

UNIVERSITY OF MUMBAI



Revised Syllabus

Program: M.E. Civil Engineering

Course: Construction Engineering & Management (CEM)

(As per Choice Based Credit & Grading System (CBCGS))

With effect from the Academic Year 2016-2017)

From Co-ordinator's Desk:-

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) give freedom to affiliated Institutes to add few (PEO's) course objectives course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, developed curriculum accordingly. In addition to outcome based education, **Choice Based Credit and Grading System** is also introduced to ensure quality of engineering education.

Choice Based Credit and Grading System enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes. Faculty of Technology has devised a transparent credit assignment policy adopted ten points scale to grade learner's performance. Credit grading based system was implemented for Master of Engineering from the academic year 2016-2017.

Dr. S. K. Ukarande
Co-ordinator,
Faculty of Technology,
Member - Academic Council
University of Mumbai, Mumbai

Preamble

The engineering education in India in general is expanding in manifolds. Now, the challenge is to ensure its quality to the stakeholders along with the expansion. To meet this challenge, the issue of quality needs to be addressed, debated taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education reflects the fact that in achieving recognition, the institution or program of study is committed open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills knowledge that a students will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

I am happy to state here that, Program Educational Objectives were finalized in a meeting where syllabus committee members were also present.

The Program Educational Objectives finalized for undergraduate program in civil Engineering are as follows:

1. To prepare Learner's with a sound foundation in the mathematical, scientific engineering fundamentals
2. To prepare Learner's to use effectively modern tools to solve real life problems
3. To prepare Learner's for successful career in Indian Multinational Organisations to excel in Postgraduate studies
4. To encourage motivate Learner's for self-learning
5. To inculcate professional ethical attitude, good leadership qualities commitment to social responsibilities in the Learner's

In addition to above each institute is free to add few (2 to 3) more Program Educational Objectives of their own. In addition to Program Educational Objectives, course objectives expected course outcomes from learner's point of view are also included in the curriculum for each course of undergraduate program to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

Dr. S. K. Ukarande

Chairman, Board of studies in Civil Engineering

University of Mumbai, Mumbai.

University of Mumbai
M.E. Construction Engineering & Management (Rev.2016)

List of Abbreviations

- CEMC- Core Course
- ILOC- Institute level Optional Course
- DLOC- Department Level Optional Course
- CEML- Lab Course
- CEMS - Special Topic Seminar
- CEMD – Dissertation

Semester-I

Course Code	Course Name	Teaching Scheme (Contact Hrs)		Credits Assigned		
		Theory	Practical	Theory	TW/Pr.	Total
CEMC101	Probability & Statistics	4	-	4	--	4
CEMC102	Management & Project Planning in Construction	4	-	4	--	4
CEMC103	Construction Contracts, Administration & Management	4	-	4	--	4
DLOC10X	Department Level Optional Course-I	3	-	3	-	3
ILOC101X	Institute Level Optional Course-I	4	--	4	--	4
CEML101	Laboratory-I	--	2	-	1	1
CEML102	Laboratory-II	-	2	-	1	1
	Total	19	04	19	02	21

Semester-II

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Practical	Theory	TW/Pr.	Total
CEMC201	Advanced Construction Technology	4	-	4	--	4
CEMC202	Infrastructure Development	4	-	4	--	4
CEMC203	Project Economics & Financial Management	4	-	4	--	4
DLOC20X	Department Level Optional Course-II	4	-	4	-	4
ILOC201X	Institute Level Optional Course-II	3	--	3	--	3
CEML201	Laboratory-III	--	2	-	1	1
CEML202	Laboratory-IV	-	2	-	1	1
	Total	19	04	19	02	21

Semester-III

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
CEMS301	Special topic seminar	--	06	--	3	3
CEMD302	Dissertation -I	--	24	--	12	12
	Total	--	30	--	15	15

Semester-IV

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Practical	Theory	Practical.	Total
CEMD401	Dissertation -II	--	30	--	15	15
	Total	--	30	--	15	15

Semester - I	Semester – II
Department Level Optional Courses (DLO)	
DLOC101 Advanced Construction Materials	DLOC201 Remote Sensing & GIS in Construction.
DLOC102 Repairs, Rehabilitation &Retrofitting of Structures.	DLOC202 Risk Management in Construction
DLOC103 Resource Management	DLOC203 Thrust Areas in Construction
DLOC104 Quality control & safety in Construction	DLOC204 Energy Conservation Techniques in Building Construction
DLOC105 Value Engineering	DLOC205 Principles of Architecture & Planning
Institute Level Optional Courses (ILOC)	
ILOC1011 Product Lifecycle Management	ILOC2021 Project Management
ILOC1012 Reliability Engineering	ILOC2022 Finance Management
ILOC1013 Management Information System	ILOC2023 Entrepreneurship Development and Management
ILOC1014 Design of Experiments	ILOC2024 Human Resource Management
ILOC1015 Operation Research	ILOC2025 Professional Ethics and CSR
ILOC 1016 Cyber Security and Laws	ILOC 2026 Research Methodology
ILOC1017 Disaster Management and Mitigation Measures	ILOC 2027 IPR and Patenting
ILOC1018 Energy Audit and Management	ILOC 2028 Digital Business Management
	ILOC 2029 Environmental Management

ME CE & M Semester I		
Course Code	Course Name	Credits
CEMC101	Probability and Statistics	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

- Develop a basic understanding on 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 their applications in civil engineering
- Determination of distributions and parameters from observation data.
- Co-relate the data set and hence establish inter-relationships between parameters
- Develop multi-linear regression equations
- Simulate the existing data to predict future performance using random numbers (manually as well as through simulation softwares)
- Apply Griffi's waiting line models to decide optimum sizing matching of construction equipments on site
- Perform EOQ, ABC & Sensitivity analysis for deciding the requirement of construction materials and products on site

Module	Sub Modules/Contents	Hrs
I	Probability 1.1 Probability theory and its importance in construction projects 1.2 Definition of probability, Rules of Probability, Causalty v/s Randonmess, Conditional probability, Total Probability, Baye's theorem, Combined experiments, Independence, Problems on the above. 1.3 Random variable concept and its application in construction	06

II	Distributions 2.1 Concept of Theoretical probability Distributions 2.2 Application of Binomial Distribution to project management 2.3 Application of Poisson's Distribution to project management 2.4 Application of Normal Distribution to project management 2.5 Application of Exponential Distribution to project management, 2.6 Beta & Gamma distribution	08
III	Sampling 3.1 Probability and Non-probability samples, Random sampling, Other sampling schemes and their applications to construction industry 3.2 Use of concepts 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.	06
IV	Correlation Analysis: 4.1 Correlation types, coefficients, Scatter Diagram 4.2 Application of Pearson's correlation analysis to establish interrelationship between various concrete parameters and similar civil engineering activities 4.3 Application of Spearman's Rank Co-relation analysis in project management and performance appraisal of human resource	06
V	Regression Analysis 5.1 Regression and Multivariate Analysis, 5.2 Multiple Regression Analysis 5.3 Non-linear Regression. 5.4 Use of regression analysis in resources management and prediction of concrete parameters.	04
VI	Simulation 6.1 Simulation – Types, applications 6.2 Case studies in construction using simulation techniques 6.3 Simulation in risk identification, analysis and mitigation of project risks 6.4 XLSTAT, SPSS Softwares used for simulation	06
VII	Modeling 7.1 Use of mathematical models based on probabilistic and statistical methods 7.2. EOQ in civil engineering, problem on frequency of ordering cement bags for infrastructure projects 7.3 Griffi's waiting line model for sizing-matching of construction equipments 7.4 Vendor Rating Indexes based on past performance of suppliers 7.5 Use of excel to perform statistical analysis in construction project management	12

Contribution to Outcomes

Students will be able to

- Critically review the quantitative data and draw results from it using probability and statistics
- Model a construction system, so the maximum output from a particular input may be obtained
- Correlate and hence develop linear regression equation between various civil engineering parameters
- Apply Griffi's waiting line models and other such models to decide the optimum number of servicing

units required for a prime mover (sizing-matching operation)

- Predict the performance of a particular system, based on past performance using simulation and other tool
- Decide the optimum ordering quantity and ordering period of construction materials/ equipments using mathematical 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. 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.

