Master of Building Engineering and Management

Course Structure for
Two Year Post Graduate Degree Programme in Architecture

(As Approved by 6th Senate meeting held on 2nd August 2019 and approved by 28th BoG meeting held on 6th August 2019)

Effective from the Academic Year 2019-20 onwards

योजना तथा वास्तुकला विद्यालय, विजयवाडा
School of Planning and Architecture, Vijayawada
An Institute of National Importance, MHRD, Govt. of INDIA.

SCHOOL OF PLANNING AND ARCHITECTURE VIJAYAWADA

FIRST SEMESTER

SL. NO.	SUBJECT CODE	SUBJECT TITLE	Distribution of Periods per week			Total Periods Per Week	CREDITS
			L	T	S/P		
1	MBEM111	Project Planning and Scheduling Studio	2	-	13	15	15
2	MBEM112	Construction Management, Tools and Techniques	2	1	-	3	3
3	MBEM113	Quantitative Methods and Operations Research	2	1	-	3	3
4	MBEM114	Construction Technology, Materials and Methods	2	1	-	3	3
5	MBEM115	Advanced Building Services	2	1	-	3	3
6	MBEM116	Construction Materials and Technology Laboratory	1	-	3	4	4
TOTAL			**11**	**4**	**16**	**31**	**31**

SECOND SEMESTER

SL. NO.	SUBJECT CODE	SUBJECT TITLE	Distribution of Periods per week			Total Periods Per Week	CREDITS
			L	T	S/P		
1	MBEM121	Project Cost and Contract Management Studio	2	-	13	15	15
2	MBEM122	Project Cost Management	2	1	-	3	3
3	MBEM123	Research Methodology	2	1	-	3	3
4	MBEM124	Construction Occupational Health and Safety Administration	2	1	-	3	3
5	MBEM125	Construction Contracts, Specifications and Legal Issues	2	1	-	3	3
6		Elective I	2	1	-	3	3
	MBEM1210	Building Facilities Management					
	MBEM1211	Waste Management					
	MBEM1212	Healthy Buildings					
	MBEM1213	Equipment Management					
TOTAL			**12**	**5**	**13**	**30**	**30**

Note: Compulsory summer professional training / internship (for six weeks) after second semester, evaluated during III semester

THIRD SEMESTER

SL. NO.	SUBJECT CODE	SUBJECT TITLE	Distribution of Periods per week			Total Periods Per Week	CREDITS
			L	T	S/P		
1	MBEM211	Project Procurement Management Studio	2	-	13	15	15
2	MBEM212	BIM based Construction Management	2	-	1	3	3
3	MBEM213	Project Finance and Risk Management	2	1	-	3	3
4	MBEM214	Project Administration and Organizational Behaviour	2	-	1	3	3
5	MBEM215	Construction Procurement and Inventory Management	2	1	-	3	3
6	MBEM216	Dissertation	-	-	3	3	3
7	MBEM217	Summer Training	-	-	-	-	1
TOTAL			**10**	**2**	**18**	**30**	**31**

FOURTH SEMESTER

SL. NO.	SUBJECT CODE	SUBJECT TITLE	Distribution of Periods per week			Total Periods Per Week	CREDITS
			L	T	S/P		
1	MBEM221	Thesis	2	-	22	24	24
2	MBEM222	Quality and Human Resource Management	2	1	-	3	3
3		Elective II	2	1	-	3	3
	MBEM2210	Prefabricated Structures					
	MBEM2211	Structural System and Design					
	MBEM2212	Environmental Impact Assessment					
	MBEM2213	Lean Construction					
TOTAL			**6**	**2**	**22**	**30**	**30**

Master of Building Engineering and Management

Detailed Syllabus for
Two Year Post Graduate Degree Programme in
Building Engineering and Management

(As Approved by 6th Senate meeting held on 2nd August 2019 and approved by 28th BoG meeting held on 6th August 2019)

Effective from the Academic Year 2019-20 onwards

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FIRST SEMESTER

MBEM111 - Project Planning and Scheduling Studio	Subject Category	SC
	Number of Credits	15
	Lecture Periods per Week	-
	Tutorials per week	-
	Studio/Lab/Workshop/Practical's	15
	Total Periods per Week	15

Objectives: To provide students hands on experience through taking real life cases to augment the theories learned along with studio. Also, to encourage them to demonstrate the cases analyses and decision-making methods through simulated applications.

The student has to undertake a project either individually or in group based on the scale of the project.

