatial separation between various zones Growth factor methods- Uniform factor method, Average factor method, Detroit Method.	**09**
IV	**Modal Split** Introduction; Influencing factors of mode choice; Types of modal split models- Trip end type and trip interchange type; Types of modal split models - Trip end type (Southern Wisconsin Model) and trip interchange type (Diversion curve model), Limitations, Aggregate and disaggregate models, advantages of disaggregate over aggregate modelling; Elements of choice decision process; Framework for the choice process of an individual Disaggregate mode choice models- Introduction, Utility theory, Probabilistic choice theory	**06**
V	**Traffic Assignment** General, link cost function, Person-trips and vehicle Trips, diurnal patterns of demand, Trip directions Network properties: Link, nodes, characteristics of link (capacity, free flow speed, travel time, etc.), link flows, inter-zonal flows, Network connectivity, Minimum spanning tree, shortest path, etc.; Network Algorithms: Kruskal, Prims, Dijkstra, Floyd.	**06**
VI	**Urban land use planning & Emerging trends in Transportation planning** Introduction; Urban land use planning- land use and land cover, land use classification; Land use transportation interaction; Accessibility and mobility, Land use models. Emerging Trends in Transportation planning: Activity based modelling; Spatial data infrastructure (SDI); Big Data analytics.	**06**

Course Outcomes

On successful completion of the course, the learners will be able to:

- **Differentiate** between the various hierarchical levels of Urban Transport Planning.
- **Discuss** the various stages involved in Urban Transportation Planning Process.
- **Apply** various techniques of Trip generation and distribution.
- **Compare** the types of modal split models.
- **Identify** the most suitable network algorithm based on the network properties.
- **Classify** land use and land cover models.

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

1) Hutchinson, B.G., Principles of Urban Transport Systems Planning, McGraw Hill, London, 1974.

2) Khisty, C. Jotin and Lall, B. Kent., Transportation Engineering and Planning, 3rd Edition, Pearson India, 2001.

3) Papacostas, C. S., and Prevedouros, P. D., Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt. Ltd., 2002.

4) Garber N.J., and Hoel L.A., Traffic and Highway Engineering, 4th Edition, Cengage Learning, 2009.

5) Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 2013.

Semester I		
Course Code	**Course Name**	**Credits**
CEMPE1022	**Program Elective 2: Resource Management**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03		**--**	**03**			**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**				**100**

Course Objectives
• Know various resources required for construction works • Know need of material management and its techniques • Evaluate performance of construction machinery and its optimum use • Understand importance of human resources in construction works • Acquire skills of time-cost optimization of resources in construction projects • Learn resources planning and scheduling with application of conventional and modern methods

Details of Syllabus		
Module	**Contents**	**Hrs**
I	**Introduction** 1.1. Definition of resources, list of various resources, classification of resources. Types of construction projects and their specific resource demand. 1.2. Need of resources for construction of projects viz. tall buildings, tunneling, bridges, dams, water and sewage treatment plants, highways, airports, pipelines for different utilities, docks and harbors, railways, metro railways, sport grounds etc. 1.3. Case study of each category mentioned above. 1.4. Importance of site visits in resource planning	5
II	**Material Management** 2.1 Definition, objectives, importance of material management in modern construction projects, role of material manager 2.2 Classification and codification of construction materials, Use of various techniques viz. ABC, SDE, FSN, HML, VDE analysis 2.3 Planning of material requirement. methods of procuring, vendor analysis, quotations, purchase procedures and legal issues.	7
III	**Inventory and Quality Control of Materials** 3.1. Techniques of inventory control, advantages and limitations of EOQ, bulk ordering, periodic ordering. Safety stocks, stockout, just in time Inventory	7

	management indices to assess effectiveness. 3.2. Receipts, storage and inspections. Means to control wastages and loss. Site layout, and scheduling of resources to control wastages and loss. 3.3. Methods of quality control, quality assurance sampling techniques. Quality management and economy, Use of material management systems, application of software/s for planning procurement and inventory control.	
IV	**Equipment Management** 4.1. Classification of construction equipment/s, working principles. Productivity, output, and cost. Criteria of selection of equipment/s 4.2. Equipment balancing, cycle time, Number of equipment based on cycle time, available time and magnitude of work. Hourly cost of operation per unit item. 4.3. Log book, Repairer, maintenance, replacement of equipment/s	7
V	**Human Resource Management** 5.1. Definition objectives and functions of HRM. 5.2. HR Planning- need, process, and requirements of HRP. 5.3. Staffing- Policy, skills, selection. Functions of personal manager. 5.4. Training- quality, productivity, employee relationship. Contractors, sub-contractors training. Performance appraisal, potential appraisal methods and benefits. 5.5. Ethics in HRM, Trends and challenges in HRM.	8
VI	**Payments and Trade Unions** 6.1. Determination of wages, compensation, incentives, fringe benefits etc. 6.2. Industrial disputes, prevention, and resolution. Trade unions, roles and responsibilities. Discipline in construction projects.	5

Course Outcomes

On successful completion of the course, the learners will be able to:

- Explain the requirements of resources for construction projects
- Classify and code the procurement process of construction materials
- Describe the need of quality control of construction materials
- Compare construction equipment/s and their optimum use
- Estimate the need of recruitment of competent staff, their training and retention.
- Elaborate the roles and responsibilities of trade unions in industry

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books.

Sr. No.	Title of Book	Name of Author/s	Publication
1	Resources Management in Construction Projects	Loosemore, Dainty Lingard	Spon Press (Taylor & Francis)
2	Resources Management for Construction	M R Canter	Macmillan
3	Purchasing and inventory control	K S Menon	Wheeler
4	Materials Management	A K Datta	Prentice Hall of India
5	Construction Materials Management	George Stukhart	Taylor & Francis
6	Materials Management – An Integrated Approach	Gopalkrishnan, Sundaresan	Prentice Hall of India
7	Construction Equipment Management for Civil Engineers, Estimators & Owners	Gransberg, Popescu, Ryan	CRC Taylor & Francis
8	Construction Planning Equipment and Methods	R L Peuripo	Tata Mc Graw
9	Heavy Construction Planning Equipment and Methods	Jagman	Oxford and IBH
10	Construction Equipment Management	John Schaufelberger	Prentice Hall of India
11	Construction Planning Equipment and Methods	Purifoy, Schexnayder, Ledbetter	Mc Graw Hill
12	Human Resource Management	Biswajit Patnaik	Prentice Hall of India
13	Human Resource Management	Dessler Garry	Prentice Hall, New Jercy
14	A Text of Human Resource Management	Mamoria, Gankar	Himalaya, New Delhi
15	Human Resource & Personal Management-Text & Class	Aswathappa k	Mc Graw Hill

Semester I		
Course Code	**Course Name**	**Credits**
CEMPE1023	**Program Elective 2: Sustainable Construction Practices**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Course Objectives

- Demonstrate an ability to evaluate and/or design whole or parts of project, taking into account not only the financial and economic issues but also the social and environmental impacts affecting the sustainability of infrastructure.
- Promote an approach to project evaluation that is based on an appreciation of the needs of society, the potential for sustainable development, and recognition of the problems that may result from poorly conceived or poorly implemented projects and programs.
- Know methods, tools, and incentives for sustainable product-service system development
- Establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal and economic problem.
- Understand the role of engineering and technology within sustainable development.
- Have increased awareness among students in the areas of sustainability.

Detailed Syllabus

Module	Sub-Modules/ Contents	Hrs
I	Necessity and importance of sustainable construction materials. Material composition and properties, production, storage, distribution, testing, acceptance criteria, limitations of use, economic consideration, recent development related to the different materials to be studied.	**06**
II	Various construction chemicals/admixtures, Fly ash and its use in concrete, Silica fume concrete, Self-compacting concrete, Fiber Reinforced plastics and concrete, Light weight concrete	**06**

III	Crumb modified bitumen Rubber, Glenium Concrete, Materials used in nuclear-containment structures	**06**
IV	High performance concrete, Nano technology in cement concrete, Ferrocement Technology	**06**
V	Sustainability in the built environment: sustainable development relative to ecological, economic and social conditions – efforts in sustainable development and construction – international organizations involved. Ethics and sustainability: environmental and resource concerns – resource consumption by construction industry – Green building movement. Ecological design – concept – major contributions. Building assessment and eco labels – standards (LEED, GRIHA) – assessment structure and process. Green building design process – documentation requirements.	**09**
VI	Sustainable site and landscape – storm water management, heat island mitigation – assessment of sustainable sites. Building energy issues – building energy design strategy – building envelope – internal load reduction – energy optimization – renewable energy systems. Reducing carbon footprint. Built environment hydrologic cycle – water resources issues – strategies for conservation and recycling – waste water and storm water handling strategies. Materials resources – Life cycle assessment – embodied energy – Green building materials and products – assessing for environmental impacts – design for deconstruction – LEED credits for different aspects.	**06**

Course Outcomes

On successful completion of the course, the learners will be able to:

- Compare key features such as cost, ease of use, and building performance of different rating systems
- Evaluate rating systems in detail, including its evolution, objectives, criteria, levels of certification benefits, and shortcomings
- Demonstrate sustainable construction through case studies
- Apply the basic principles of sustainable construction on buildings by proposing solutions that advance sustainable building performance and applying existing tools of sustainable strategies to buildings
- Create written communications appropriate to the construction discipline through Social Media and/or Report deliverables and make informed personal decisions about activities and actions that would reflect sustainability of the built environment.
- Identify the fundamental concepts of energy and science of climate that defines Sustainable Construction techniques

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks

3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

1) "Sustainable Building Design Manual – Volume II", Published by TERI, New Delhi, 2004.
2) Concrete Technology by Neville
3) Construction Materials, Methods & Techniques(3e) by William P Spence, Yesdee Publication 2012, Pvt. Ltd,, Chennai, India
4) Building Materials by M L Gambhir, Neha Jamwal, Tata McGraw Hill Publ.
5) Kibert, C. J., "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2013.
6) Steven V. Szokolay., "Introduction to Architectural Science – The Basis of Sustainable Design", Elsevier, 2007.
7) Sandy Halliday, "Sustainable Construction", Routledge, (Taylor & Francis Group), 2013.