ME CE & M Semester I		
Subject Code	Subject Name	Credits
CEMC102	Management and Project Planning in Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

- Classify various forms of organizations
- Understand the concept Project management planning and apply it on construction projects
- Focus on Cost management of a construction project
- Demonstrate Time management of a construction project by proper scheduling using PERT, CPM, Resource allocation, Updating, etc.
- Summarize Quality management systems required for construction projects
- Formulate required procedures for Contract administration
- Narrate Safety management principles on construction sites
- Manage the project team, defining roles and responsibilities and fixing scope of the project
- Perform Time-motion studies on construction activities and interpret the results
- Devise training program for construction managers
- Administer incentive schemes for construction human resource
- Assess the safety conditions of a construction site
- Apply excel, MSP, PRIMAVERA, Construction manager and other softwares to solve construction problems

Detail Syllabus

Module	Sub Modules/Contents	Hrs
I	Basics of Management 1.1 Modern scientific management, Management Functions, Management Styles with special focus on the contributions of Henry Fayol, Frederick Taylor, Abraham Maslow, Elton Mayo and Douglas McGregor	04

<p style="text-align: center;">II</p>	<p>Project Management</p> <p>2.1 Basic forms of organization with emphasis on Project and matrix structures</p> <p>2.2 Project Life Cycle, concept of s-curve between time and cost of project</p> <p>2.3 Planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic-environmental impact analysis</p> <p>2.4 Project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, etc.</p> <p>2.5 Qualities, role and responsibilities of project Manager</p> <p>2.6 Role of Project Management Consultants</p> <p>2.7 Web based project management.</p> <p>(Site visit to study documentation procedures available on major sites will be highly useful).</p>	<p style="text-align: center;">10</p>
<p style="text-align: center;">III</p>	<p>Project Scheduling</p> <p>3.1 Construction Scheduling. LOB technique, Mass haul diagrams. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).</p> <p>3.2 Work break down structure</p> <p>3.3 Activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modeling) techniques</p> <p>3.4 Mass haul diagrams.</p> <p>3.5 Precedence Network Analysis,</p> <p>3.6 Softwares used in Construction project scheduling (MSP, Primavera, etc.)</p>	<p style="text-align: center;">08</p>
<p style="text-align: center;">IV</p>	<p>Project Controlling</p> <p>4.1 Monitoring and Control of construction project</p> <p>4.2 Network Crashing</p> <p>4.3 Resource Leveling and Smoothing</p> <p>4.4 Project Updating.</p>	<p style="text-align: center;">08</p>
<p style="text-align: center;">V</p>	<p>Construction Management</p> <p>5.1 Site mobilization – demobilization aspects</p> <p>5.2 Various Resources management techniques based on availability of funds.</p> <p>5.3 Co-ordinating, communicating & reporting techniques.</p> <p>5.4 Application of MIS to construction.</p> <p>5.5 Training of Construction Managers.</p>	<p style="text-align: center;">04</p>
<p style="text-align: center;">VI</p>	<p>Work Study</p> <p>6.1 Definition, Objectives, basic procedure of work study</p> <p>6.2 work study applications in Civil Engineering.</p> <p>6.3 Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.</p> <p>6.4 Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse photography technique, Analytical production studies</p>	<p style="text-align: center;">04</p>

VII	Safety Engineering 7.1 Causes of Accidents on various construction sites, 7.2 Safety measures and safety policies to be adopted. 7.3 Determination of safety parameters, personal protective equipments.	04
VIII	Administration of Incentive Schemes 8.1 Necessity of Incentive Schemes 8.2 Merit rating, job evaluation, installation, modification and maintaining of Incentive schemes based on implementation experience.	04
IX	Case Studies 9.1 Study of Planning, managing, execution process, commissioning, handing over, operation and maintenance of major projects in and around Mumbai	

Contribution to Outcomes

Students will be able

- Highlight the contributions of Henry Fayol, Fredrick Taylor, Abraham Maslow, Elton Mayo and Douglas McGregor
- Classify organizations into various forms, explain the concept of project Life cycle, jolt down the responsibilities of project managers & PMCs, define the scope of the Project and various documentations required on major projects
- Optimize a network manually as well as with using soft wares.
- Highlight the various domains of construction management as regards to mobilization, demobilization, co-coordinating, communicating, reporting and training aspects
- Study the methods of a construction system and hence measure works.
- Identify the causes of accidents on construction site, suggest Preventive measures and discuss various acts for safety.
- Devise incentive scheme for construction employees.

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. Construction Planning & management By P S Gahlot & B M Dhir, New Age International Limited Publishers
2. Construction Project planning & Scheduling By Charles Patrick, Pearson
3. Construction Project Management Theory & practice --- Kumar Neeraj Jha, Pearson
4. Construction management Fundamentals by Knutson, Schexnayder, Fiori, Mayo, Tata McGraw Hill, 2nd Edition
5. Modern construction management--.Harris, Wiley India.
6. Construction Management and Planning by Sengupta and Guha-Tata McGraw Hill publication.
7. Project Management – K Nagrajan – New age International Ltd.
8. Work study – Currie.
9. Professional Construction Management Barrie-Paulson-McGraw Hill Institute Edition.
10. Project Management – Ahuja H.N. – John Wiley, New York.
11. Construction Project Management Planning, Scheduling and Controlling-Chitakara- Tata McGraw Hill, New Delhi
12. Construction Management – Roy, Pilcher
13. Construction Management – O'Brien.
14. Project Management-Planning and Control---Rory Burkey 4th ed.—Wiley, Ind

ME CE & M Semester I		
Course Code	Course Name	Credits
CEMC103	Construction Contract Administration and Management	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to:

- 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. 2.1 Tender documents, Prequalification of bidders. Class & grade of contractors etc. 2.2 Global Tenders. 2.3 Bidding models & bidding strategies.	08
II	Contract Administration 2.1 Basic forms of contract 2.2 General & Special types of contract. 2.3 Rights of contracting Parties 2.4 Clauses & conditions of contract as per Ministry of statistics & program Implementation 2.5 Contract documents 2.6 EPC Contracts 2.7 FIDIC Contracts	10

III	Contract Management 3.1 Role of specifications in contracting process 3.2 Termination of Contract, Breach of Contract 3.2 Indian Contract Act- 1872 with latest amendments. 3.3 Sale of goods Act-1930 with new amendments. 3.3 Professional ethics to be followed by Contracting Parties.	07
IV	Dispute Resolution 4.1 Claims & disputes 4.2 Standard methods of resolving disputes. 4.2 Dispute Resolution Board (DRB) – Necessity, formation, Functioning, Advantages etc. 4.3 Arbitration & conciliation Act -1996 – Arbitration agreement, Arbitration process, duties & powers of an arbitrator, rules of preparing evidences, Publication of an award.	06
V	Industrial Acts & Labour laws with latest amendments 5.1 Indian Trade Union Act- 1926 5.2 Workmen’s Compensation Act- 1923 5.3 Payment of Wages Act-1936 5.4 Minimum Wages Act- 1948 5.5 Industrial Dispute Act - 1947	05
VI	Bailment 6.1 Definition & basic terminology. 6.2 Roles of bailor & bailee 6.3 Pledges	04
VII	Injunctions 7.1 Definition & basic terminology. 7.2 Types of injunctions.	02
VIII	Indemnity & guarantee 8.1 Definition & basic terminology 8.2 Difference between Indemnity & guarantee 8.3 Consideration of guarantee & surety etc.	04

Contribution to Outcomes

Students will be able to:

- Understand the basic procedure of bidding for construction projects.
- Demonstrate the all the types of contract along with their suitability in construction practices.
- Know various industrial acts & their relevance to construction Industry.
- Understand different methods for resolving the disputes arisen.
- Demonstrate the important terms associated with Indian Contract Act.

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.

Reference 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 (Nicmar Mumbai.)

ME CE & M Semester I		
Course Code	Course Name	Credits
DLOC101	Elective: Advanced Construction Materials	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Course Objectives

- To understand the properties of different construction materials this helps in their wise selection.
- To get acquainted with materials with low GHG emissions, which is the need of the hour.
- To promote reuse and recycling of construction wastes.
- To gain the knowledge of modern concretes and mortars available.
- To know about the different newer varieties of ceramic materials available.
- To understand the process of polymerization and know the different applications of polymers to construction field.
- To understand the installation process of moisture barriers, sound barriers and glass facades.
- To know the use of smart and intelligent materials as well as the applications of nano technology to civil engineering.

Detail Syllabus

Module	Sub Modules/Contents	Hrs
I	Introduction: Consideration of physical, Mechanical, thermo physical Properties, characteristics behavior under stress, selection criteria for construction materials, Materials with lower greenhouse gas (GHG) emissions, industrial waste products, reuse and recycling. Lightweight materials. Application of nanotechnology to civil engineering, Materials for construction of emergency as well as cost effective structures.	10
II	Mortar and concrete: Characteristics, properties and uses of basic ingredients of concrete. Photo catalytic cement, Reactive powder concrete, decorative concrete, lime concrete, use of Pozzolanic materials in concrete, Translucent concrete, Bacterial concrete, bioconcrete, syndecrete. Condensed silica fume, ternary blends of mineral admixtures. Hydrophobic concrete waterproofing system, New systems and chemicals available for waterproofing, Bendable concrete, Concrete canvas. Study of air void systems of different concretes.	10

	Dust free concrete batching system, Insulated concrete forms, Exterior self leveling concrete topping, Use of CO ₂ for curing precast units. Types of mortars, special mortars, admixtures added properties and applications.	
III	Ceramic Materials: Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistant materials, Uses and application New types of floor finishes and tiling, liquid granite, lotuslan (used in paints).	06
IV	Polymeric Materials: Polymerization mechanism and Depolymerisation, Rubber and plastics, properties, effect of temperature on mechanical properties, Uses and application. Polymer foams and polymers in Building Physics. Polymer concrete composites, Different kinds of polymers used in concrete, Fibre reinforced polymer (FRP) in sandwich panels, Geofom, Aerogel.	06
V	Metals & Alloy : Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel, Corrosion of concrete in various environments. Corrosion of reinforcing steel, methods/treatments to overcome the corrosion, Electro-chemical process. Ferro-cement, material and properties. fibers and composites, Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Glass facade, materials and techniques. Use of titanium dioxide, Transparent Aluminum.	08
VI	Non Structural Materials: Thermal insulation and acoustic absorption materials, Sound barriers used on motorway railways. Materials for intelligent buildings- Sensi tile, aluminums radiant barriers, solar panel roof tiles, use of old jeans for roofing, flexi comb-electrical installation, kinetic glass, unfired clay bricks, richlite (recycled paper), carbon fibers.	04
Approximate rates/cost of different construction materials should be told to the students or the students should find it from industry, market and internet.		