Unit I Preliminary Work 30

Preparation of project appraisal based on project documents (contracts, drawings, site, etc.); Preparation of SWOT Analysis and Work Breakdown Structure (WBS).

Unit II Identification of Activities, Resources & Durations 60

Identification of Activities, Milestones and Construction Sequencing considering: Activities, Non-work activities, Repetitive activities and projects, Typical and non-typical activities. Determining time duration and labour/equipment resources, Calculation of quantities, cost and productivity data. Determine activity durations based on productivity data; Determining activity durations through deterministic and probabilistic durations; Expert Judgement.

Unit III Development of Networks 45

Development of hierarchy of networks using any Project Management Software with detailed activities & milestones

Unit IV Time-Cost Analysis & Resource Management 45

Time Cost Analysis; Crash Cost; Earned Value Management; Developing Planned Value, Actual Cost, Earned Value and Variances; EVM application for project progress;

Unit V Resource and Material Management 45

Resource levelling; Application of Multiple Resource Allocation Procedure, PACK method, Branch and Bound Method.

Total: 225 Periods

Outcome:

The students will be gaining the experience as they will be dealing with cases and appling the theories learned. The students will be having enough experience in decision making by applying the simulated applications.

MBEM112 - Construction Management, Tools and Techniques	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To introduce the importance of construction Management, tools and techniques required for planning and managing construction projects.

Unit I Introduction 9

Construction in India; its role in development, importance of Management in Construction, role of Construction Manager, Construction team, responsibilities and authorities of Construction Manager. Project management, main causes of project failure, Management Functions, Management Styles, SWOT Analysis in construction.

Unit II Project Planning Process 6

Construction projects, Project development process, Plan development process, time planning process, work scheduling process, resource planning process, Importance of planning, scheduling and controlling projects.

Unit III Management Techniques 9

Planning for Construction Projects: Principles, objectives, advantages of planning, stages of planning.

Scheduling: Definition, advantages, Methods of scheduling: Bar Chart, Milestone chart, Controlling, Life cycle curse, Job layout, work break down structure

Unit IV Project Management through Networks 12

Introduction, objectives, advantages, terms and definitions, types of networks, rules for drawing a network, rules for drawing a network, Fulker son's Rate of numbering the events.

Unit V Project Controlling & Construction Site Management 9

Project Controlling: Monitoring and Control, Crashing, Resource Levelling, Updating. Project Controlling: Monitoring and Control, Crashing, Resource Levelling, Updating.

Construction site management: Site mobilization – demobilization aspects, various Resources management based on funds availability, 10 coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers, Engineers, Supervisors

Total: 45 Periods

Outcome:

The students will be having the knowledge of construction management, tools and techniques which will be used for planning and managing the construction project.

References Books

1. Gupta, B.L. and Gupta, Amit. Construction Management, Machinery and Accounts, 3rd ed. Standard Pub, 2005.
2. Loraine, R.K. Construction Management in Developing Countries. Thomas Telford, London, 1993

3. Srinath, L.S. PERT and CPM Principles and Applications, 3rd ed. Affiliated East-West Press, New Delhi, 2003.
4. Singh, Harpal. Construction Management and Accounts 14th ed. Tata McGraw-Hill Pub., New Delhi, 1981
5. Gould, Frederick and Joyce, E. Nancy. Construction Project Management. Prentice Hall, New Jersey, 2000
6. Shrivastava, U.K. Construction Planning and Management, 3rd ed. Galgotia Pub., New Delhi, 2004
7. Chitkara, K.K. Construction Project management: Planning. Scheduling and Controlling. Tata McGraw-Hill Pub., New Delhi. 1999.
8. Sharma, S.C. construction Equipment and its Management, 4th ed. Khanna Pub., New Delhi, 2004.

MBEM113 - Quantitative Methods and Operations Research	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To strengthen the quantitative decision-making capability through delivering the analytical scientific approach to Problem solving, quantitative analysis, Operational research models & modelling process for Managerial Decision Making.

Unit I Statistics for Management 9

Measures of Central Tendency & Dispersion, Probability concepts, Bayes Theorem & Applications, Probability Distributions Binomial, Poisson, Normal & Exponential, Sampling & Sampling Distributions, Testing of Hypothesis. Correlation, Regression & Multivariate Analysis, Forecasting methods & Time Series Analysis. Stochastic process introduction.

Unit II Decision Making 9

Decision Trees & Utility Theory, Decision Making under uncertainty, under risk, under certainty & under conflict. Game Theory. Linear Programming; graphical, simplex method, dual simplex, Sensitivity Analysis & Duality. Integer Programming. Transportation, Transhipment & Assignment Models.