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1011	**Institute Level Elective: Product Life-cycle Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End SemExam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To familiarize the students with the need, benefits and components of PLM
- To acquaint students with Product Data Management & PLM strategies
- To give insights into new product development program and guidelines for designing and developing a product
- To familiarize the students with Virtual Product Development

Module	Detailed Contents	Hrs
I	**Introduction to Product Lifecycle Management (PLM):** Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications **PLM Strategies:** Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM	10
II	**Product Design:** Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product DevelopmentProcess, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design	09

	for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process	
III	**Product Data Management (PDM):** Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation	05
IV	**Virtual Product Development Tools:** For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies	05
V	**Integration of Environmental Aspects in Product Design:** Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design	05
VI	**Life Cycle Assessment and Life Cycle Cost Analysis:** Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis	05

Contribution to Outcomes:

Students will be able to

- Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
- Illustrate various approaches and techniques for designing and developing products.
- Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
- Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. John Stark, “Product Lifecycle Management: Paradigm for 21st Century Product Realisation”, Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, AntoninoRisitano, “Product Design for the environment-A life cycle approach”, Taylor & Francis 2006, ISBN: 0849327229
3. SaaksvuoriAntti, ImmonenAnselmie, “Product Life Cycle Management”, Springer, Dreamtech, ISBN: 3540257314
4. Michael Grieve, “Product Lifecycle Management: Driving the next generation of lean thinking”, Tata McGraw Hill, 2006, ISBN: 0070636265

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1012	**Institute Level Elective: Reliability Engineering**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Avg						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives

- To familiarize the students with various aspects of probability theory
- To acquaint the students with reliability and its concepts
- To introduce the students to methods of estimating the system reliability of simple and complex systems
- To understand the various aspects of Maintainability, Availability and FMEA procedure

Module	Detailed Contents	Hrs
I	**Probability theory:** Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. **Probability Distributions:** Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. **Measures of Dispersion:** Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.	08
II	**Reliability Concepts:** Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve. **Failure Data Analysis:** Hazard rate, failure density, Failure Rate, Mean Time ToFailure (MTTF), MTBF, Reliability Functions. **Reliability Hazard Models:** Constant Failure Rate, linearly increasing, Time Dependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.	08
III	**System Reliability:** System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems.	05
IV	**Reliability Improvement:** Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success Path method, Decomposition method.	08

V	**Maintainability and Availability:** System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement. Availability – qualitative aspects.	05
VI	**Failure Mode, Effects and Criticality Analysis:** Failure mode effects analysis, severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis	05

Outcomes

Students will be able to…

- Understand and apply the concept of Probability to engineering problems
- Apply various reliability concepts to calculate different reliability parameters
- Estimate the system reliability of simple and complex systems
- Carry out a Failure Mode Effect and Criticality Analysis

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. L.S. Srinath, “Reliability Engineering”, Affiliated East-Wast Press (P) Ltd., 1985.
2. Charles E. Ebeling, “Reliability and Maintainability Engineering”, Tata McGraw Hill.
3. B.S. Dhillion, C. Singh, “Engineering Reliability”, John Wiley & Sons, 1980.
4. P.D.T. Conor, “Practical Reliability Engg.”, John Wiley & Sons, 1985.
5. K.C. Kapur, L.R. Lamberson, “Reliability in Engineering Design”, John Wiley & Sons.
6. Murray R. Spiegel, “Probability and Statistics”, Tata McGraw-Hill Publishing Co. Ltd.

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1013	**Institute Level Elective: Management Information System**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- The course is blend of Management and Technical field.
- Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built
- Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage
- Identify the basic steps in systems development

Module	Detailed Contents	Hrs
I	Introduction to Information Systems (IS): Computer Based Information Systems, Impact of IT on organizations, Imporance of IS to Society. Organizational Strategy, Competitive Advantages and IS.	4
II	Data and Knowledge Management: Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management. Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results	7
III	Ethical issues and Privacy: Information Security. Threat to IS, and Security Controls	7
IV	Social Computing (SC): Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C. Mobile commerce.	7
V	Computer Networks Wired and Wireless technology, Pervasive computing, Cloud computing model.	6
VI	Information System within Organization: Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models.	8

Contribution to Outcomes

Students will be able to:

- Explain how information systems Transform Business
- Identify the impact information systems have on an organization
- Describe IT infrastructure and its components and its current trends
- Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
- Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Kelly Rainer, Brad Prince, Management Information Systems, Wiley
2. K.C. Laudon and J.P. Laudon, Management Information Systems: Managing the Digital Firm, 10th Ed., Prentice Hall, 2007.
3. D. Boddy, A. Boonstra, Managing Information Systems: Strategy and Organization, Prentice Hall, 2008

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1014	**Institute Level Elective: Design of Experiments**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand the issues and principles of Design of Experiments (DOE)
- To list the guidelines for designing experiments
- To become familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

Module	Detailed Contents	Hrs
I	**Introduction** 1.1 Strategy of Experimentation 1.2 Typical Applications of Experimental Design 1.3 Guidelines for Designing Experiments 1.4 Response Surface Methodology	06
II	**Fitting Regression Models** 2.1 Linear Regression Models 2.2 Estimation of the Parameters in Linear Regression Models 2.3 Hypothesis Testing in Multiple Regression 2.4 Confidence Intervals in Multiple Regression 2.5 Prediction of new response observation 2.6 Regression model diagnostics 2.7 Testing for lack of fit	08
III	**Two-Level Factorial Designs** 3.1 The 2^2 Design 3.2 The 2^3 Design 3.3 The General2^k Design 3.4 A Single Replicate of the 2^k Design 3.5 The Addition of Center Points to the 2^k Design, 3.6 Blocking in the 2^k Factorial Design 3.7 Split-Plot Designs	07

IV	**Two-Level Fractional Factorial Designs** 4.1 The One-Half Fraction of the 2^k Design 4.2 The One-Quarter Fraction of the 2^k Design 4.3 The General 2^{k-p} Fractional Factorial Design 4.4 Resolution III Designs 4.5 Resolution IV and V Designs 4.6 Fractional Factorial Split-Plot Designs	07
V	**Response Surface Methods and Designs** 5.1 Introduction to Response Surface Methodology 5.2 The Method of Steepest Ascent 5.3 Analysis of a Second-Order Response Surface 5.4 Experimental Designs for Fitting Response Surfaces	07
VI	**Taguchi Approach** 6.1 Crossed Array Designs and Signal-to-Noise Ratios 6.2 Analysis Methods 6.3 Robust design examples	04

Contribution to Outcomes

Students will be able to

- Plan data collection, to turn data into information and to make decisions that lead to appropriate action
- Apply the methods taught to real life situations
- Plan, analyze, and interpret the results of experiments

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Raymond H. Mayers, Douglas C. Montgomery, Christine M. Anderson-Cook, Response Surface Methodology: Process and Product Optimization using Designed Experiment, 3rd edition,John Wiley & Sons, New York, 2001
2. D.C. Montgomery, Design and Analysis of Experiments, 5th edition, John Wiley & Sons, NewYork, 2001
3. George E P Box, J Stuart Hunter, William G Hunter, Statics for Experimenters: Design, Innovationand Discovery, 2nd Ed. Wiley
4. W J Dimond, Peactical Experiment Designs for Engineers and Scintists, John Wiley and Sons Inc. ISBN: 0-471-39054-2
5. Design and Analysis of Experiments (Springer text in Statistics), Springer by A.M. Dean, and D.T.Voss

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1015	**Institute Level Elective: Operation Research**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- Formulate a real-world problem as a mathematical programming model.
- Understand the mathematical tools that are needed to solve optimization problems.
- Use mathematical software to solve the proposed models.

Module	Detailed Contents	Hrs
I	**Introduction to Operations Research**: Introduction, , Structure of the Mathematical Model, Limitations of Operations Research **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, Revised simplex method, **Duality**, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis **Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method. **Assignment Problem**: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem **Integer Programming Problem**: Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.	14

II	**Queuing models**: queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population	05
III	**Simulation**: Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation	05
IV	**Dynamic programming**. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	05
V	**Game Theory**. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	05
VI	**Inventory Models**: Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,	05

Outcomes:

Students will be able to

- Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
- Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
- Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
- Understand the applications of integer programming and a queuing model and compute important performance measures

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002.
2. Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009.
3. Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002.
4. Operations Research, S. D. Sharma, KedarNath Ram Nath-Meerut.
5. Operations Research, KantiSwarup, P. K. Gupta and Man Mohan, Sultan Chand & Sons.

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1016	**Institute Level Elective: Cyber Security and Laws**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand and identify different types cybercrime and cyber law
- To recognized Indian IT Act 2008 and its latest amendments
- To learn various types of security standards compliances

Module	Detailed Contents	Hrs
I	**Introduction to Cybercrime:** Cybercrime definition and origins of the world, Cybercrime andinformation security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes.	4
II	**Cyber offenses & Cybercrime:** How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops	9
III	**Tools and Methods Used in Cyberline** Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)	6
IV	**The Concept of Cyberspace** E-Commerce, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law , The Evidence Aspect in Cyber Law, The Criminal Aspect in Cyber Law, Global Trends in Cyber Law, Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking, The Need for an Indian Cyber Law	8

V	**Indian IT Act.** Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments	6
VI	**Information Security Standard compliances** SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.	6

Outcomes

Students will be able to:

- Understand the concept of cybercrime and its effect on outside world
- Interpret and apply IT law in various legal issues
- Distinguish different aspects of cyber law
- Apply Information Security Standards compliance during software design and development

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination.

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi
2. The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi
3. The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
4. Cyber Law & Cyber Crimes By Advocate Prashant Mali; Snow White Publications, Mumbai
5. Nina Godbole, Information Systems Security, Wiley India, New Delhi
6. Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.
7. William Stallings, Cryptography and Network Security, Pearson Publication
8. Websites for more information is available on: The Information Technology ACT, 2008- TIFR: https://www.tifrh.res.in
9. Website for more information , A Compliance Primer for IT professional : https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals-33538

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1017	**Institute Level Elective: Disaster Management and Mitigation Measures**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives

- To understand physics and various types of disaster occurring around the world
- To identify extent and damaging capacity of a disaster
- To study and understand the means of losses and methods to overcome /minimize it.
- To understand role of individual and various organization during and after disaster
- To understand application of GIS in the field of disaster management
- To understand the emergency government response structures before, during and after disaster

Module	Detailed Contents	Hrs
I	**Introduction** **1.1** Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	**03**
II	**Natural Disaster and Manmade disasters:** 2.1 Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion 2.2 Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	**09**
III	**Disaster Management, Policy and Administration** 3.1 Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. 3.2 Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and	**06**

	how to proceed in due course of time, study of flowchart showing the entire process.	
IV	**Institutional Framework for Disaster Management in India:** 4.1 Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management ofcasualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations. 4.2 Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.	**06**
V	**Financing Relief Measures:** 5.1 Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. 5.2 International relief aid agencies and their role in extreme events.	**09**
VI	**Preventive and Mitigation Measures:** 6.1 Pre-disaster, during disaster and post-disaster measures in some events in general 6.2 Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication 6.3 Non-Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. 6.4 Do's and don'ts in case of disasters and effective implementation of relief aids.	**06**

Outcomes:

Students will be able to…

- Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
- Plan of national importance structures based upon the previous history.
- Get acquainted with government policies, acts and various organizational structure associated with an emergency.
- Get to know the simple do's and don'ts in such extreme events and act accordingly.