Contribution to outcomes

- Students will understand the mechanism behind the behavior/performance of a particular material individually as well as in combination. This will help them to make the apt choice of materials.
- Knowledge of the recent advances in materials used for structural and non-structural elements of a building will help students to keep pace with the industry and make them more industry-ready product.

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 Books & Journals:

1. Engineering Materials, Rangawala S.C., Charotar Publications
2. Building Materials, S.K. Duggal, New Age International Publications
3. Building Materials Technology Structural Performance & Environmental Impact, Bruntley L.R, McGraw Hill Inc Construction Technology, Vol I - IV, R Chudley, Longman Group Construction Ltd
4. Building Material by Verghese PHI EEE New Delhi -2012
5. Engineering Materials: An introduction to Properties, applications and designs by Ashby, M.F. and Jones. D.R., H.H. Elsevier Publications, 2005.
6. Materials for Civil and Construction Engineers by Mamlouk, M.S. and Zaniewski, J.P., Prentice Hall.

ME CE & M Semester I		
Course Code	Course Name	Credits
DLOC102	Departmental Elective: Repairs, Rehabilitation & Retrofitting of Structures	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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 functional performance objectives of various Civil Engineering Structures.
- To understand durability aspects of construction materials and causes of distress.
- To get acquainted with assessment of distress in structures.
- To understand structural health monitoring procedures.

Detailed Syllabus

Module	Description	Hrs
I	Introduction 1.1 Need for strengthening due to various reasons, 1.2 An overview of present repair practices, repair of RCC, masonry, steel wooden structures. 1.3 Causes of distress in concrete structures - holistic models for deterioration of concrete.	4
II	Distress identification and testing methods 2.1 Condition Survey for identification and estimation of damage, Objectives, different stages-Preliminary inspection, planning stage, visual inspection, and field laboratory testing stage. 2.2 Types of cracks. 2.3 Non Destructive and Destructive Testing Methods: - Concrete strength assessment - Rebound hammer test - Ultrasonic pulse velocity tests, penetration resistance, pull out tests, core sampling and testing, Chemical tests - Carbonation tests and chloride content, Corrosion potential assessment - cover meter survey, half-cell potentiometer test, resistivity measurement, 2.4 Fire damage assessment.	12

	2.5 Structural integrity and soundness assessment, interpretation and evaluation of results, Evaluation of reserve strength of existing structures, analysis necessary to identify critical sections.	
III	Repair Materials 3.1 Selection of repair materials, essential parameters for repair materials. 3.2 Materials for repair-Premixed cement concrete and mortars, polymer modified mortars, epoxy mortars and concrete, polyester resins, coating. 3.3 Discussion of case studies-RCC buildings, water tanks, and industrial structures- Identifying a suitable repair option for certain damage in a structure.	8
IV	Repair/ Rehabilitation Techniques 4.1 Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems. 4.2 Important factors to be considered for selection of repair methods. 4.3 Repair stages, Guniting, Shotcreting, polymer concrete system, reinforcement replacement, surface impregnation, polymer and epoxy overlays, Resin/polymer modified slurry injection, plate bonding technique, ferrocement jacketing, steel jacketing, RCC jacketing, FRP wrapping technique, chemical and electrochemical repair using re-alkalization and chloride extraction techniques, Stress reduction techniques, modeling of repaired composite structures.	10
V	Guidelines for Repair and Rehabilitation Work 5.1 Post repair inspection and maintainance, 5.2 Guidelines for framing terms and conditions for repair and rehabilitation works contracts- engagement of consultants, contractors, execution of work.	4
VI	Seismic retrofitting and Maintenance of Heritage Structures 6.1 Earthquake damages of buildings, their retrofitting and restoration. 6.2 Effects of earthquakes. 6.3 Response of buildings to earthquake motion, factors related to building damages due to earthquake, 6.4 Methods of seismic retrofitting, restoration of buildings Special care in repair and rehabilitation of heritage structures.	6
VII	Case Studies 7.1 Discussion of case studies of RCC buildings subjected to distress. 7.2 Foundation rehabilitation, base isolation method. 7.3 Repair of water retaining structures, hydraulic structures, Pavements and Runways, bridges, sewage treatment plants Tunnels, industrial structures- Specialized repairs for chemical disruption, fire, marine exposure etc.	4

Contribution to Outcomes

Students will be able to :

- Understand need of repairs and rehabilitation of structures.
- Asses, evaluate causes of distress in various structures.
- Propose guidelines and prepare contract documents for repair and rehabilitation of structures.
- Understand advance methods to rehabilitate various Civil Engineering structures, including 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 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)

Only Four question need to be solved.

Reference books:

1. Raikar, R.N., "Learning from failures - Deficiencies in Design, Construction and Service" R and D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
2. Maintenance, Repair & Rehabilitation and Minor Works of Buildings P.C.Varghese, PHI Publications
3. Santhakumar A.R., "Concrete Technology" Oxford University Press, 2007, New Delhi
4. CPWD Handbook on Repair and Rehabilitation of RCC buildings, Govt of India Press, New Delhi
5. Maintenance & Repairs of Buildings, P.K.Guha
6. Concrete structures Concrete Structures Protection Repair and Rehabilitation, R.Dodge woodson Elsevier.

ME CE & M Semester I		
Course Code	Course Name	Credits
DLOC103	Departmental Elective: Resource Management	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to:

- To know the different resources required for different kinds of construction projects.
- To understand the importance of material management and learn related techniques & practices.
- To measure the performance of different construction equipments and balance them for optimum utilization.
- To get acquainted with the importance of human power – as a construction resource.
- To gain knowledge of time-cost optimization & effective utilization of different resources on construction project sites.
- To know the process of harmonizing the use of different resources on a construction site.
- To learn different resource planning and scheduling techniques by use of conventional methods as well as softwares.

DETAIL SYLLABUS

Module	Sub Modules/Contents	Hrs
I	<p>Introduction</p> <p>1.1 Definition of Resource, List of different resources used in a construction project, categorization of these resources, Study of different types of construction projects, variations in the scope/nature of these projects and their specific resource requirements.</p> <p>1.2 Resources required for construction of multistoried building, tunnel, bridge, dam, treatment plants, roads, airports, utility lines, harbors, railway lines and stations, stadiums, etc.</p> <p>1.3 Study of at least one project from each category mentioned above.</p> <p>1.4 Use of PowerPoint presentation and arranging site visits will make learning process easier.</p>	06

<p>II</p>	<p>Material Management</p> <p>2.1 Definition, Need and scope of material management with the changing nature and size of construction projects.</p> <p>2.2 Hierarchy of stores department on a construction site, Roles/responsibilities of a material manager.</p> <p>2.3 Classification and codification of materials. Different techniques used for the same – Always better control (ABC), Scarce Difficult and easily available (SDE), fast moving slow moving nonmoving (FSN), Highest medium low (HML), Vital Essential Desirable (VED) etc. and their respective procedures.</p> <p>2.4 Methods of procuring materials, identification of sources of procurement, vendor analysis, purchase procedure and related legal aspects, Quotation, typical purchase order.</p> <p>2.5 Concept of material requirement planning (MRP) & allied terms/procedures.</p> <p>2.6 Definition of Inventory, Techniques of inventory control, different ways of ordering, Bulk purchasing, Economic order quantity (EOQ) - its advantages and limitations, periodic ordering, order point control. Concept of safety stock, stockout, just in time (JIT). Indices used for assessing the effectiveness of Inventory management.</p> <p>2.7 Receipt, inspection and storage of materials on construction site, Ways to minimise wastage and loss on storage. Importance of effective site layout and resource scheduling in this regard.</p> <p>2.8 Definitions of Quality control (QC) and Quality assurance (QA). Methods of quality control of construction materials. Importance and Share of QC in overall cost of project.</p> <p>2.9 Use of material management systems (MMS) & softwares available for material planning, procurement, inventory & cost control.</p> <p>2.10 Site or local terminologies used with regards to material management. Numericals related to different techniques of classification and codification of materials. (Site visit to study documents related to material management will be highly useful).</p>	<p>18</p>
<p>III</p>	<p>Equipment Management</p> <p>3.1 Different categories of equipments. Use, application, working principle, productivity, output, approximate cost of each equipment. Criteria for selection of the right kind of equipment.</p> <p>3.2 Balancing of equipments, cycle time, Working out the number of equipments required for a project based on :</p> <p>a) cycle time b) available time and c) quantum of work.</p> <p>Working out the hourly cost of operation and cost per unit of item for different types of equipments.</p> <p>3.3 Equipment log book (History sheet), Equipment maintenance and repairs, replacement decision, procedure for condemnation.</p>	<p>14</p>