Unit III Multi-criteria Decision making 6

Linear Goal Programming, Scoring Models, Fuzzy outranking, Introduction to concepts of AHP (Analytic Hierarchy Process} & ANP (Analytic Network Process).

Unit IV Inventory Models & Network Models 12

Inventory models (static, dynamic, probabilistic & stochastic), Waiting Line / Queuing models steady state operation (M/M/1). Simulation concepts & applications for inventory & Q-ing situations. Network models; shortest route, maximal flow problem. PERT, CPM

Unit V Advanced Methods 9

Glimpses of Metaheuristics (Tabu, Simulated Annealing & Genetic algorithm), Markov chains & Decision Processes, Sequencing, Dynamic Programming & Nonlinear Programming (Quadratic & Geometric Programming). Case studies & applications.

Total: 45 Periods

Outcome:
The student will be having a clear idea on how to resolve the issues/problems through right quantitative analysis method/models and in appropriate decision making.

Reference Books

1. Frederic S.Hillier, Gerald J.Liberman,2005 Introduction to Operations Research, Tata McGraw-Hill
2. Gupta M.P. and R.B. Khanna, 2004, Quantitative Techniques for Decision Making, Prentice Hall of India
3. Natarajan,A.M, Balasuramani.P,Tamilarasi, A2009 Operations Research, Pearson Education
4. Sharma J.K, 2006, Operations Research Theory and Practice, Macmillan India Ltd.
5. Wisniewski MIK, 2004, Quantitative Methods for Decision Makers, Macmillan India Ltd.
6. Rao M.R Puri MC Operational research and its applications recent trends Alled Publishers Pvt, Ltd
7. David.E. Goldberg 2007 Genetc Algorithm Pearson Education.

MBEM114 - Construction Technology, Materials and Methods	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials. To study and understand the latest construction techniques applied to engineering construction for sub structure, super structure.

Unit I Special Concretes 9

Concretes, Behaviour of concretes – Properties and Advantages of High Strength and high-Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, self-compacting concrete

Unit II Metals and Composites 9

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

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

Unit III Other Materials 9

Other Materials Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application.

Smart and Intelligent materials - Types and features of smart and Intelligent Materials – Case studies showing the applications of smart & Intelligent Materials.

Unit IV Sub Structure and Super Structure 6

Foundation for tall buildings- Pile foundation, Raft foundation- types and applications - Piling techniques – Vacuum dewatering of concrete flooring – Concrete paving technology

Unit V Construction Methods 12

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab-aerial transporting – Handling and erecting lightweight components on tall structures.

Total: 45 Periods

Outcome:

Student will have clear picture on the properties of modern construction materials used also will gain knowledge on the latest construction techniques used in engineering construction for sub and super structure of the buildings.

Reference Books

1. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.
2. Aitkens, "High Performance Concrete", McGraw Hill, 1999
3. Ashby, M.F. and Jones. D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
4. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, "Materials for civil and Highway Engineers", Prentice Hall Inc., 1998.
5. Mamlouk, M.S. and Zaniewski, J.P., "Materials for Civil and Construction Engineers", Prentice Hall Inc., 1999.
6. Santhakumar. A.R., "Concrete Technology", Oxford University press, New
7. Shan Somayaji, "Civil Engineering Materials", Prentice Hall Inc., 2001
8. Shetty M. S, "Concrete Technology: Theory and Practice", S. Chand & Company Ltd., 2005.
9. Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984
10. Robertwade Brown, "Practical foundation engineering hand book", McGraw Hill Publications, 1995.
11. Sankar, S.K. and Saraswati, S., "Construction Technology", Oxford University.

MBEM115 - Advanced Building Services	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical’s	-
	Total Periods per Week	03

Objective: To provide exposure to students about important services like water supply, lighting, HVAC, mechanical transportation and fire safety design, execution and maintenance in important in modern day construction. Also deals with external infrastructural services, like storm water drainage, sewerage treatment etc., important in large scale construction projects for effective coordination in pre-construction and construction phases of the projects.

Unit I Water and Waste Management 12

Water quality and quantity standards for water; Purification and treatment- water supply and distribution systems, Sewerage and Sewerage Treatment Plants; R.O. system for potable water; Storm water drainage for buildings; Rain water harvesting; Plumbing system for buildings-fittings and fixtures; Hydro pneumatic systems; Multi-stage pumping; Measures for effective water management; Net zero water approach; septic and sewage treatment plant.