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. 'Disaster Management' by Harsh K.Gupta, Universities Press Publications.
2. 'Disaster Management: An Appraisal of Institutional Mechanisms in India' by O.S.Dagur, published by Centre for land warfare studies, New Delhi, 2011.
3. 'Introduction to International Disaster Management' by Damon Copolla, Butterworth Heinemann Elseveir Publications.
4. 'Disaster Management Handbook' by Jack Pinkowski, CRC Press Taylor and Francis group.
5. 'Disaster management & rehabilitation' by Rajdeep Dasgupta, Mittal Publications, New Delhi.
6. 'Natural Hazards and Disaster Management, Vulnerability and Mitigation – R B Singh, Rawat Publications
7. Concepts and Techniques of GIS –C.P.Lo Albert, K.W. Yonng – Prentice Hall (India) Publications. (Learners are expected to refer reports published at national and International level and updated information available on authentic web sites)

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1018	**Institute Level Elective: Energy Audit and Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
- To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
- To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

Module	Detailed Contents	Hrs
I	**Energy Scenario:** Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act-2001 and its Features. Basics of Energy and its various forms, Material and Energy balance	04
II	**Energy Audit Principles:** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution. Elements of monitoring& targeting; Energy audit Instruments; Data and information-analysis. Financial analysis techniques: Simple payback period, NPV, Return on investment (ROI), Internal rate of return (IRR)	08
III	**Energy Management and Energy Conservation in Electrical System:** Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipments and appliances, star ratings.**Energy efficiency measures in lighting system, Lighting control:** Occupancy sensors, daylight integration, and use of intelligent controllers. Energy conservation opportunities in: water pumps, industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives.	10

IV	**Energy Management and Energy Conservation in Thermal Systems:** Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system. General fuel economy measures in Boilers and furnaces, Waste heat recovery, use of insulation- types and application. HVAC system: Coefficient of performance, Capacity, factors affecting Refrigeration and Air Conditioning system performance and savings opportunities.	10
V	**Energy Performance Assessment:** On site Performance evaluation techniques, Case studies based on: Motors and variable speed drive, pumps, HVAC system calculations; Lighting System: Installed Load Efficacy Ratio (ILER) method, Financial Analysis.	04
VI	**Energy conservation in Buildings:** Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources	03

Outcomes:

On successful completion of the course, the learners will be able to:

- identify and describe present state of energy security and its importance.
- identify and describe the basic principles and methodologies adopted in energy audit of an utility.
- describe the energy performance evaluation of some common electrical installations and identifythe energy saving opportunities.
- describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
- analyze the data collected during performance evaluation and recommend energy saving measures

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Handbook of Electrical Installation Practice, Geofry Stokes, Blackwell Science
2. Designing with light: Lighting Handbook, By Anil Valia, Lighting System
3. Energy Management Handbook, By W.C. Turner, John Wiley and Sons

4. Handbook on Energy Audits and Management, edited by A. K. Tyagi, Tata Energy ResearchInstitute (TERI).
5. Energy Management Principles, C.B.Smith, Pergamon Press
6. Energy Conservation Guidebook, Dale R. Patrick, S. Fardo, Ray E. Richardson, Fairmont Press
7. Handbook of Energy Audits, Albert Thumann, W. J. Younger, T. Niehus, CRC Press
8. www.energymanagertraining.com
9. www.bee-india.nic.in

ME CE & M Semester I		
Course Code	**Course Name**	**Credits**
CEMIE 1019	**Institute Level Optional Course – I: Development Engineering**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Avg						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

1. To understand the characteristics of rural Society and the Scope, Nature and Constraints of rural Development
2. To study Implications of 73rd CAA on Planning, Development and Governance of Rural Areas
3. An exploration of human values, which go into making a 'good' human being, a 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals
4. To understand the Nature and Type of Human Values relevant to Planning Institutions

Module	Detailed Contents	Hrs.
I	Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.	**08**
II	Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development.	**04**
III	Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the	**06**

	weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development.	
IV	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	**04**
V	Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education. Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom.	**10**
VI	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	**04**

Outcomes: Learner will be able to…

1. Apply knowledge for Rural Development.
2. Apply knowledge for Management Issues.
3. Apply knowledge for Initiatives and Strategies
4. Develop acumen for higher education and research.
5. Master the art of working in group of different nature.
6. Develop confidence to take up rural project activities independently

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions**, **each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. **Only Four questions need to be solved**

Reference

1. ITPI, Village Planning and Rural Development, ITPI, New Delhi
2. Thooyavan, K.R. Human Settlements: A 2005 MA Publication, Chennai

3. GoI, Constitution (73rd GoI, New Delhi Amendment) Act, GoI, New Delhi
4. Planning Commission, Five Year Plans, Planning Commission
5. Planning Commission, Manual of Integrated District Planning, 2006, Planning Commission New Delhi
6. Planning Guide to Beginners
7. Weaver, R.C., The Urban Complex, Doubleday.
8. Farmer, W.P. et al, Ethics in Planning, American Planning Association, Washington.
9. How, E., Normative Ethics in Planning, Journal of Planning Literature, Vol.5, No.2, pp. 123-150.
10. Watson, V. , Conflicting Rationalities: -- Implications for Planning Theory and Ethics, Planning Theory and Practice, Vol. 4, No.4, pp.395 – 407

Semester I		
Course Code	**Course Name**	**Credits**
CEML101	**Program Lab-I**	**01**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-----	**2**	**-----**	**----**	**1**	**----**	**01**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
----	**----**	**----**	**----**	**----**	**25**	**----**	**25**	**50**

Objectives

- To make students aware about the difference between listening and hearing
- To enhance speaking and technical writing skills.
- To prepare students to face interviews, group discussions.

Module	Description	Hrs
I	**Listening Skills:** Barriers to listening, Kinds of Listening & Note making.	**02**
II	**Speaking Skills:** Voice Modulation, Good Pronunciation, Speaking without fear, Extempore & Prepared speaking, Body Language, Telephone Etiquette/ Mobile /Video conferences. **Presentation Skills:** Planning, preparing, Organizing, Delivery, Feedback.	**05**
III	**Reading Skills:** SQ3R Reading Technique, Skimming and Scanning	**03**
IV	**Writing Skills:** Building Vocabulary, Effective Sentences & paragraphs, Organizational Techniques & patterns, Summarizing. **Content writing:** Social media post, blogs, LinkedIn Building Network Approach, articles and testimonials for websites Media tools: like surfer SEO tools, keyword planner, copywritely, HubSpot topic generator, Grammarly, QuillBot	**10**

V	**Types of Writing:** Letters, memo, Reports/ Proposals/ Research Paper/ Conference Paper/ E-mails/Sharing Documents On-line.	**04**
VI	**Interview:** Pre-Interview Preparation, Interview Question Answer, Resume & Job Application,Group Discussion, Telephone Interviews.	**03**
IX	**Seminar Presentation on the following Topics:** (1) Time Management (2) Motivation (3) Negotiation & Conflict Management (4) Stress Management (5) IPR (6) Transactional Analysis (7) Leadership (8) Emotional Intelligence (EQ/IQ) (9) Assertiveness (10) Presentation Through Video conferences.	**02**

Contribution to Outcomes

Students will be able to:

- Differentiate between listening and hearing
- Develop speaking and technical writing skills
- Execute interviews, group discussions and presentation skill

Reference Books

1. Effective Technical Communication- M. Ashraf Rizvi (Tata McGraw Hill)
2. HBR Guide to Better Business Writing- Bryan A. Garner (Harvard Business Review Press)

Semester I		
Course Code	**Course Name**	**Credits**
CEMSBL101	**Skill Based Lab-I**	**02**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
-------	**4**	**------**	**-----**	**2**	**----**	**02**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
----	**-----**	**----**	**---**	**-----**	**50**	**----**	**50**	**100**

Objectives:

- Prepare detailed project reports
- Perform statistical quality analysis
- Perform common material testing laboratory practicals
- Inspire self and others from watching motivational videos/lecture series related to team building/project management
- Use spreadsheet to solve complex civil engineering problems

Module	Description	Hrs
I	Minimum two site visits to study construction techniques and use of major construction equipment associated with ongoing major construction works. Visit Report to be submitted in written form	**16**
II	Material testing laboratory: Two Tests destructive / non-destructive related with determination of various material properties related with construction. students are expected to write a detailed report on the same	**04**
III	Use of excel to perform statistical analysis in construction project management.	**02**
IV	Application of XLSTAT, SPSS and similar softwares used for simulation	**02**
V	Group discussion on two motivational videos of project management (could be movie clips, construction processes related to construction management)	**02**
VI	ONE assignment on each subject.	**-**

Contribution to Outcomes

On successful completion of the course, the learners will be able to:

- Observe very keenly various activities/processes going on at various construction sites and hence comment on how consistently they are performed and hence suggest improvement measures

- Write effective project reports highlighting the pros & cons of the technologies envisaged for the project
- Perform on-field tests to check the quality of materials/ technology used and hence draw inferences from the results thus obtained
- Apply spreadsheet (excel or other) tools to simplify complex civil engineering problems
- Demonstrate effective interpersonal soft skills w.r.t putting forwards one's viewpoint, group discussion, etc.
- Envisage the roles and responsibilities of a project manager on construction projects

Semester- II

Semester II		
Course Code	**Course Name**	**Credits**
CEMC201	**Project Economics and Financial Management**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**---**	**---**	**---**	**100**

Objectives

- Understand the principles of economics and finance
- Prepare financial statements, Perform ratio analysis and comment on the financial stability of the firm
- Manage the working capital required on construction projects
- Analyze the impact of exchange rate fluctuations on infrastructure projects
- Employ capital budgeting methods to arrive at the best investment options
- Learn from case studies of financial successes and failures

Detailed Syllabus		
Module	**Sub Modules/Contents**	**Hrs**
I	**Principles of Economics** 1.1 Importance of the economic background to measurement, objectives of business firm. Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms. 1.2 Accounting terminologies and recording process 1.3 The Companies Act, 1956 1.4 Preparation of balance sheet and Ratio Analysis. 1.5 Preparation of cash flow statement 1.6 Preparation of profit & loss account 1.7 Escrow Account for PPP Project.	**10**

II	**Capital** **2.1** Need of working capital 2.2 Numericals on Estimation of requirements of working capital 2.3 Numericals on Credit Management, Cash Management, Managing payments to suppliers and out standings. 2.4 Numerical on exchange rate fluctuations on international projects	**07**
III	**Economic Analysis** 3.1 Cost implication to different forms of construction 3.2 Maintenance and replacement lives of construction projects 3.3 Installation and running cost of services 3.4 Capital investment in project 3.5 Cost analysis by traders and by functional elements 3.6 Cost control during design and Construction, 3.7 Depreciation and its calculation by various methods 3.8 Various Appraisal Criteria Methods, viz, Payback period, ARR, NPV, B/C and IRR. Numericals on the same 3.9 Break-even analysis: numericals 3.10 Project portfolio management	**10**
IV	**Financial Planning** 4.1 Long term finance planning, Sources of finance, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves & surplus, Role of financing institutes in Construction, ole of Lender's Engineer. 4.2 Venture Capital Financing- Indian Venture Capital scenario, SEBI regulations 4.3 Over and under capitalization with practical examples 4.4 World financial market 4.5 CIDC-ICRA grading of construction entities	**04**
V	**Budget** 5.1 Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual 5.2 Numericals on preparation of production budget for a manufacturing company 5.3 Numericals on Preparation of cash budget 5.4 Numericals on Preparation of sales budget	**04**
VI	**Case Studies** 6.1 Konkan Railway Financial Appraisal or any Financial Appraisal of various sectors 6.2 Case studies for BOT, Dams, Mass Transit System, Infrastructure Projects Government Funded Projects with respect to a) Project Appraisal b) Raising of funds c) Cost to complete analysis	**04**

Course Outcomes
• Apply the basic principles of economics to construction entities • Prepare financial statements • Estimate the working capital required on a construction project

- Plan finance w.r.t. cash and credit required
- Perform capital budgeting and project portfolio analysis
- Appraise and criticize various Indian construction and infrastructure projects for their financial successes or failures.