IV	<p>Human Resource Management (HRM)</p> <p>4.1 Definition of HRM. Scope, objectives and functions of HRM.</p> <p>4.2 Human resource planning (HRP) – objectives, need, process, prerequisites for successful HRP, Barriers in the way. Job analysis and job design.</p> <p>4.3 Recruitment – policy, process, sources, methods. Selection procedure</p> <p>4.4 Need types, objectives and importance of employee training.</p> <p>4.5 Need objectives, methods and benefits of performance appraisal.</p> <p>4.6 Wage determination, compensation, incentives, and fringe benefits.</p> <p>4.7 Concept of Industrial relations Forms of industrial disputes, ways to prevent and settle them. Trade unions- roles and responsibilities. Concept of collective bargaining. Importance of Discipline in construction industry.</p> <p>4.8 Concept of Human resource accounting, HR valuation models.</p> <p>4.9 Managing ethical issues in HRM.</p> <p>4.10 Recent trends in HRM, E-HRM, Challenges before HRM in global as well as Indian context.</p>	10
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Contribution to Outcomes

Students will be able to

- Understand the resource requirements of different kinds of civil engineering projects.
- Know different techniques of classification and codification of materials. They will be able to understand the purchase and procurement procedures and get acquainted with the concept of MRP, EOQ, JIT, MMS, QC, etc.
- Understand the different kinds of equipments and knowledge gained will help them to make optimum utilization of equipments on construction site.
- Realize the importance of recruiting and retaining the relevant, enthusiastic and hardworking staff for the betterment of the organization.

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:

Books are listed in the order of the modules stated above:

Module No	Sr No	Title of the book	Author	Publications
I	a	Resource management in construction projects	Loosemore,Dainty, Lingard	Spon Press(Taylor & Francis group)
	b	Resource management for construction	M.R.Canter	Macmillan
II	a	Purchasing & Inventory Control	K.S.Menon	Wheeler
	b	Materials Management	A.K.Datta	Prentice Hall, India
	c	Construction Materials Management	George Stukhart	Taylor & Francis group
	d	Materials management – an integrated approach	Gopalakrishnan,Sundaresan	PHI learning, New Delhi
III	a	Construction Equipment Management for Engineers, Estimators,& Owners	Gransberg,Popescu, Ryan	CRC Taylor & Francis group
	b	Construction Equipment Management	John Schaufelberger	Prentice Hall
	c	Construction Planning, equipments and methods	Peurifoy,Schexnayder, Ledbetter	McGraw Hill
IV	a	Human Resource Management	Biswajit.Patnaik	Prentice Hall, India
	b	Human Resource Management	Dessler Garry	Prentice Hall, New Jersey
	c	A Textbook of Human Resource Management	Mamoria,Gankar	Himalaya, New Delhi
	d	Human Resource & Personnel Management- Text & Cases	Aswathappa K.	Tata McGraw Hill, New Delhi

ME CE & M Semester I		
Course Code	Course Name	Credits
DLOC104	Elective: Quality control & safety in Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to

- Study the concepts of quality and assurance and control techniques in construction.
- Gain knowledge of quality systems & quality planning in construction industry.
- Get acquainted with quality control concept for improving the quality of construction.
- Summarize safety policies, methods, equipments, training provided on any ISO approved construction company.
- Study and understand the various safety concepts, requirements applied to construction Project

Detailed Syllabus		
Module	Sub Modules/Contents	Hrs
I	Quality Management 1.1 Introduction. 1.2 Definitions and objectives. 1.3 Factor influencing construction quality. 1.4 Responsibilities and authority. 1.5 Quality plan, Quality Management Guidelines & Quality circles 1.6 Concept of Quality Audit 1.7 Importance of Quality Control in Construction 1.8 Measure taken for Improving Quality of Construction 1.9 Challenges faced on Construction project due to Globalization 1.10 Best Quality Construction Projects.	10

II	Quality Systems 2.1 Introduction. 2.2 Quality system standard. 2.3 ISO 9000 family of standards & requirements. 2.4 Preparing Quality System Documents 2.5 Quality related training. 2.6 Implementing a Quality system. 2.7 Bench-marking quality. 2.8 Design of Quality manuals, checklist and inspection reports.	08
III	Quality Assurance and Control 3.1 Objectives. 3.2 Difference between Quality Control and Quality assurance. 3.3 Regularity agent, owner, design, contract and construction oriented objectives & methods. 3.4 Techniques and needs of QA/QC. 3.5 Different aspects of quality. 3.6 Appraisals, Factors influencing construction quality.	06
IV	Quality Improvement Techniques 4.1 Selection of new materials 4.2 Influence of drawing, detailing, specifications & standardization. 4.3 Bid Preparation. 4.4 Construction activity, environmental safety, social and environmental factors. 4.5 Natural causes and speed of construction. 4.6 Life cycle costing. 4.7 Value engineering and value analysis.	06
V	Construction Safety Management 5.1 Role of top management. 5.2 Duties & responsibilities of various officers on site.. 5.3 Responsibilities of general employees. 5.4 Safety committee. 5.4 Safety training, Safety campaign.	06
VI	Safety in construction operations 6.1 Safety on various construction sites viz. buildings,dams, Tunnels, bridges, roads 6.2 Safety at various stages of construction. 6.3 Prevention of accidents. Safety measures.	04
VII	Safety in Use of Construction Equipments 7.1 Safety while operating construction equipments.eg.Vehicles, cranes, hoists and lifts 7.2 Safety of scaffolding and working platforms. 7.3 Safety while using electrical appliances and explosives used.	04
VIII	Study of Safety Policies 8.1 Study of safety policies, methods, equipment and training provided On any ISO approved construction company. 8.2 Safety in office, working on sites of high rise construction.	04

Course Outcomes

Students will be able to

- Apply control concepts for improving the quality of construction.
- Maintain the records of quality assurance processes and audits.
- Know various quality improvements techniques.
- Examine construction safety management.
- Implement safety policies, methods, training provided on any ISO approved construction policies.
- Practice safety in construction operations.

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.

Reference books:

1. James, J.O' Brian, Construction Inspection Handbook – Quality Assurance and Quality Control, Van No strand, New York, 1989.
2. Mantri Handook- A to Z of Construction- Mantri Publication.
3. Kwaku, A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., Virginia, 1985.
4. 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
6. Rumane, Abdul Razzak (2011) “Quality Management in Construction Projects”, ISBN: 9781439838723 464p.
7. Clarkson H. Oglesby, Productivity Improvement in Construction, McGraw-Hill, 1989.
8. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, New York, 1989.
9. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, England. 1998.
10. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.
11. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.

ME CE & M Semester I		
Course Code	Course Name	Credits
DLOC105	Elective: Value Engineering	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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 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 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.	10
II	Value Engineering Job Plan 2.1 Definition & Terms related to Value Engineering Job Plan 2.2 Various versions of job plan. 2.2 Phases involved in job plan.	08
III	Function Analysis 3.1 Function- Definition, Role of function in achieving value 3.2 Types of function. 3.3 Function Analysis System Techniques (FAST) 3.4 Graphical function Analysis	08

IV	Creative Thinking 4.1 Creative Thinking- Definition 4.2 Characteristics of Creative people. 4.3 Creative processes 4.4 conducting creative sessions	08
V	Value Analysis 5.1 Principles of value analysis. 5.2 Benefits & applications of value analysis 5.3 Methods for improving the effectiveness of value analysis.	08
VI	Case studies	

Contribution to Outcomes:

Students will be able to:-

1. Illustrate the concept and importance of Value Engineering
2. Demonstrate their capability for Value analysis and management.
3. Use of Life cycle costing for the construction project.

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. 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.

ME CE & M Semester I		
Course Code	Course Name	Credits
ILOC1011	Institute Level Elective: Product Lifecycle 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 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	<p>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</p> <p>PLM Strategies: Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM</p>	10
II	<p>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 Development Process, 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</p>	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 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. John Stark, "Product Lifecycle Management: Paradigm for 21st Century Product Realisation", Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, "Product Design for the environment-A life cycle approach", Taylor & Francis 2006, ISBN: 0849327229
3. Saaksvuori Antti, Immonen Anselmie, "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
ILOC1012	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	Average						
20	20	20	80	03 Hrs.	--	--	--	

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	<p>Probability theory: Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem.</p> <p>Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance.</p> <p>Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.</p>	08
II	<p>Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve.</p> <p>Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time To Failure (MTTF), MTBF, Reliability Functions.</p> <p>Reliability Hazard Models: Constant Failure Rate, Linearly increasing, Time Dependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.</p>	08
III	<p>System Reliability: System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems.</p>	05
IV	<p>Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis.</p> <p>System Reliability Analysis – Enumeration method, Cut-set method, Success Path method, Decomposition method.</p>	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, Fault 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 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. L.S. Srinath, "Reliability Engineering", Affiliated East-West Press (P) Ltd., 1985.
2. Charles E. Ebeling, "Reliability and Maintainability Engineering", Tata McGraw Hill.
3. B.S. Dhillon, 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
ILOC1013	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 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. 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
ILOC1014	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.	--	--	--	

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 General 2^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 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. Raymond H. Myers, 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, New York, 2001
3. George E P Box, J Stuart Hunter, William G Hunter, Statics for Experimenters: Design, Innovation and 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
ILOC1015	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	<p>Introduction to Operations Research: Introduction, , Structure of the Mathematical Model, Limitations of Operations Research</p> <p>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</p> <p>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.</p> <p>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</p> <p>Integer Programming Problem: Introduction, Types of Integer Programming Problems, Gomory’s cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.</p>	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.

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ME CE & M Semester I		
Course Code	Course Name	Credits
ILOC1016	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 of cybercrime and cyber law
- To recognize Indian IT Act 2008 and its latest amendments
- To learn various types of security standards and compliances

Module	Detailed Contents	Hrs
I	Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2008, A global Perspective on cybercrimes.	4
II	Cyber offenses & Cybercrime: How criminals plan the attacks, Social Engg, Cyber stalking, Cyber café 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. Kenneth 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
ILOC1017	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	<p>Institutional Framework for Disaster Management in India:</p> <p>4.1 Importance of public awareness, Preparation and execution of emergency management programme. 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 of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations.</p> <p>4.2 Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.</p>	06
V	<p>Financing Relief Measures:</p> <p>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.</p> <p>5.2 International relief aid agencies and their role in extreme events.</p>	09
VI	<p>Preventive and Mitigation Measures:</p> <p>6.1 Pre-disaster, during disaster and post-disaster measures in some events in general</p> <p>6.2 Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication</p> <p>6.3 Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans.</p> <p>6.4 Do's and don'ts in case of disasters and effective implementation of relief aids.</p>	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 Elsevier 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. Yongg – 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
ILOC1018	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	<p>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.</p> <p>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.</p>	10
V	<p>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.</p>	04
VI	<p>Energy conservation in Buildings: Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources</p>	03

Outcomes:

Students will be able to:

- To identify and describe present state of energy security and its importance.
- To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
- To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
- To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
- To 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 Research Institute (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

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ME CE & M Semester I		
Course Code	Course Name	Credits
CEML101	Laboratory - I	01

Objectives:

- Prepare site visit reports
- Perform statistical quality analysis
- Perform time-motion studies on construction processes
- Perform common on-site geotechnical/transportation/environmental/ material tests
- 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	Working out total number of construction equipment necessary to complete a particular quality of item work in a particular time and determining its direct cost per module-for construction equipment working in a group	02
II	Assignment on showing the schematic representation of a pumped concrete layout and determining the total length of the pipe-line required, considering dependent factors	02
III	Studying any construction process, and hence identifying the various activities, breaking down the various activities into sub-activities and hence calculating the measures of dispersion(range, c.r, std. dev., variance, cv) to ascertain whether the activity is consistently performed or not	04
IV	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	08
V	This module includes field tests which are actually performed on construction sites and students are expected to have a basic understanding of the same <ul style="list-style-type: none"> • Transportation Engineering Laboratory: Two tests on aggregates and bitumen as a flexible pavement material. • Geotechnical Engineering Laboratory: Two Tests related with determination of various soil properties related to construction • Material testing laboratory: Two Tests destructive / non-destructive related with determination of various material properties related with construction. • Environmental Engineering Laboratory: Two Tests related with determination of portability of water and chemical contents in water required for use of water for construction. 	12
VI	Field exercise on EOQ and bulk purchase of cement bags	02
VII	ONE assignment on each subject.	-

Contribution to Outcomes

Students 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

ME CE & M Semester I		
Course Code	Course Name	Credits
CEML102	Laboratory - II	01

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, Listening & Note making.	02
II	Speaking Skills: Voice Modulation, Good Pronunciation, Speaking without fear, Extempore & Prepared speaking, Body Language, Telephone Etiquette/ Mobile /Video conferences.	04
III	Reading Skills: SQ3R Reading Technique, Skimming and Scanning	01
IV	Writing Skills: Building Vocabulary, Effective Sentences & paragraphs, Organizational Techniques & patterns, Summarizing.	02
V	Types of Writing: Letters, memo, Reports/ Proposals/ Research Paper/ Conference Paper/ E-mails/ Sharing Documents On-line. Field exercise on EOQ and bulk purchase.	04
VI	Interview: Pre-Interview Preparation, Interview Question Answer, Resume & Job Application, Group Discussion, Telephone Interviews.	06
VII	Presentation Skills: Planning, preparing, Organizing, Delivery, Feedback.	02
VIII	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) Presentation Through Video conferences. 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.	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)

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ME CE & M Semester II		
Course Code	Course Name	Credits
CEMC201	Core Course: Advanced Construction Technology	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to:

- Summarize the construction of underwater and underground construction.
- Understand the design concept of recent forms of formwork and shuttering.
- Study recent construction materials used in construction industry.
- Understand the High-rise structures & prefabricated construction technology
- Summarize the transportation system construction like rail, roads and waterways.
- Understand the construction technology of power generating structures.

Detail Syllabus

Module	Sub Modules/Contents	Hrs
I	Underwater and Underground Construction 1.1. Methods of tunneling in different strata Tunnel-Shaft sinking, tunnel lining, Bedding of Conducts. 1.2. Under water construction: Underwater drilling, blasting and concreting. Construction of diaphragm walls. 1.3. Foundation treatment: Techniques of Dewatering, piles techniques, Wells and Caissons, cofferdams and grouting techniques. 1.4 Ground improvement techniques	08
II	Formwork and Modern Materials: 2.1. Design and requirement of different types of formwork. Types of formwork: Timber, steel, aluminum, scaffoldings, slip form, jump form, modular shuttering, Mivaan, Doka shuttering. 2.2) Materials: RMC, SCC, FRP, HPC, Construction Chemicals and admixtures, advanced building material like Aluminum, Glass and Fabric. Various finishes and treatments, weathering material, flooring and façade material, prefabricated materials.	08

III	High Rise Structure & Prefabricated structure 3.1) Construction systems for High Rise structures 3.2) Special techniques required for construction and maintenance. 3.3) Prefabricated Construction techniques & System Planning for pre-casting, selection of equipment for fabrication, transport and erection, quality measures, safety measure during erection.	08
IV	Construction of transporting facilities: 4.1) Roads and Bridges: Various techniques for rigid and flexible pavements, types and construction methods for bridges& Flyover. 4.2) Railways: construction techniques for high speed rails (Metro rails, Monorail, Bullet trains and Maglev trains) and underground railways. 4.2) Ports: Construction of docks and jetties, Fender systems, Container terminals and oil terminals.	10
V	Power Generating Structures: 5.1) Hydro power station 5.2) Atomic power Stations 5.3) Thermal power station 5.4) Windmills, Solar Power, transmission towers.	10
VI	Case studies	

Contribution to Outcomes

Students will be able to,

- Understand what activities are necessary for implementing construction sequence the Underground & Underwater construction.
- Design and suggest type of formwork and material to be used for a particular piece of work.
- Understand the concepts of Hi-rise and prefabricated construction technology.
- Identify various construction activities and processes for transporting facilities.
- Prepare action plan for the various construction activities for Power Generating 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 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 & Journals:

1. Foundation Engineering- G. A. Leonards Mcgraw Hills Co. Ltd.
2. Modern Foundation Methods- R. Hammond Pub. Oxford & IBH Pub. Co
3. Foundation Engineering by S.J. Brahma, Tata mcgraw Hill Pub. Co
4. Construction & Geotechnical Methods in Foundation Engineering R. M. Koeme : Mcgraw Hill
5. Dr. P. Purushothamma Raj, Ground Improvement Techniques, Laxmi Publications , Bridge Construction
6. Formwork Design and Construction-Wynn
7. Formwork Construction and Practice – John G. Richardson
8. Construction Technology for High Rise Buildings: Handbook Paperback – 2014 by Basem M.
9. Thomas Baron, Erection of steel structures
10. Stubbs, handbook of heavy Construction
11. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction•
12. Handbook of Transportation Engineering, Volume II: Applications and Technologies second Edition , McGraw-Hill Education, New delhi, ISBN9780071614771
13. Indian railway works Manual(IRICEN)
14. Port engineering: planning, construction, maintenance, and security
15. Tata-McGraw Hill Railroad Engineering, William F. Hay, John Wiley
16. Power Plant Construction Management by Peter G Hessler
17. Construction technologies for nuclear power plants : International Atomic Energy Agency, 2011.(IAEA nuclear energy series, ISSN 1995–7807 NP-T-2.5)
18. Handbook on Construction Techniques: A Practical Field Review of Environmental Impacts in Power Transmission/Distribution, Run-of-River Hydropower and Solar Photovoltaic Power Generation Project.
19. The Engineering of large Dams (vol I & II) by Hemy H. Thomas
20. Introduction to off-shore structure – D. Fautner, M. I. Cowlines & P. A. Frieze
21. Journal of Construction Engineering and Management
22. Building construction handbook seventh edition r. Chudley and r. Greeno

ME CE & M Semester II		
Course Code	Course Name	Credits
CEMC202	Core Course: Infrastructure Development	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Course Objective