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended books:

1. Construction project scheduling and control ----Mubarak, Wiley India.
2. Construction Management & PWD Accounts --- D Lal, S. K. Kataria& Sons
3. Construction Management and Accounts -- Singh H. Tata McGraw Hill, New Delhi
4. Construction Management: Planning and finance-- Cormican D. Construction press, London
5. Principles of Corporate Finance, Brealey R.A. Tata McGraw Hill, New Delhi
6. Engineering Economics—Kumar---Wiley,India.
7. Engineering Economy, Leland T. Blank. Anthony Tarquin. McGraw Hill
8. Engineering Economics, David Bedworth, Sabah Randhawa. McGraw Hill
9. Real Estate, Finance and investment, Bruggeman. Fishr, McGraw Hill
10. Foundations of Financial Management', Block Hirt. McGraw Hill
11. Case studies in finance, Burner, McGraw Hill
12. Cases in Finance , De Mello McGraw
13. The cost management toolbox ; A Managers guide to controlling costs and boosting profits. Oliver, Lianabel. Tata McGraw Hill
14. "Financial Management" – Indian Institute of Banking and Finance – Macmillan Publications.
15. Projects planning, Analysis Selection, Implementation and Review, Prasanna Chandra Tata McGraw Hill, New Delhi,
16. Fundamentals of Engineering Economics—Pravin Kumar, Wiley, India.
17. E. Sreedharan's presentation on January 16, 2001 as part of the Department of Administrative Reformsand Public Grievances, lecture series on "Ideas that have worked"

Semester II		
Course Code	**Course Name**	**Credits**
CEMC202	**Infrastructure Development**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03		**--**	**03**			**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**				**100**

Objectives
Students will be able to: • demonstrate the role of infrastructure in overall development of the nation. • gain knowledge of various sectors of infrastructure & status of present progress. • get acquainted with the knowledge of funding & managing infrastructure projects. • explain the concept of public private partnership & its implementation in practice.

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I.	**Development & Construction Industry** 1.1 Concept of Development, Measures of Development, Determinants of Development 1.2 Construction Industry: Global and Indian perspective 1.3 Characteristics, scope and features of construction Industry in India 1.4 Roles of various agencies involved in construction industry.	**08**
II.	**Infrastructure in India** 2.1 Classification of Infrastructure projects. 2.2 Role of infrastructure in development of country 2.3 Present status of various sectors of Infrastructure in India	**08**
III.	**Economics of Infrastructure Projects** 3.1 GDP & GNP 3.2 Sources of financing infrastructure projects 3.3 Role of Foreign Direct Investment (FDI) in Construction Industry	**06**

IV	**Public Private Partnership** 4.1 Definition of PPP, Principle, purpose & role of partnership 4.2 Various PPP models involved in construction industry 4.3 Role and functions of PMC in Infrastructure projects	**05**
V.	**Issues related to Infrastructure Development** 5.1 Environmental clearances for special as well as mega projects 5.2 Pre-requisites & documentation required for Infrastructure development 5.3Role of Federation of Indian Chambers of Commerce & Industry (FICCI)	**06**
VI.	**Delay and Failures in Infrastructure projects** 6.1 Causes of delay in infrastructure projects. 6.2 Cost over-run and Time over run 6.3 Case study of TOR & COR	**06**

Course Outcomes

Students will be able to,

- Explain the concept of development & significance of Construction Industry.
- Demonstrate the classification of infrastructure projects.
- Illustrate the economy measurement indicators such as GDP & GNP
- Differentiate amongst various PPP models & choose appropriate model for the particular execution
- Identify various issues related to Infrastructure development
- Explain various causes of Time Over run & Cost Over run

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved

Recommended Books:

1) India Infrastructure Report --- Rakesh Mohan
2) Public Private Partnership - R.N.Joshi (Vision Books)
3) Indian Economy – Datt & Sundharam (S.Chand publication)
4) FDI in India --- Niti Bhasin
5) Infrastructure Development & Financing in India --- N. Mani (New Century Publications)
6) Infrastructure & economic development ---Anu Kapil (Deep &Deep Publications)

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2011	**Program Elective 3: System Approach in Civil Engineering**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03		**--**	**03**			**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**				**100**

Objectives
• To look at a practical problem through the perspective of Mathematics. • To understand the various mathematical tools available at our hand. • To analyze and apply the best suited mathematical model for getting feasible solution to our problem. • To compare various mathematical model to decide upon the method giving optimum solution. • To understand the similitude between mathematical models and real-life situations and identifying applications of Operation research on a continual basis. • To apply Computer software and programming for solution of the mathematical models.

Detailed Syllabus		
Module	**Sub-Modules/ Contents**	**Hrs**
I	**Introduction Systems Approach:**	**15**
	Introduction Systems Approach: Need of Systems Approach, Structure of the Mathematical Model, Limitations of Operations Research. **Linear Programming:** Difference between linear and non-linear programming, Linear Programming Problem (LPP), Primal-Dual Construction, Symmetric & Asymmetric Dual, Mathematical Formulation of LPP, Graphical method, Simplex Method.	
	Transportation Model: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method.	

	Assignment Model: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem.	
II	**Queuing Models & Simulation** Queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population. Basic Concepts in Simulation, Methodology of Simulation, Introduction & Application of Monte-Carlo Method; Advantages, Limitations & Applications of Simulation.	**05**
III	**Introduction to Soft Computing** Applications of Fuzzy logic, Artificial Neural Network, Neuro-fuzzy optimization, Genetic Algorithm, Genetic Programming, Particle Swarm Optimization, etc. in civil engineering.	**05**
IV	**Dynamic programming** Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	**05**
V	**Game Theory** Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, Value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	**05**
VI	**Integer Programming** Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch & Bound Technique. Introduction to Decomposition algorithms.	**04**

Course Outcomes

- **Formulate** a mathematical model for a given complex problem.
- **Solve** linear programming problems using various models.
- **Apply** queuing model & simulations for prediction of civil engineering system outcomes
- **Use** soft computing for solving civil engineering problems
- **Compare** various strategies using Game theory.
- **Refine** the solution using integer programming.

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the**

syllabus.

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Recommended Books:

- Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002.
- Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles & Practice", John Willey and Sons, 2nd Edition, 2009.
- Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002.
- Sharma S.D. “Operations Research”,, KedarNath Ram Nath-Meerut.
- KantiSwarup, P. K. Gupta and Man Mohan “Operations Research”,Sultan Chand & Sons.

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2012	**Program Elective 3: Building Services and Repairs**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**---**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Objectives
• Electrical system and lighting systems in buildings • Water distribution and drainage systems, piped gas supply systems, fire-fighting installations, • Mechanical systems in buildings • Deterioration of concrete structures & distress identification • Repair materials and techniques • Seismic retrofitting and maintenance of heritage structures

Detailed Syllabus			
Module	**Course Module / Contents**		**Hrs**
I	**Electrical system and lighting systems in buildings**		07
	1.1	electrical systems in buildings, indoor and outdoor lighting systems, electrical layout plan, wiring system, Single and three phase supply, distribution boards, various electrical appliances, ISI specifications, electrical load calculation. Protective devices, Solar energy and panels	
	1.2	Principles of Illumination Design: Visual task, Modern theory of light &color: classification of lighting, artificial lights sources, Lighting for various buildings like offices, school, hospitals and house	
II	**Water Distribution and drainage systems, piped gas supply systems fire-fighting installations**,		08
	2.1	Water Distribution system: Material used, pipes & connections, Water meter, valves and storage tanks,	
	2.2	Drainage system: system of plumbing, house drainage plans Pipe and traps, Chambers- gradient and spacing, manholes, septic tanks, rain water harvesting system.	

	2.3	piped gas supply systems, materials, connections, standards	
	2.4	Fire safety, fire-fighting systems	
III	**Mechanical systems in buildings**		06
	3.1	Motors, Generators, Pumps, HVAC Systems, capacity, components and working, maintenance.	
	3.2	Lifts, escalators, their components, working and maintenance.	
IV	**Deterioration of Concrete Structures & Distress identification**		07
	4.1	Need for strengthening due to various reasons, Causes of distress in concrete structures - holistic models for deterioration of concrete.	
	4.2	Distress identification and testing methods, structural audit and different stages, field and laboratory testing.	
	4.3	Non-Destructive and Destructive Testing Methods: - Concrete strength assessment and tests, interpretation and evaluation of results,	
V	**Repair Materials and techniques**		06
	5.1	Selection of various repair materials and their essential parameters, identification of suitable repair strategy. machines/instruments required.	
	5.2	Rehabilitation and retrofitting methods, selection of repair methods. Jacketing methods,	
VI	**Seismic retrofitting and Maintenance of Heritage Structures**		05
	6.1	Effects of earthquakes and factors related to building damages due to earthquake, Methods of seismic retrofitting, restoration of buildings	
	6.2	Repair and rehabilitation of heritage structures	

Course Outcomes

On successful completion of the course, the learners will be able to:

- Describe the electrical system and lighting systems in buildings
- Explain water distribution and drainage systems, piped gas supply systems, fire-fighting systems.
- Explain mechanical systems in buildings
- Identify causes for deterioration of structures & evaluate them
- Explain repair materials and techniques
- Describe seismic retrofitting and maintenance of heritage structures

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

4. Only Four question need to be solved

Recommended Books:

- David V. Chadderton, Building Services Engineering 6th 2012 edition, T&F India
- CPWD Handbook on Repair and Rehabilitation of RCC buildings, Govt of India Press, New Delhi
- Raikar, R.N., "Learning from failures - Deficiencies in Design, Construction and Service" R and D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
- Maintenance, Repair & Rehabilitation and Minor Works of Buildings, P.C.Varghese, PHI Publications
- Maintenance & Repairs of Buildings, P.K.Guha, New Central Book Agency
- Heating Ventilating and Air Conditioning Analysis and Design, Faye C. McQuiston and Jerald D. Parker, Wiley
- MEP systems & Repairs of Buildings: A.S. Radke, Published by Synergy Knowledgeware
- Bureau of Indian Standards, "Hand book of functional requirements of buildings, (SP-41 & SP-32)"
- Fire Safety in Building: V. K. Jain, New Age International Publication, Delhi
- Building maintenance guidebook / Buildings Department by HKSAR. Hong Kong: Building Dept.
- Building services: performance, diagnosis, maintenance, repair and the avoidance of defects by H.W. Harrison, P.M. Trotman., London: CRC.
- Guide to Concrete Repair and Protection, HB84-2006, A joint publication of Australia Concrete Repair Association, CSIRO and Standards Australia

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2013	**Program Elective 3: Thrust Areas in Project Management**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Objectives

- Develop a thorough understanding of project pre-planning and importance of defining the scope of the project and setting benchmarks well in advance
- Highlight the advantages of project partnering
- Appraise the importance of SCM & CCM in construction sector
- Perform S.W.O.T analysis of construction entities
- Apply lean construction techniques to construction projects
- Appraise the leadership styles and motivations necessary on construction projects

	Detailed Syllabus	
Module	**Sub modules / contents**	**Hrs**
I	**Project pre-planning** 1.1 Project Influence cost diagram. Definition & selecting of pre-planning team design. 1.2 Defining project scope and setting benchmarks and documenting them well in advance 1.3 Evaluation of alternatives. Decision whether to invest in project or not. Problems on the same 1.4 Concept of PDRI— Project definition rating index. PDRI for residential and industrial buildings. Utility of PDRI with respect to benchmarking 1.5 Any case study on construction Project preplanning.	**06**
II	**Project partnering** 2.1 Definition; partnering as an effective risk sharing mechanism, partnering charter, partnering workshop. 2.2 Advantages of partnering; role in preventing construction disputes 2.3 Critical success factors for implementation	**04**

	2.4 Any case study on project partnering.	
III	**S. W. O. T. analysis** 3.1 Practical Application of S.W.O.T Analysis in the Management of a Construction Project 3.2 S.W.O.T. matrix- utility and advantage on strategic planning and management. 3.3 S.W.O.T Analysis of Indian construction industry and infrastructure projects 3.4 Any Case study on S.W.O.T analysis on construction project	**04**
IV	**Supply Chain Management (SCM) & Critical Chain Management (CCM)** 4.1 Concept of Supplier and customer in context of ISO 4.2 Identifying the chain associated connecting various processes between the supplier and the customer in context of construction projects 4.3 Management strategy for implementing S. S. C. M. in construction organizations and on construction projects 4.4 Benefits of S. C. M 4.5 Case Study on S.C.M in the construction sector 4.6 Concept of critical chain in construction projects based on the theory of constraints. 4.7 Developing critical chain plans for a single project and multiple projects. 4.8 Measuring, monitoring and controlling the critical chain. 4.9 Advantages of CCM.	**06**
V	**Lean construction Techniques** 5.1 Lean Construction – concepts, development, objectives and practical applications 5.2 Definitions - lean, value, waste, pull, flow 5.3 Differences between LC and project management approaches 5.4 Integrated Project Delivery (ILPD) & Integrated Lean Project Delivery (ILPD) 5.5 Last Planner System (LPS) 5.6 Target Value Design (TVD) 5.7 Building Information Modeling (BIM) 5.8 5s, Six sigma and Visual Management 5.9 Just in Time (JIT) 5.10 Standardized work and continuous improvement 5.11 Repetitive, look ahead and pull/push scheduling	**10**

VI	**Leadership styles and motivation** 6.1 Qualities of a leader, difference between leader and manager 6.2 Maslow's Hierarchy of Needs 6.3 Alderfer's ERG Theory 6.4 McClelland's Theory of Needs 6.5 Participatory leadership and factors affecting leadership 6.6 Various Leadership Styles 6.7 Emotional & Spiritual intelligence and their quotients 6.8 Transformational and Transactional leadership 6.9 Seven habits of highly effective people and the 8th habit	**09**

Course Outcomes

On successful completion of the course, the learners will be able to:

- Appreciate the benefits of pre-project planning, scope definition and setting benchmarks, Perform design PDRI for particular projects
- Highlight the advantages of project partnership
- Perform SWOT analysis for a construction firm
- Appraise the role of an efficient Supply Chain Management (SCM) & Critical Chain Management (CCM) for the successful completion of infrastructure and construction projects
- Apply lean construction techniques to construction processes
- Demonstrate leadership styles and motivation techniques on construction projects

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carries equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved

Recommended Books:

- Pre-project planning handbook—published by Construction Industry Institute (CIT) USA. ASCE journal papers on project pre-planning to be used. ASCE journal papers.
- Project Management—Financial evaluation with strategic planning, networking and control—Bhavesh Patel—2nd edition 2010, reprinted in 2011—Vikas publishing House Pvt. Ltd.
- Scheduling Construction Projects—Principles and practices—Sandra Weber—Indian edition published in 2012—Pearson Publication.

- Construction Project management—Planning, Scheduling and controlling—K. K. Chitkara—Eight reprint 2004, Tata McGraw Hill Publishing Company Limited.
- Practical Application of SWOT Analysis in the Management of a Construction Project-IGOR N. MILOSEVIC; Leadership and Management in Engineering {Leadership Manage. Eng., 2010,
- http://www.leanconstruction.org/; Lean Construction Journals
- Lean Construction Management-The Toyota Way; Gao, Shang, Low, Sui Pheng
- Leadership and Motivation — Ralph Nader, Unit 11, ccb_leadershipguide
- Funder, David Charles. The Personality Puzzle. W.W. Norton & Company. New York, 1977.
- Johns, Gary. Concordia University. "Theories of Work Motivation" "Leadership" Organizational Behaviour: Understanding and Managing Life at Work. Harper Collins College Publishers, 1996.
- Maslow, A. H. Motivation and Personality. Harper & Row. New York, 1970. Alderfer, C. P. "Existence, Relatedness and Growth: Human Needs in Organizational Settings".
- McClelland, D. C. Human Motivation. Glenview, IL. Scott, Foresman, 1985. House, R. J. & Mitchell, T. R. "Path-Goal Theory of Leadership". Journal of Contemporary Business. Autumn,
- Vroom, V. H. & Jago, A. G. "The New Leadership: Managing Participation in Organizations". The 7 habits of highly effective people- Stephen R. Covey

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2021	**Program Elective 4: Remote Sensing and Geographical Information System**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**---**	**---**	**---**	**100**

Objectives

- Trigger academic excellence on par with international standards
- Fetch attitudinal changes in students towards work and shape them as task completers for successful employable adults in geospatial technology.
- Mould students as responsible citizens with knowledge, intellect, personal, social and cultural perception in solving geospatial problems.
- Capacity building by training the students with practical knowledge and executable solutions to ever-growing Geo-spatial Problems and
- Motivate the undergraduate students of all science and engineering disciplines to use Geo-information Technology for solving the problems relevant to their own disciplines

Detailed Syllabus		
Module	**Subject Module / Content**	**Hrs**
I	**Remote Sensing**	**07**
	Physics of remote sensing, ideal remote sensing system orbital and sensor characteristics of major earth resource satellites, Electromagnetic spectrum – wavelength regions important to remote sensing, Atmospheric scattering, Atmospheric windows, Spectral signature concepts – typical spectral reflective characteristics of water, vegetation, and soil , Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors, Introduction to spatial resolution, spectral resolution, radiometric resolution, and temporal resolution,, Elements of remote sensing for visual interpretation viz. tone, shape, size, pattern, texture, shadow, and association.	

II	**Digital Image Processing:**	**06**
	Digital / Satellite image, Image histogram, Introduction to image rectification, digital image processing, preprocessing and post-processing, Image registration, image enhancement, image transformations, Digital image classification (supervised & unsupervised). Digital elevation model (DEM) and its derivatives, triangular irregular network model (TIN), and other models & their applications	
II	**Geographical Information System (GIS)**	**07**
	Basic component, Objectives, Advantages, Basic components, and Functions of GIS. Spatial and non-spatial information, GIS data types - Vector and Raster data. Points, lines, and areas features. Manpower for GIS - Roles and responsibilities of Project Manager, Database Manager, digital map maker, system operator, and programmer Parameters for success and failure of GIS, GIS data types and data representation, data acquisition, geo-referencing of data, raster and vector data, attribute data models and its types, Digitizer and scanners. Commercially available GIS hardware and Software (Various open-source and closed-source)	
III	**Global Positioning System (G.P.S) and Global Navigation Satellite System (G.N.S.S.)**	**06**
	G.P.S. Segments: Spaces Segment, Control Segment, User Segment Features of G.P.S. Satellites. Absolute Positioning, Relative Positioning, differential G.P.S., Kinematics of G.P.S. G.P.S. Receivers: Navigational Receivers, Surveying Receivers, Geodetic Receivers. Introduction to GNSS and Types, IRNSS, GPS, GPS components, D Differential GPS, types of GPS tracking, Application of GNSS in surveying, Mapping and navigation	
V	**Remote Sensing and GIS Applications in Civil Infrastructure Management**	**07**
	Remote Sensing Applications in Disaster Management, Flood mapping, Drought assessment, Environmental monitoring, other Civil Engineering applications. GIS Applications in planning and database management in civil infrastructure, in Environmental & Water Resource Management., Underground infrastructure Management., Green infrastructure Management., in Transportation infrastructure management-Intelligent Transport System, Urban Transport Planning, Highway Alignment, Traffic Congestion analysis and Accident Studies, Road Network Planning.	
VI	**Case studies:**	**06**
	Application in land measurement work for land record department, Applications of land use and land cover pattern, Application in urban planning, Application in smart cities planning and development	

Course Outcomes

On successful completion of the course, the learners will be able to:

- Explain remote sensing and spatial data from satellite imagery.
- Gain expertise of various digital image processing.
- Acquire knowledge of GIS and various GIS software packages
- Use GPS and GNSS for gathering geo-spatial data
- Apply Remote Sensing and GIS for solving civil engineering problems

Assessment:

Internal:

Assessment consists of two tests out of which; one should be a compulsory class test and the other is either a class test or assignment on live problems or course projects.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question, the paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus,

I. Question paper will comprise o[total of six-question

2. All questions carry equal marks

3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

4. Only Four questions need to be solved.

Recommended books & Journals:

1. Fundamentals of Remote Sensing, George Joseph and C Jeganathan , University Press.
2. Concepts and Techniques of Geographical Information System, Lo C.P.Yeung A K, Prentice India
3. Introduction to Geographical Information system, Kang-Tsung Chang, Tata McGraw Hill
4. international and National Journals on GIS and GPS
5. GIS A Management, Perspent-t Stan Aronof'f, WDL Publisher.
6. Peter A Burrough Rachael A Mc Donnel, "Principles of GIS" (Oxford), 2000'
7. Christopher Jones, "GIS and Computer cartography" (Longman), 2000
8. Remote sensing and geographic Information System, AM, Chanra & S.K. Ghosh, Narosa Pub.
9. Concepts of Geographic Information System, C.P Yeung & Loe, PHI.
10. Introduction to Remote Sensing, Lillesand & keifer.
11. Global Positioning System, theory & practice, Hofmann and wellenhof, Springer India.