Students will be able to:

- To understand the role of infrastructure in overall development of the nation.
- To gain knowledge of various sectors of infrastructure & status of present progress.
- To get acquainted with the knowledge of funding & managing infrastructure projects.
- To understand 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 , Theories 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, Roles of various agencies involved in construction industry.	08
II	Infrastructure 2.1 Classification of Infrastructure projects. 2.2 Present status of various sectors of Infrastructure in India 2.3 Role of infrastructure in development of country. 2.5 Major achievements in infrastructure sector in India.	08
III	Financing of Infrastructure Projects 3.1 Definition of GDP and its role 3.2 Government Policies & Strategies 3.2 Sources of financing infrastructure projects 3.3 Role of Foreign Direct Investment(FDI) in Construction Industry 3.4 12thFive year Plan perspective allocation of funds and expected growth till next plan	08

IV	Public Private Partnership 4.1 Definition of PPP, Principle, purpose & role of partnership 4.2 PPP as an alternative procurement option 4.3 Various PPP models involved in construction industry 4.4 Comparison between Public procurement & PPP. 4.5 Role and functions of PMC in Infrastructure projects	08
V	Issues related to Infrastructure Development 5.1 Environmental clearances for special as well as mega projects . 5.2 Switching over from Public sector to private sector & vice versa. 5.3 Pre-requisites & documentation required for Infrastructure development 5.4 Role of Federation of Indian Chambers of Commerce & Industry(FICCI)	08
VI	Delay and Failures in Infrastructure projects 6.1 Causes of delay in infrastructure projects 6.2 Cost over-run and time over runs. 6.3 International policy effects and effects of variation in GDP 6.4 International Disputes, demand-supply ratio in construction housing industry	06

Contribution to Outcomes

Students will be able to,

- Understand the significance of infrastructure projects.
- Demonstrate the all the types of infrastructure projects.
- Know how to manage & how to arrange funds for executing infrastructure projects.
- Understand the documentation required for entire process.

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.

Reference books:

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

ME CE & M Semester II		
Course Code	Course Name	Credits
CEMC203	Core Course: Project Economics & Financial Management	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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 principles of economics.
- To Manage the working capital required on construction projects
- To Analyze the impact of exchange rate fluctuations on infrastructure projects
- To Employ capital budgeting methods to arrive at the best investment options
- To Perform project portfolio management to select the best from the mix of options available
- To Prepare various types of budgets required for civil works
- To Know the concepts of corporate tax planning, CIDC-ICRA grading system for construction entities
- Perform ratio analysis and comment on the financial stability of the firm
- To 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. 1.2 Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms 1.3 Study of present economy with focus on latest five year plan	04
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	10

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 planning techniques 3.7 Cost control during design and Construction, 3.8 Depreciation and its calculation by various methods 3.9 Various Appraisal Criteria Methods, viz, Payback period, ARR, NPV, B/C and IRR. Problems on the same 3.10 Break-even analysis: numericals 3.11 Numericals on Cash flow analysis, 3.12 Project portfolio management 3.13 Role of Lender's Engineer.	14
IV	Financial Planning 4.1 Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves & surplus 4.2 Venture Capital Financing- Indian Venture Capital scenario, SEBI regulations 4.3 Over and under capitalization with practical examples 4.4 Introduction to Micro financing.	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	Corporate Sector 6.1 Corporate tax planning 6.2 World financial market 6.3 Role of financing institutes in Construction 6.4 CIDC-ICRA grading of construction entities	04
VII	Construction Accounts 7.1 Accounting terminologies and process 7.2 Preparation of profit and loss account and balance sheet as per the companies Act, 1956 7.3 Preparation of contract accounts for each project 7.4 Methods of recording and reporting site accounts between project office and head office, 7.5 Numerical on Ratio Analysis. 7.6 Escrow Account for PPP Project.	06

VIII	<p>Case Studies</p> <p>8.1 Konkan Railway Financial Appraisal or any Financial Appraisal of various sectors</p> <p>8.2 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</p>	
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Contribution to Outcomes

The students will be able to

- Highlight the basic principles of economics
- estimate the working capital required on a construction project
- manage cash and credit of suppliers
- demonstrate the impact of exchange rate fluctuations on international projects
- perform capital budgeting and project portfolio analysis
- prepare various types of budgets required in civil works
- illustrate the concepts of Corporate tax planning, World financial market, Role of financing institute Construction and CIDC-ICRA grading of construction entities
- Preparation accounts and balance sheet as per the companies Act, 1956
- financial perform ratio analysis
- summarize the case studies in Indian construction industry for financial successes and 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 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. 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 Reforms and Public Grievances, lecture series on "Ideas that have worked"

ME CE & M Semester II		
Course Code	Course Name	Credits
DLOC201	Departmental Elective: Remote Sensing and GIS in Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

- Spatially referenced data using scientific method to address an inquiry based study
- Acquire and create spatial data from satellite imagery, printed maps, online sources, & GPS
- Spatial and temporal models for presentation, analysis and decision-making
- Design and execute a workflow GIS techniques appropriate to an applied field
- Achieve competency in the use of the GIS software packages

DETAIL SYLLABUS

Module	Sub Modules/Contents	Hrs
I	<p>Remote sensing:</p> <p>1.1) Introduction, Physics of remote sensing, Ideal remote sensing system, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi concept, Interpretation of remote sensing images.</p> <p>1.2) Digital image processing: Satellite image – characteristics and formats, Image histogram, Introduction to image rectification, Image enhancement, Land use and land cover classification system.</p>	08
II	<p>Geographical Information System (GIS)</p> <p>2.1) Information systems ; spatial and non- spatial information, geographical concept and terminology, Basic component of GIS,</p> <p>2.2) GIS data: Field data, statistical data, maps, aerial Photographs, satellite data, points , lines, and areas features, vector and raster data, data entry through keyboard, digitizer and scanners, preprocessing of data rectification and registration , interpolation techniques</p> <p>2.3) Advantages of GIS. Commercially available GIS hardware and Software.</p>	08

III	Global Positioning System (G.P.S): 3.1) Introduction, G.P.S. Segments: Spaces Segment, Control Segment, User Segment Features of G.P.S. Satellites, 3.2) Principle of Operation surveying with G.P.S.: Methods of observations, Absolute Positioning, Relative Positioning, differential G.P.S., Kinematics of G.P.S. G.P.S. Receivers: Navigational Receivers, Surveying Receivers, Geodetic Receivers, Computation of Co- ordinates:- Transformation from Global to Local Datum , Geodetic Coordinates to map co- ordinates , G.P.S. Heights and mean sea level Height 3.3) Applications of G.P.S.	12
IV	Applications in Civil Infrastructure Management: 4.1) GIS based planning and data base management in civil infrastructure. 4.2) GIS in Transportation infrastructure management-Intelligent Transport System, Urban Transport Planning, Highway Alignment, Traffic Congestion analysis and Accident Studies, Road Network Planning, 4.3) Application of GIS in Environmental & Water resource Management. 4.4) GIS-GPS based Underground infrastructure Management. 4.5) GIS-GPS based Green infrastructure Management.	14
V	Case studies Minimum one Case study on each topic of Module IV required to be covered.	

Contribution to Outcomes

Students will be able to:

- Acquire and create spatial data from satellite imagery, printed maps, online sources, &GPS
- Analyze spatially referenced data using scientific method to address an inquiry based study
- Develop spatial and temporal models for presentation, analysis and decision-making
- Achieve competency in the use of the GIS software packages
- Design and execute a workflow GIS techniques appropriate to an applied field

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 & Journals:

- 1) Concepts and Techniques of Geographical Information System, Lo C.P. Yeung A K, Prentice India
- 2) Introduction to Geographical Information System, Kang-tsung Chang, Tata McGraw Hill
- 3) International and National Journals on GIS and GPS
- 4) GIS A Management, Perspenfi Stan Aronoff, WDL Publisher.
- 5) Peter A Burrough Rachael A Mc Donnel, "Principles of GIS" (Oxford), 2000.
- 6) Christopher Jones, "GIS and Computer cartography" (Longman), 2000..
- 7) Remote Sensing and geographic Information System, AM, Chanra & S.K. Ghosh, Narosa Pub.
- 8) Concepts of Geographic Information System, C.P Yeung & Loe, PHI.
- 9) Introduction to Remote Sensing, Lillesand & keifer.
- 10) Global Positioning System, theory & practice, Hofmann and wellenhof, Springer India.

ME CE & M Semester II		
Course Code	Course Name	Credits
DLOC202	Departmental Elective: Risk Management in Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Course Objectives

Students will be able to

- To understand the various issues associated with risk.
- To learn techniques to identify and quantify risks
- To learn to risk containment and risk reduction policies.
- To manage risk effectively for better decision making.

Module	Sub modules / contents	Hrs
I	Introduction to risk management 1.1 Importance of risk, development of risk management system 1.2 Identifying risk events, cost of risk, types of risk and classification 1.3 Benefits of risk management, responsibilities of those involved in risk management 1.4 Risk management standards, decision making strategies effects of tax laws, government rulings, conflict resolution. money, time and technical risks 1.5 Risks in the context of global project teams 1.6 Problems related to natural disasters or unusual events like earthquakes, fires, accidents	06
II	Risk Analysis and Management for Projects (RAMP) 2.1 Probability distribution 2.2 Stages in Investment life-cycle 2.3 Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and uncorrelated cash	06

III	Risk Analysis Techniques 3.1 Sensitivity analysis 3.2 Uncertainty, cost factors and benefit factors 3.3 Scenario analysis, scenario analysis simulation 3.4 Decision tree analysis, risk profile method, certainly equivalent method, risk adjusted discount rate method, certainty index method, 3 point estimated method 3.5 Use of risk prompts, use of risk assessment tables, details of RAMP process, utility of grading of construction entities for reliable risk assessment 3.6 Entrepreneurial risks, pure risks 3.7 Contract review and legal conflicts	14
IV	Risk Mitigation 4.1 By elimination, reducing, transferring, avoiding, absorbing or pooling 4.2 Residual risk, mitigation of unqualified risk 4.3 Coverage of risk through CIDC's and Actuarial Society of India programs : through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI). Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy	12
V	Risk Management and Internal Control 5.1 Internal audit works, control systems 5.2 Auditing risk management –setting up internal audit function.	06
VI	Case Study Case study of construction projects based on risk analysis and mitigation.	

Course Outcome

Students will be able to

- Classify and compute risks and risk containment and risk reduction policies.
- Manage risk effectively and thus have better decision making.
- Understand financial savings and better productivity due to effective use of resources and thus have enhanced success rates of ongoing as well new 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 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:

Sr. No	Name of Author/s	Title of Book	Publishers
1	Kit Sadgrove	Complete guide to business risk management	Gower Publishing Ltd.
2	Hans Buhlmann	Mathematical Methods in Risk Theory	Springer Verlag
3	Prasanna Chandra	Project planning analysis selection implementation and review	Tata McGraw Hill
4	Christopher Marrison	Fundamentals of risk measurements	Tata McGraw Hill
5	Ian Cameron, Raghu Raman	Process Systems Risk Management	Elsevier Academic Press
6	Seetharaman	Construction Engineering and Management	Umesh Publications

ME CE & M Semester II		
Course Code	Course Name	Credits
DLOC203	Departmental Elective: Thrust Areas in Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to

- Develop a thorough understanding of project pre-planning and importance of defining the scope of the project and setting benchmarks well in advance
- Understand concepts of PDRI and other project rating tools
- Highlight the advantages of project partnering
- Appraise the importance of SCM & CCM in construction sector
- Perform S.W.O.T analysis of construction entities
- Formulate techniques and procedures of fast-track construction
- Hypothesis and hence apply lean construction techniques to construction projects
- Propose Earn value management for construction projects
- Reframe the project reporting relationships of construction project parties and hence expedite the construction processes
- Appraise the leadership styles and motivations necessary on construction projects

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	04

	2.3 Critical success factors for implementation 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	Competency mapping & training programs 5.1 Concepts of competency mapping, gap analysis and strategic management 5.2 Devise training programs for filling competency gaps of skilled HR	04
VI	Fast Track Construction 6.1 Diagrammatic representation of the concept of the fast track construction. 6.2 Advantage, suitability of fast track construction. 6.3 Various Techniques used in fast track construction 6.4 Form of contract suitable for fast track projects. 6.5 Concept of guaranteed maximum pricing (GMP). 6.6 Any case study on fast track construction	04
VII	Lean construction Techniques 7.1 Lean Construction – concepts, development, objectives and practical applications 7.2 Definitions - lean, value, waste, pull, flow 7.3 Differences between LC and project management approaches 7.4 Integrated Project Delivery (ILPD) & Integrated Lean Project Delivery (ILPD) 7.5 Last Planner System(LPS) 7.6 Target Value Design(TVD) 7.7 Building Information Modeling (BIM) 7.8 5s, Six sigma and Visual Management 7.9 Just in Time (JIT) 7.10 Standardized work and continuous improvement 7.11 Repetitive, Look ahead and pull/push scheduling	06

VIII	<p>Earned Value Analysis</p> <p>8.1 Definition of earned value. Importance of Earned value analysis.</p> <p>8.2 Concepts of cost variance, schedule variance, cost performance index and schedule performance</p> <p>8.3 Index methods of determining earned value viz. Ratio method, repetitive type work package method, Complex construction work package method, start or finish method.</p> <p>8.4 Accounting practices for determining the earned value.</p>	03
IX	<p>Project Reporting</p> <p>9.1 Guidelines for report preparation, various stakeholders of projects associated with reporting.</p> <p>9.2 Scheduling program default report content, report Sorting, selection criteria, interpretation.</p> <p>9.3 Reporting requirements of particular specifications.</p> <p>9.4 Use of Project Management software's in reporting.</p> <p>9.5 Study of sample construction project reports.</p>	03
X	<p>Leadership styles and motivation</p> <p>10.1 Qualities of a leader, difference between leader and manager</p> <p>10.2 Maslow's Hierarchy of Needs</p> <p>10.3 Alderfer's ERG Theory</p> <p>10.4 McClelland's Theory of Needs</p> <p>10.5 Participatory leadership and factors affecting leadership</p> <p>10.6 Various Leadership Styles</p> <p>10.7 Emotional & Spiritual intelligence and their quotients</p> <p>10.8 Transformational and Transactional leadership</p> <p>10.9 Seven habits of highly effective people and the 8th habit</p>	06

Contribution to Outcomes

The students 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
- Conduct training need assessment and device training programs for construction managers
- Apply fast track construction techniques, lean construction techniques and earn value analysis
- Prepare construction project reports manually as well as through various MIS soft wares
- 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 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/articles:

- 1 Pre-project planning handbook—published by Construction Industry Institute (CIT) USA. ASCE journal papers on project pre-planning to be used. ASCE journal papers.
- 2 Project Management—Financial evaluation with strategic planning, networking and control—Bhavesh Patel—2nd edition 2010, reprinted in 2011—Vikas publishing House Pvt. Ltd.
- 3 Scheduling Construction Projects—Principles and practices—Sandra Weber—Indian edition published in 2012—Pearson Publication.
- 4 Construction Project management—Planning, Scheduling and controlling—K. K. Chitkara—Eight reprint 2004, Tata McGraw Hill Publishing Company Limited.
- 5 Practical Application of SWOT Analysis in the Management of a Construction Project- IGOR N. MILOSEVIC; Leadership and Management in Engineering {Leadership Manage. Eng., 2010,
- 6 <http://www.leanconstruction.org/>; Lean Construction Journals
- 7 Lean Construction Management-The Toyota Way; Gao, Shang, Low, Sui Pheng
- 8 Leadership and Motivation — Ralph Nader, Unit 11, ccb_leadershipguide
- 9 Funder, David Charles. The Personality Puzzle. W.W. Norton & Company. New York, 1977.
- 10 Johns, Gary. Concordia University. “Theories of Work Motivation” “Leadership” Organizational Behaviour: Understanding and Managing Life at Work. Harper Collins College Publishers, 1996.
- 11 Maslow, A. H. Motivation and Personality. Harper & Row. New York, 1970. Alderfer, C. P. “Existence, Relatedness and Growth: Human Needs in Organizational Settings”.
- 12 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,
- 13 Vroom, V. H. & Jago, A. G. “The New Leadership: Managing Participation in Organizations”. The 7 habits of highly effective people- Stephen R. Covey

ME CE & M Semester II		
Course Code	Course Name	Credits
DLOC204	Departmental Elective: Energy Conservation Techniques in Building Construction	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Students will be able to:

- Understand the important issues associated with energy performance of buildings.
- Describe the important issues and considerations of building energy performance.
- Explain the technologies, codes and policies for energy conservation in buildings
- Study the design of energy efficient buildings and environment friendly building.
- Develop the skills for theoretical analysis and practical study of building energy performance.