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2022	**Program Elective 4: Advanced Construction Technology**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**---**	**--**	**---**	**100**

Objectives

- To study and understand the latest construction techniques applied to engineering construction for sub structure.
- To summarize the students about various techniques of super structure construction.
- To give an experience in the implementation of new technology concepts which are applied in field of advanced construction in special structures.
- Know the different methods of some advanced construction techniques and ground improvement techniques.
- To present the new technology related to dredging system and its concepts related advanced construction technology.
- To study different methods of Rehabilitation and strengthening in construction to successfully achieve the structural design.

Detailed Syllabus			
Module	**Course Module / Contents**		**Hrs**
I	**Sub Structure Construction**		06
	1.1	Box jacking, Pipe jacking, Underwater drilling, blasting, and concreting. Underwater construction of diaphragm walls and basement	
	1.2	Driving well and caisson, sinking cofferdam, cable anchoring, and grouting. Driving diaphragm walls, sheet piles	
	1.3	Laying operations for built-up offshore system, Shoring for deep cutting, large reservoir construction, and well points. Dewatering for underground open excavation.	
II	**Super Structure Construction for building**		06

	2.1	Vacuum dewatering of concrete flooring, Concrete paving technology	
	2.2	Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections, Erection techniques of tall structures, large span structures, launching techniques for heavy decks, in-situ prestressing in high rise structures, post-tensioning of the slab, aerial transporting, Handling, and erecting lightweight components on tall structures	
III	**Construction of Special Structures**		06
	3.1	Erection of lattice towers - Rigging of transmission line structures, Construction sequence in cooling towers, Silos, chimneys, skyscrapers. Construction sequence and methods in domes, Support structure for heavy equipment and machinery in heavy industries, Erection of articulated structures and space decks.	
	3.2	Roof truss: erection problems Building / Industrial component, Equipment and tackles used for erecting these. Plate girder Launching a portion of bridge girder, large span lattice girder. Erection of chimney**,** Erection of overhead tank.	
IV	**Advancement in Construction techniques**		08
	4.1	Building construction techniques: Zero energy building, green building, pre-engineering building, Solar Paints, Building Integrated Photovoltaic (BIPV), Earthquake Resisting Controls-Isolation and Dissipation.	
	4.2	Coastal construction techniques: Sound Proofing walls, water-resistant roofs, high-performance doors and windows, air and moisture barriers.	
	4.3	Road construction techniques: 3D Printing, Road Printer, smart roads	
	4.4	Ground improvement techniques: Advanced piling techniques - Stone Column, Vibro Floatation, Grouting, Geotextile application, Micro Piles, and Soil Nailing. Vertical drains-Sand Drains, Pre-Fabricated Vertical Drains. Thermal Methods- soil heating and soil freezing.	
V	**Dredging**		06
	5.1	Dredging System, Mechanism, Hydraulic dredger in waves, dredging equipment, Water & Booster System, dredging in the navigation system, Agitation dredging system, silt dredging system, water injection system, Pneumatic dredging system, Amphibious & scrapper dredging system.	
	5.2	Advantages & Disadvantages of Various Dredging Systems, Production Cycle for Dredgers, Application, Capacity of dredgers, & its economical use, dredging economics	
VI	**Rehabilitation and Strengthening Techniques**		07
	6.1	Seismic retrofitting, strengthening of beams, strengthening of columns, strengthening of the slab, strengthening of a masonry wall, Protection methods of structures, Mud jacking and grouting for foundation, Micro	

		piling and underpinning for strengthening floor and shallow profile, Subgrade waterproofing, Soil Stabilization techniques	
	6.2	Repair of steel structures, bridge, building, towers etc., monuments and historical structures. Prevention of water leakage in structures; Underwater repair; Durability of repairing material. Maintenance of underground railways.	

Course Outcomes

On successful completion of the course, the learners will be able to:

- Explain the procedure of construction techniques for sub structure of major civil engineering projects.
- Gain knowledge of various stages of construction of super structure of major civil engineering projects.
- Demonstrate the Implementation of new construction technology on engineering concepts which are applied in field Advanced construction technology in special structures.
- Illustrate the different methods of advancement in construction techniques and ground improvement techniques.
- Describe various dredging systems for major civil engineering projects.
- Apply the theoretical and practical aspects of rehabilitation and strengthening techniques in civil engineering along with the design and management applications

Assessment:

Internal:

Assessment consists of two tests out of which; one should be a compulsory class test and the other is either a class test or assignment on live problems or course projects.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question, the paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus,

I. Question paper will comprise o[total of six-question

2. All questions carry equal marks

3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

4. Only Four questions need to be solved.

Recommended books & Journals:

- Construction Technology by Roy Chudley and Roger Greeno, Prentice Hall, 2005.
- Dr. B.C. Punamia (2008); "Building Construction" Laxmi Publications (P) Ltd.ISBN13: 978-8131804285. 666p.
- S. S. Bhavekatti (2012); "Building Construction" Vikas Publishing House Pvt Ltd. ISBN-13: 978-9325960794. 356p.
- Peter. H. Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt. Ltd., 2001.

- S. P. Arora and S. P. Bindra (2010); “Textbook of Building Construction”, Dhanpat Rai & Sons publication, ISBN-13: 978-8189928803. 688p
- Sushil Kumar (2010); “Building Construction” Standard Publishes-Distributors. ISBN-13: 978-8180141683. 796p.
- S.C. Rangwala, Building Construction, Charotar Publication Pvt Ltd. Anand
- Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.
- Construction Planning, Equipment and methods – Peurifoy-Tata McGraw Hill Publication
- Construction Equipment Planning and Applications – Dr. Mahesh Varma
- R. Chudley (revised by R. Greeno), Building Construction Handbook, Addison
- Wesley, Longman Group, England, 3rd ed.
- S.S. Ataev, Construction Technology, Mir Publishers, Moscow
- Robertwade Brown, "Practical foundation engineering hand book", McGraw Hill Publications

Semester II		
Course Code	**Course Name**	**Credits**
CEMPE2023	**Program Elective 4: Quality and Risk Management**	**03**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
03	**--**	**--**	**03**	**--**	**--**	**03**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
20	**20**	**20**	**80**	**03 Hrs.**	**--**	**--**	**--**	**100**

Objectives
• Study the concepts of Quality, Quality Management and Quality Audit in construction. • Gain knowledge of quality systems & quality planning in construction industry. • Get acquainted with quality control concept for improving the quality of construction. • Understand the various issues associated with risk. • Learn techniques to identify and quantify risks

Detailed Syllabus		
Module	**Subject Module / Content**	**Hrs**
I	**Quality Management**	**08**
	1.1 Introduction to Quality Management 1.2 objectives of Quality Management 1.3 Factor influencing construction quality. 1.4 Quality plan, Quality Management Guidelines & Quality circles 1.5 Concept of Quality Audit 1.6 Importance of Quality Control in Construction 1.7 Measure taken for Improving Quality of Construction 1.8 Challenges faced on Construction project due to Globalization	
II	**Quality Systems**	**06**
	2.1 Introduction to Quality systems	

	2.2 ISO 9000 family of standards & requirements. 2.3 Quality System Documents 2.4 Quality oriented training. 2.5 Bench-marking quality. 2.6 Design of Quality manuals	
III	**Quality Assurance and Control**	**07**
	3.1 Difference between Quality Control and Quality assurance. 3.2 Necessity of QA/QC. 3.3 Techniques and needs of QA/QC 3.4 Different aspects of quality. 3.5 Factors influencing construction quality.	
IV	**Introduction to risk management**	**06**
	4.1 Importance of risk, development of risk management system 4.2 Identifying risk events, cost of risk, types of risk and classification 4.3 Benefits of risk management, responsibilities of agencies involved in risk management 4.4 Risk management standards, decision making strategies effects of tax laws, government rulings, conflict resolution. money, time and technical risks 4.5 Risks in the context of global project teams 4.6 Problems related to natural disasters or unusual events like earthquakes, fires, accidents	
V	**Risk Analysis Techniques**	**07**
	5.1 Sensitivity analysis 5.2 Uncertainty, cost factors and benefit factors 5.3 Scenario analysis, scenario analysis simulation 5.4 Decision tree analysis, risk profile method, certainly equivalent method, risk adjusted discount rate method, certainty index method, 3 point estimated method 5.5 Use of risk prompts, use of risk assessment tables, details of RAMP process, utility of grading of construction entities for reliable risk assessment 5.6 Entrepreneurial risks, pure risks 5.7 Contract review and legal conflicts	
VI	**Risk Mitigation**	**05**
	6.1 Risk Mitigation methods such as by elimination, reducing, transferring, avoiding, absorbing or pooling 6.2 Residual risk, mitigation of unqualified risk	

Course Outcomes
On successful completion of the course, the learners will be able to: • Demonstrate Quality management guidelines • Apply Quality Systems in construction Practices • Describe the concept of Quality Control & Quality Manual

- Classify various types of risk applicable to Construction Projects
- Apply knowledge of Risk analysis techniques in mitigation process
- Implement appropriate method of Risk Mitigation in construction practices

Assessment:

Internal:

Assessment consists of two tests out of which; one should be a compulsory class test and the other is either a class test or assignment on live problems or course projects.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question, the paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus,

I. Question paper will comprise o[total of six-question

2. All questions carry equal marks

3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

4. Only Four questions need to be solved.

Recommended books & Journals:

- James, J.O' Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van No strand, New York, 1989.
- Mantri Handook- A to Z of Construction- Mantri Publication.
- Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.
- Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, Tata McGraw Hill, 1993

5. Hutchins.G, ISO 9000, Viva Books, New Delhi, 2000

- John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989
- Kit Sadgrove, Complete guide to business risk management, Gower Publishing Ltd
- Hans Buhlmann, Mathematical Methods in Risk Theory, Springer Verlang
- Christopher Marrison, Fundamentals of risk measurements, Tata McGraw Hill
- Seetharaman, Construction Engineering and Management, Umesh Publications

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2021	**Institute Level Elective: Project Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques.
- To appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Module	Detailed Contents	Hrs
I	**Project Management Foundation:** Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager. Negotiations and resolving conflicts. Project management in various organization structures. PM knowledge areas as per Project Management Institute (PMI).	**5**
II	**Initiating Projects:** How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.	**6**
III	**Project Planning and Scheduling:** Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart. Introduction to Project Management Information System (PMIS).	**8**
IV	**Planning Projects:** Crashing project time, Resource loading and leveling, Goldratt's critical chain,	**6**

	Project Stakeholders and Communication plan. Risk Management in projects: Risk management planning, Risk identification and risk register. Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks	
V	**5.1 Executing Projects:** Planning monitoring and controlling cycle. Information needs and reporting, engaging with all stakeholders of the projects. Team management, communication and project meetings. **5.2 Monitoring and Controlling Projects:** Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep. Project audit. **5.3 Project Contracting** Project procurement management, contracting and outsourcing,	**8**
VI	**6.1 Project Leadership and Ethics:** Introduction to project leadership, ethics in projects. Multicultural and virtual projects. **6.2 Closing the Project:** Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.	**6**

Outcomes

Students will be able to :

- Apply selection criteria and select an appropriate project from different options.
- Write work break down structure for a project and develop a schedule based on it.
- Identify opportunities and threats to the project and decide an approach to deal with them strategically.
- Use Earned value technique and determine & predict status of the project.
- Capture lessons learned during project phases and document them for future reference

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Jack Meredith & Samuel Mantel, Project Management: A managerial approach, Wiley India, 7thEd.
2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed, Project Management Institute PA, USA
3. Gido Clements, Project Management, Cengage Learning.
4. Gopalan, Project Management, , Wiley India
5. Dennis Lock, Project Management, Gower Publishing England, 9 th Ed.