Detail Syllabus

Module	Sub Modules/Contents	Hrs
I	Energy Conservation 1.1. Introduction and Fundamentals of Energy, Energy production systems, Energy Flow Diagram, Energy Economic Analysis 1.2. Importance of Energy and Energy conservation, Energy and its Impact on Environment -Heat-Iceland Effect, Greenhouse gas effect, Global warming, 1.3. Domestic Energy Consumption-Savings-Primary Energy use in Buildings- Residential-Commercial-Institutional And Public Buildings.	08
II	Energy Management & Energy Audit 2.1. Principle & Objectives of Energy of Management, importance of Energy Planning, Energy Management Program 2.2. Energy Audit-Types of Energy audit- Energy Audit Initiation, Energy Audit Preparation, Audit Execution , Audit Report, Case studies. 2.3. Post Audit Activities- Implementing energy efficiency	12

III	Energy Efficient & Environment Friendly Design 3.1. Conservation & energy efficiency concepts - significance of energy use and energy processes in buildings. 3.2. Heating and ventilation design-Human thermal comfort, material specifications and heat transfer principles, Thermal performance evaluation, Heat loss from buildings, design of artificial ventilation system, design of insulators 3.3. Solar energy fundamentals & practices in building design- Active solar and Passive solar Design 3.4. Principles and Design of green buildings, Types of Energy-Embodied and Operating Energy Green building rating systems-LEED Standards, Evaluation Tools for Building Energy	12
IV	Energy Saving Opportunities 4.1. Introduction to Energy savings opportunities in various Building Services, Electrical Equipment-Improvement of Power Factor , Energy Savings in Lighting Systems-Air Conditioning Systems-Applications 4.2. Facility Operation And Maintenance, Facility Modifications, Energy Recovery-Dehumidifier, Water Heat Recovery-Steam Plants and Distribution Systems, Energy Savings in Pumps-Fans-Compressed air systems- Applications	12
V	Case studies	

Contribution to Outcomes

Students will be able to:

- Understand the important of Energy and Conservation of energy in facility design.
- Outline the Principles and objectives of Energy Management and Energy Auditing.
- Describe the technologies, codes and policies for energy conservation in buildings
- Design of energy efficient buildings and environment friendly building.
- Explain the Energy Saving Opportunities in Various Building facilities and Services

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 & Journals:

- 1) Energy Efficiency and Energy management Handbook
- 2) Moore F., "Environmental control systems ", McGraw Hill, Inc., 1994.
- 3) Brown, G.Z, Sun, " Wind and Light: Architectural design Strategies ", John Wiley & Sons
- 4) Cook, J, " Award - Winning Passive Solar Design ", McGraw Hill, 1984
- 5) Energy Efficient Buildings In India by Mili Majumdar The Energy Research Institute.
- 6) Energy Efficient Building Systems Lal Jayamaha McGraw Hill Publication.
- 7) Solar Energy and thermal processes J a Duffie & W a Beckman John Wiley.
- 8) Green Building Design Handbook (Open Source)
- 9) Energy Conservation Building Code, 2007.
- 10) Handbook of functional requirement of buildings, SP: 41:1987.

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ME CE & M Semester II		
Course Code	Course Name	Credits
DLOC205	Departmental Elective: Principles of Architecture & Planning	04

Teaching Scheme

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
04	--	--	04	--	--	04

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

Course Objectives

Students will be able to:

- To introduce the basic principles of design, architecture and space articulation.
- To study the built environment and to develop a basic understanding of space and form.
- Systematic introduction to issues related with the design of human habitat, its components.
- To introduce students the passive design concepts and techniques and their design application.
- To introduce rules and regulations about development control, zoning regulations, layout regulations, urban planning standards.
- To introduce the landscape design and planning

Detail Syllabus

Module	Sub Modules / Contents	Hrs
I	Architecture Design 1. Architecture Design – an analysis-integration for function and aesthetics 2. Introduction to basic elements and principles of design.	08
II	Climate Responsive Design 1. Factors that determine climate 2. Characteristics of climate types 3. Design for various climate types 4. Passive and active energy controls	06
III	Building planning and standards : 1. Residential, institutional, commercial and industrial buildings 2. Planning concepts-application of anthropometry and space standards 3. Interrelationships of functions 4. Safety standards 5. Building Rules & Regulations 6. Integration of building services.	14
IV	Environmental design and regulations: 1. Surveys-site Analysis	10

	2. Development control 3. Zoning regulations 4. Layout regulations 5. Urban planning standards 6. Layout design concepts	
V	Site Planning: 1. Urban renewal- conservation 2. Issues related to site choice, unwanted site	04
VI	Principles of Landscape design 1. Landscape styles, landscape elements and materials, 2. Plant characteristics & planting design, 3. Environmental considerations in landscape planning	06
VII	Case studies.	

Contribution to Outcomes

Students will be to

- Understand fundamental knowledge of architecture and its principles.
- Utilize skills of drawing and representation; assimilate learning of graphics, construction, structures.
- Designs the landscaping.

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.

Reference books:

Author/s	Title of Book	Publishers
Gallion B. Arthur and Simon	The Urban Pattern-city planning and design	John Wiley & Sons
Margaret Roberts	An Introduction to Town Planning Tech.	Hutchinson Educational
Francis D K Ching	Architecture: Form, Space and Order	John Wiley & Sons
Givoni Baruch	Man, Climate and Architecture	Van Nostrand Reinhold
Edward D Mills	Planning the Architects Handbook	Butterworth

ME CE & M Semester II		
Subject Code	Subject Name	Credits
ILOC2021	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, 9th Ed.

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ME CE & M Semester II		
Course Code	Course Name	Credits
ILOC2022	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	<p>Overview of Indian Financial System: Characteristics, Components and Functions of Financial System.</p> <p>Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills.</p> <p>Financial Markets: Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market</p> <p>Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges</p>	06
II	<p>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.</p> <p>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.</p>	06
III	<p>Overview of Corporate Finance: Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision.</p> <p>Financial Ratio Analysis: Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio</p>	09

	Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	
IV	<p>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)</p> <p>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.</p>	10
V	<p>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.</p> <p>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</p>	05
VI	<p>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</p>	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 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. 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.

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ME CE & M Semester II

Course Code	Course Name	Credits
ILOC2023	Intitute 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
ILOC2024	Intitute 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	<p>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.</p>	5
II	<p>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</p>	7
III	<p>Organizational Structure & Design Structure, size, technology, Environment of organization; Organizational Roles &</p>	6

	<p>conflicts: Concept of roles; role dynamics; role conflicts and stress.</p> <p>Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership.</p> <p>Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.</p>	
IV	<p>Human resource Planning</p> <p>Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale.</p> <p>Performance Appraisal Systems: Traditional & modern methods, Performance Counseling, Career Planning.</p> <p>Training & Development: Identification of Training Needs, Training Methods</p>	5
V	<p>Emerging Trends in HR</p> <p>Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development , managing processes & transformation in HR. Organizational Change, Culture, Environment</p> <p>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.</p>	6
VI	<p>HR & MIS</p> <p>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)</p> <p>Strategic HRM</p> <p>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</p> <p>Labor Laws & Industrial Relations</p> <p>Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act</p>	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 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. 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
ILOC2025	Intitute 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
Test 1	Test 2	Average						
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
ILOC2026	Intitute 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.
- 5.

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, (2nded), Singapore, Pearson Education

ME CE & M Semester II

Course Code	Course Name	Credits
ILOC2027	Intitute 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						
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 of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in 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-IEEE Press

ME CE & M Semester II

Course Code	Course Name	Credits
ILOC2028	Intitute 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	<p>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,</p>	09
2	<p>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</p>	06
3	<p>Digital Business Support services: ERP as e –business backbone, knowledge Tope Apps, Information and referral system Application Development: Building Digital business Applications and Infrastructure</p>	06
4	<p>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</p>	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, Vinocenzo Morabito, 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-en](https://doi.org/10.1787/9789264221796-en) OECD Publishing

ME CE & M Semester II		
Course Code	Course Name	Credits
ILOC2028	Intitute 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
- Familiarise 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 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.**

5. Question paper will comprise of total six question
6. All question carry equal marks
7. 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)
8. 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, Macmillan India, 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

ME CE & M Semester II		
Course Code	Course Name	Credits
CEML201	Laboratory - III	01

Objectives:

- Prepare site visit reports
- Apply spreadsheet (excel or other) tools to simplify complex civil engineering problems
- Administer incentive schemes and devise training programmes 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	Use of spread sheet and data base application software for performing various functions of civil engineers as mentioned below is to be demonstrated <ul style="list-style-type: none"> • Quantity Estimation • Rate Analysis • Bid preparation • Material and supplier information • Employee / equipment information etc. 	04
II	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	08
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	04
VI	Exercise on Cash Flow analysis.	02
VII	Preparation of models/charts related to various construction techniques/ equipment, organizational structures of existing companies etc. (Group Activity to generate interest and explore creativity-Group of 3-4 students per model/chart).	04
VIII	Summarizing two articles related to construction engineering and management from reputed technical journals	02
IX	Group discussion on two motivational videos of project management (could be movie clips, construction processes related to construction management)	02
	One Assignment related to each subject	-

Contribution to Outcomes

Students 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
- 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 programmes 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
- Formulate the conditions of contract for a particular project
- Write technical papers in reputed journals
- Summarizes technical articles

ME CE & M Semester II		
Course Code	Course Name	Credits
CEML202	Laboratory - IV	01

Course Objectives

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	Hours
I	Computerized Project Management: Introduction Concepts of Advanced Construction Management using Software. Application and Case studies	02
II	Construction Project management using Ms-Project Software: Real Estate Project (Residential or Commercial building Project etc.)	08
III	Advanced Project Management using Primavera Software: Infrastructure Projects (Hi-Rise Structure/Transportation Infrastructure/ Hydropower Project etc.)	08
IV	BIM & REVIT: Applications Building information Modeling (BIM) & Revit Software in Construction Project.	08
V	GIS Software: Applications of GIS software in Construction Database Management & Mapping.	04

Term work

Minimum one Assignment on above all modules required to Submit for Term work Assessment and Site Visit Report etc.

Course Outcome

Students will be able to: with Case Studies

- Explain Concept Computerized Project management
- Describe Project management Software used in Construction Project
- Execute the Planning and managing database of Construction Project using Software

Recommended Books & Journal

- 1) Computerized Project Management Manual: NICMAR
- 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

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