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2022	**Institute Level Elective: Finance Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			Total Marks
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- Overview of Indian financial system, instruments and market
- Basic concepts of value of money, returns and risks, corporate finance, working capital and its management
- Knowledge about sources of finance, capital structure, dividend policy

Module	Detailed Contents	Hrs
I	**Overview of Indian Financial System:** Characteristics, Components and Functions of Financial System. **Financial Instruments:** Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. **Financial Markets:** Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market **Financial Institutions:** Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges	**06**
II	**Concepts of Returns and Risks:** Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. **Time Value of Money:** Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.	**06**
III	**Overview of Corporate Finance:** Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision. **Financial Ratio Analysis:** Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio	**09**

	Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	
IV	**Capital Budgeting:** Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR) **Working Capital Management:** Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.	**10**
V	**Sources of Finance:** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance. **Capital Structure:** Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure	**05**
VI	**Dividend Policy:** Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches—Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach	03

Outcomes

Students will be able to…

- Understand Indian finance system and corporate finance
- Take investment, finance as well as dividend decisions

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education,New Delhi.

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2023	**Institute level Elective: Entrepreneurship Development and Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To acquaint with entrepreneurship and management of business
- Understand Indian environment for entrepreneurship
- Idea of EDP, MSME

Module	Detailed Contents	Hrs
I	**Overview Of Entrepreneurship:** Definitions, Roles and Functions/Values of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in the National Economy, Functions of an Entrepreneur, Entrepreneurship and Forms of Business Ownership Role of Money and Capital Markets in Entrepreneurial Development: Contribution of Government Agencies in Sourcing information for Entrepreneurship	**04**
II	**Business Plans And Importance Of Capital To Entrepreneurship:** Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur **Entrepreneurship And Business Development:** Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations	**09**
III	Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises	**05**
IV	**Indian Environment for Entrepreneurship:** key regulations and legal aspects , MSMED Act 2006 and its implications, schemes and policies of the Ministry of MSME, role and responsibilities of various government organisations, departments, banks etc., Role of State governments in terms of infrastructure developments and support etc., Public private partnerships, National Skill development Mission, Credit	**08**

	Guarantee Fund, PMEGP, discussions, group exercises etc	
V	**Effective Management of Business:** Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing	**08**
VI	**Achieving Success In The Small Business:** Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business	**05**

Outcomes:

Students will be able to…

- Understand the concept of business plan and ownerships
- Interpret key regulations and legal aspects of entrepreneurship in India
- Understand government policies for entrepreneurs

Assessment

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Poornima Charantimath, Entrepreneurship development- Small Business Enterprise, Pearson
2. Education Robert D Hisrich, Michael P Peters, Dean A Shapherd, Entrepreneurship, latest edition, The McGrawHill Company
3. Dr TN Chhabra, Entrepreneurship Development, Sun India Publications, New Delhi
4. Dr CN Prasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi
5. Vasant Desai, Entrepreneurial development and management, Himalaya Publishing House
6. Maddhurima Lall, Shikah Sahai, Entrepreneurship, Excel Books
7. Rashmi Bansal, STAY hungry STAY foolish, CIIE, IIM Ahmedabad
8. Law and Practice relating to Micro, Small and Medium enterprises, Taxmann Publication Ltd.
9. Kurakto, Entrepreneurship- Principles and Practices, Thomson Publication
10. Laghu Udyog Samachar
11. www.msme.gov.in
12. www.dcmesme.gov.in
13. www.msmetraining.gov.in

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2024	**Institute level Elective: Human Resource Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To introduce the students with basic concepts, techniques and practices of the human resource management.
- To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations.
- To familiarize the students about the latest developments, trends & different aspects of HRM.
- To acquaint the student with the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

Module	Detailed Contents	Hrs
I	**Introduction to HR** Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.	5
II	**Organizational Behavior (OB)** Introduction to OB Origin, Nature and Scope of Organizational Behavior, Relevance to Organizational Effectiveness and Contemporary issues Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness Perception: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behavior. Motivation: Theories of Motivation and their Applications for Behavioral Change (Maslow, Herzberg, McGregor); Group Behavior and Group Dynamics: Work groups formal and informal groups and stages of group development. Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Case study	7
III	**Organizational Structure &Design** Structure, size, technology, Environment of organization; Organizational Roles &	6

	conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.	
IV	**Human resource Planning** Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale. Performance Appraisal Systems: Traditional & modern methods, Performance Counseling, Career Planning. Training & Development: Identification of Training Needs, Training Methods	5
V	**Emerging Trends in HR** Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes & transformation in HR. Organizational Change, Culture, Environment Cross Cultural Leadership and Decision Making**:** Cross Cultural Communication and diversity at work**,** causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation.	6
VI	**HR & MIS** Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries **Strategic HRM** Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals **Labor Laws & Industrial Relations** Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act	10

Contribution to Outcomes:

Students will be able to:

- Understand the concepts, aspects, techniques and practices of the human resource management.
- Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
- Gain knowledge about the latest developments and trends in HRM.
- Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Stephen Robbins, Organizational Behavior, 16th Ed, 2013
2. V S P Rao, Human Resource Management, 3rd Ed, 2010, Excel publishing
3. Aswathapa, Human resource management: Text & cases, 6th edition, 2011
4. C. B. Mamoria and S V Gankar, Dynamics of Industrial Relations in India, 15th Ed, 2015, Himalaya Publishing, 15thedition, 2015
5. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Ed, 2013, Himalaya Publishing
6. Laurie Mullins, Management & Organizational Behavior, Latest Ed, 2016, Pearson Publications

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2025	**Institute level Elective: Professional Ethics and CSR**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test1	Test 2	Avg						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand professional ethics in business
- To recognized corporate social responsibility

Module	Detailed Contents	Hrs
01	**Professional Ethics and Business:** The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business	04
02	**Professional Ethics in the Marketplace:** Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy **Professional Ethics and the Environment:** Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources	08
03	**Professional Ethics of Consumer Protection:** Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy **Professional Ethics of Job Discrimination:** Nature of Job Discrimination; Extent of Discrimination; Reservation of Jobs.	06
04	**Introduction to Corporate Social Responsibility:** Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns—Nature of business; Motives; Misdirection. Trajectory of Corporate Social Responsibility in India	05
05	**Corporate Social Responsibility:** Articulation of Gandhian Trusteeship Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility and Public-Private Partnership (PPP)	08
06	**Corporate Social Responsibility in Globalizing India:** Corporate Social Responsibility Voluntary Guidelines, 2009 issued by the Ministry of Corporate Affairs, Government of India, Legal Aspects of Corporate Social Responsibility—Companies Act, 2013.	08

Contribution to outcomes

Students will be able to…

- Understand rights and duties of business
- Distinguish different aspects of corporate social responsibility
- Demonstrate professional ethics
- Understand legal aspects of corporate social responsibility

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Business Ethics: Texts and Cases from the Indian Perspective (2013) by Ananda Das Gupta; Publisher: Springer.
2. Corporate Social Responsibility: Readings and Cases in a Global Context (2007) by Andrew Crane, Dirk Matten, Laura Spence; Publisher: Routledge.
3. Business Ethics: Concepts and Cases, 7th Edition (2011) by Manuel G. Velasquez; Publisher: Pearson, New Delhi.
4. Corporate Social Responsibility in India (2015) by BidyutChakrabarty, Routledge, New Delhi.

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2026	**Institute level Elective: Research Methodology**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand Research and Research Process
- To acquaint students with identifying problems for research and develop research strategies
- To familiarize students with the techniques of data collection, analysis of data and interpretation

Module	Detailed Contents	Hrs
01	**Introduction and Basic Research Concepts** **1.1** Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Research methods vs Methodology **1.2** Need of Research in Business and Social Sciences **1.3** Objectives of Research **1.4 Issues** and Problems in Research **1.5** Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical	**09**
02	**Types of Research** **2.1.** Basic Research **2.2.** Applied Research **2.3.** Descriptive Research **2.4.** Analytical Research **2.5.** Empirical Research **2.6** Qualitative and Quantitative Approaches	**07**
03	**Research Design and Sample Design** **3.1** Research Design – Meaning, Types and Significance **3.2** Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors	**07**
04	**Research Methodology** **4.1** Meaning of Research Methodology **4.2**. Stages in Scientific Research Process:	**08**

	a. Identification and Selection of Research Problem **b.** Formulation of Research Problem **c.** Review of Literature **d.** Formulation of Hypothesis **e.** Formulation of research Design **f.** Sample Design **g.** Data Collection **h.** Data Analysis **i.** Hypothesis testing and Interpretation of Data **j.** Preparation of Research Report	
05	**Formulating Research Problem** **5.1** Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis	**04**
06	**Outcome of Research** **6.1** Preparation of the report on conclusion reached **6.2** Validity Testing & Ethical Issues **6.3** Suggestions and Recommendation	**04**

Outcomes

Students will be able to:

- Prepare a preliminary research design for projects in their subject matter areas
- Accurately collect, analyze and report data
- Present complex data or situations clearly
- Review and analyze research findings

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2^{nd}ed), Singapore, Pearson Education

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2027	**Institute level Elective: IPR & Patenting**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To understand intellectual property rights protection system
- To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures
- To get acquaintance with Patent search and patent filing procedure and applications

Module	Detailed Contents	Hr
01	**Introduction to Intellectual Property Rights (IPR)**: Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc. **Importance of IPR in Modern Global Economic Environment:** Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development	05
02	**Enforcement of Intellectual Property Rights:** Introduction, Magnitude ofproblem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) activein IPR enforcement **Indian Scenario of IPR:** Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc.	07
03	**Emerging Issues in IPR:** Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc.	05
04	**Basics of Patents:** Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification	07

	Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent	
05	**Patent Rules:** Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.)	08
06	**Procedure for Filing a Patent (National and International):** Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication etc, Time frame and cost, Patent Licensing, Patent Infringement **Patent databases:** Important websites, Searching international databases	07

Outcomes:

Students will be able to…

- understand Intellectual Property assets
- assist individuals and organizations in capacity building
- work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

Reference Books:

1. Rajkumar S. Adukia, 2007, A Handbook on Laws Relating to Intellectual Property Rights in India, The Institute of Chartered Accountants of India
2. Keayla B K, Patent system and related issues at a glance, Published by National Working Group on Patent Laws
3. T Sengupta, 2011, Intellectual Property Law in India, Kluwer Law International
4. Tzen Wong and Graham Dutfield, 2010, Intellectual Property and Human Development: Current Trends and Future Scenario, Cambridge University Press
5. Cornish, William Rodolph & Llewelyn, David. 2010, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Right, 7th Edition, Sweet & Maxwell
6. Lous Harns, 2012, The enforcement of Intellactual Property Rights: A Case Book, 3rd Edition, WIPO
7. Prabhuddha Ganguli, 2012, Intellectual Property Rights, 1st Edition, TMH
8. R Radha Krishnan & S Balasubramanian,2012,Intellectual Property Rights, 1st Edition,Excel Books

9. M Ashok Kumar and mohd Iqbal Ali, 2-11, Intellectual Property Rights, 2nd Edition, Serial Publications
10. Kompal Bansal and Praishit Bansal, 2012, Fundamentals of IPR for Engineers, 1st Edition, BS Publications
11. Entrepreneurship Development and IPR Unit, BITS Pilani, 2007, A Manual on Intellectual Property Rights,
12. Mathew Y Maa, 2009, Fundamentals of Patenting and Licensing for Scientists and Engineers, World Scientific Publishing Company
13. N S Rathore, S M Mathur, Priti Mathur, Anshul Rathi**,** IPR: Drafting,Interpretation of Patent Specifications and Claims**,** New India Publishing Agency
14. Vivien Irish, 2005, Intellectual Property Rights for Engineers,IET
15. Howard B Rockman, 2004, Intellectual Property Law for Engineers and scientists, Wiley-IEEEPress

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
CEMIE 2028	**Institute level Elective: Digital Business Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- To familiarize with digital business concept
- To acquaint with E-commerce
- To give insights into E-business and its strategies

Module	Detailed content	Hrs
1	**Introduction to Digital Business-** Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy, **Drivers of digital business**- Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things (digitally intelligent machines/services) Opportunities and Challenges in Digital Business,	09
2	**Overview of E-Commerce** **E-Commerce-** Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e-commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC	06
3	**Digital Business Support services**: ERP as e –business backbone, knowledge Tope Apps, Information and referral system **Application Development:** Building Digital business Applications and Infrastructure	06
4	**Managing E-Business**-Managing Knowledge, Management skills for e-business, Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital	06

	Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications	
5	**E-Business Strategy**-E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)	04
6	**Materializing e-business: From Idea to Realization**-Business plan preparation **Case Studies and presentations**	08

Outcomes:

Students will be able to:

- Identify drivers of digital business
- Illustrate various approaches and techniques for E-business and management
- Prepare E-business plan

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or at least 6 assignment on complete syllabus or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. A textbook on E-commerce**,** Er Arunrajan Mishra, Dr W K Sarwade,Neha Publishers & Distributors, 2011
2. E-commerce from vision to fulfilment, Elias M. Awad, PHI-Restricted, 2002
3. Digital Business and E-Commerce Management, 6th Ed, Dave Chaffey, Pearson, August 2014
4. Introduction to E-business-Management and Strategy, Colin Combe, ELSVIER, 2006
5. Digital Business Concepts and Strategy, Eloise Coupey, 2nd Edition, Pearson
6. Trend and Challenges in Digital Business Innovation, VinocenzoMorabito, Springer
7. Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan
8. E-Governance-Challenges and Opportunities in : Proceedings in 2nd International Conference theory and practice of Electronic Governance
9. Perspectives the Digital Enterprise –A framework for Transformation, TCS consulting journal Vol.5
10. Measuring Digital Economy-A new perspective -DOI:10.1787/9789264221796-enOECD Publishing

ME CE & M Semester II		
Course Code	**Course Name**	**Credits**
ILOC2029	**Institute level Elective: Environmental Management**	**03**

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
03	--	--	03	--	--	03

Evaluation Scheme

Theory					Term work / Practical / Oral			**Total Marks**
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test 1	Test 2	Average						
20	20	20	80	03 Hrs.	--	--	--	100

Objectives:

- Understand and identify environmental issues relevant to India and global concerns
- Learn concepts of ecology
- Familiarize environment related legislations

Module	Detailed Contents	Hrs
I	Introduction and Definition of Environment: Significance of Environment Management for contemporary managers, Career opportunities. Environmental issues relevant to India, Sustainable Development, The Energy scenario.	10
II	Global Environmental concerns : Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.	06
III	Concepts of Ecology: Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.	05
IV	Scope of Environment Management, Role & functions of Government as a planning and regulating agency. Environment Quality Management and Corporate Environmental Responsibility	10
V	Total Quality Environmental Management, ISO-14000, EMS certification.	05
VI	General overview of major legislations like Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.	03

Contribution to Outcomes

Students will be able to…

- Understand the concept of environmental management
- Understand ecosystem and interdependence, food chain etc.
- Understand and interpret environment related legislations

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either aclass test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper weightage of each module will be proportional tonumber of respective lecture hours as mention in the syllabus.**

1. Question paper will comprise of total six question
2. All question carry equal marks
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four question need to be solved.

References:

1. Environmental Management: Principles and Practice, C J Barrow, Routledge Publishers London,1999
2. A Handbook of Environmental Management Edited by Jon C. Lovett and David G. Ockwell,Edward Elgar Publishing
3. Environmental Management,T V Ramachandra and Vijay Kulkarni, TERI Press
4. Indian Standard Environmental Management Systems — Requirements With Guidance For Use,Bureau Of Indian Standards, February 2005
5. Environmental Management: An Indian Perspective, S N Chary and Vinod Vyasulu, MaclillanIndia, 2000
6. Introduction to Environmental Management, Mary K Theodore and Louise Theodore, CRC Press
7. Environment and Ecology, Majid Hussain, 3rd Ed. Access Publishing.2015

Semester II		
Course Code	**Course Name**	**Credits**
CEML201	**Program Lab-II**	**01**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
--	**2**	**--**	**--**	**1**	**--**	**01**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
--	**--**	**---**	**---**	**---**	**25**	**--**	**25**	**50**

Objectives
• Apply spreadsheet (excel or other) tools to simplify complex civil engineering problems • Prepare site visit reports • Administer incentive schemes and devise training programs for construction managers • Valuate civil engineering structure • Read tender notices/contract documents and extract information from it • Formulate the conditions of contract for a particular project • Write technical papers in reputed journals • Summarizes technical articles

Module	Description	Hrs
I	Minimum two site visits to study the feasibility aspects, tendering procedures, accounting systems, funds raising and other financial management aspects, billing procedures etc. associated with on-going major construction work-visit report to be submitted	**16**
II	Use of spread sheet and data base application software for performing various functions of civil engineers as mentioned below is to be demonstrated • Quantity Estimation • Rate Analysis • Bid preparation • Material and supplier information • Employee / equipment information etc.	**04**
III	Collection and study of tender notices, tender documents of contract document associated with Civil Engineering works. Exercise on contract document associated with Civil Engineering works.	**02**
IV	Exercise on Valuation: Valuation of land and building using various methods report to be submitted on prescribed format	**02**
V	Preparation of training program for site engineers based on competency mapping and training needs assessment	**02**
VI	Summarizing two articles related to construction engineering and management from reputed technical journals	**02**
VII	One Assignment related to each subject	**-**

Contribution to Outcomes

Students will be able to:

- Write effective project reports highlighting the pros & cons of the technologies envisaged for the project
- Apply spreadsheet (excel or other) tools to simplify complex civil engineering problems
- Administer incentive schemes based on the contribution of employee to previous projects and bridging gaps by devising training programs for construction managers by identifying their competency gaps
- Perform Valuation using various methods and arrive at actual present value of a civil engineering structure
- Read tender notices/contract documents and extract information from it and formulate the conditions of contract for a particular project
- Summarize technical articles and write technical papers in reputed journals

Semester II		
Course Code	**Course Name**	**Credits**
CEMSBL201	**Skill Based Lab-II**	**02**

Teaching Scheme						
Contact Hours			**Credits Assigned**			
Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
--	**4**	**--**	**--**	**2**	**--**	**02**

Evaluation Scheme								
Theory					**Term Work/ Practical/Oral**			**Total**
Internal Assessment			**End Sem Exam**	**Duration of End Sem Exam**	**TW**	**PR**	**OR**	
Test 1	**Test 2**	**Average**						
--	**--**	**--**	**--**	**--**	**50**	**--**	**50**	**100**

Students will be able to:

- Understand the Concept Computerized Project management
- Study the Various Project management Software used in Construction Project
- Study Planning and managing database of Construction Project using Software

Module	Description	Hrs
I	**Computerized Project Management:** Introduction to Concepts of Advanced Construction Management using Softwares. Application and Case studies.	**03**
II	**Project management using MS-Project Software: Real Estate Project** Residential or Commercial building Project etc.	**06**
III	**Advanced Project Management using Primavera Software:** Infrastructure Projects (Hi-Rise Structure/Transportation Infrastructure/ Hydropower Project etc.)	**10**
IV	**GIS Software for Project Management (Gram++, Arc GIS, Q-GIS etc.):** Applications of GIS software in Construction Database Management & Mapping.	**10**
V	**Building Information Modeling (BIM-Software) REVIT, TEKLA etc.**: Building information Modeling (BIM) & Revit Software in Construction Project.	**10**
Term Work: At least one Project Assignment must be prepared with the help of mentioned softwares to Submit for Term work		

Contribution to Outcomes

On successful completion of the course, the learners will be able to:

- Explain Concept of Computerized Project management.

- Apply Project management Software (MS-Project) for Planning of Building Projects.
- Apply Advanced Project management Software (Primavera) for Planning of Infrastructure Projects.
- Execute the Planning and managing database of Construction Project using GIS Software.
- Illustrate the Principles of Building information Modeling (BIM) Software in Construction Project.

Recommended Books & Journal

1) Computerized Project Management Manual
2) MS-Project Software & Manual
3) Primavera Software & Manual
4) BIM & REVIT Software & manual
5) Arc GIS, Q-GIS, Gramm++ Software & Manual
6) Open Source Project Management Software