Unit II Electrical services & Lighting 9

Planning electrical wiring for building; main and distribution boards; transformers and switch gears; Power distribution systems, and sub-station equipment (for large developments); Standby / captive power supply, metering; Renewable energy sources; Cogeneration systems- modern theory of light and colour, synthesis of light, definitions, luminous flux, Candela, lighting design, design for modern lighting, lighting software

Unit III HVAC 6

System types and components; Heating and cooling load determination; District cooling; Planning and design of ventilation; VRF, packaged air-conditioners-chilled water plant –fan coil systems-water piping; air conditioning systems for different types of buildings. Overview of codes and standards applicable to MEP services;

Unit IV Fire Safety & Vertical Transportation 9

Causes of fire in buildings-safety regulations-NBC-planning considerations in buildings like Non-combustible materials, construction, staircases and A.C. systems, special features required for physically handicapped and elderly in building types-heat and smoke detectors-dry and wet risers-Automatic sprinklers, Vertical transportation system; Elevators; travellators; escalators

Unit V Intelligent Buildings & building Automation 9

Intelligent buildings-Building Automation-Smart buildings- Building services in high rise buildings-Green Buildings-Energy efficient buildings for various zones-Case studies of residence, office buildings and other buildings in each zone. Access control CCTV system; Security and surveillance systems; Telecommunication and other latest technologies; Study of schematic diagrams; Operation, maintenance and planning for retrofitting of services;

Total: 45 Periods

Outcome:

By the end of the course student will have an idea on the internal and external services in a project and how to have proper coordination between these services so as to complete the project in scheduled time.

Reference Books

1. Fair G.M., Geyer J.C. and Okun. D, “Water and waste Engineering “, Vol. II, John Wiley & sons, Inc., New York. 2008.
2. Hopkinson. R.G and Kay. J. D, “The Lighting of buildings”, Faber and Faber, London, 2009.
3. “Hand book for Building Engineers in Metric systems”, NBC, New Delhi, 2008.
4. “Philips Lighting in Architecture Designs”, McGraw Hill, New York, 2004.
5. “Time saver Standards for Architecture Design Data”, Callendar JH, McGraw Hill, 2004.
6. William H. Severns and Julian R. Fellows, “Air conditioning and refrigeration”, John Wily and sons, London, 2008.

MBEM116 - Construction Materials and Technology Lab	Subject Category	JC
	Number of Credits	04
	Lecture Periods per Week	01
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical's	03
	Total Periods per Week	04

Objective: A thorough knowledge of material selection through the material testing based on specification

LIST OF EXPERIMENTS

1. Casting and Testing of Concrete Cubes
2. Casting and Testing of Concrete Cylinders
3. Tests on Cement
4. Tests on Fine Aggregate
5. Tests on Coarse Aggregate
6. Tests on Concrete
7. Mix design of concrete as per IS Code
8. Mix design of high-performance concrete as per IS Code
9. Flow Characteristics of Self Compacting concrete.
10. Effect of minerals and chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.
11. NDT on hardened concrete – Ultra sonic Pulse Velocity Test- – Demonstration
12. NDT on hardened concrete – Rebound Hammer Test
13. NDT on hardened concrete – Core Extraction- – Demonstration
14. Permeability tests on hardened concrete – Demonstration
15. Flexural Test on Beams- Demonstration

SECOND SEMESTER

MBEM121 - Project Cost and Contract Management Studio	Subject Category	SC
	Number of Credits	15
	Lecture Periods per Week	-
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical's	15
	Total Periods per Week	15

Objective: The objective of the course is to augment the knowledge imparted through lectures by discussion of practical cases to determine practice, critically analyse application of knowledge in professional context, experience simulated application procedure in a limited context. Live case studies are undertaken and various aspects of the course are taken up in the Studios. Emphasis is given to interaction with project technical staff and other stakeholders. Details Specifications; Understand execution process of building works; Frame scope of work for specification of item; Write specifications.

Unit I Cost Management 45

Plinth Area Estimate; Arrive at volumes/areas/heights of the building projects; Calculations of Plinth Area; Detailed listing of work packages; Specification deviation statement; Calculation of cost index; Additional item rate calculations; Item nomenclature for civil and MEP works; Quantity surveying of projects; Analysis of rates;

Unit II Contract Management 75

Conventional and emerging contracts types like CPWD, MES, FIDIC, AIA, NEC, JCT etc.; International contract types, and comparative analysis; Contract estimations; Bidding models and bidding strategies; Qualification of bidders; Suitability of contracts for various types of project; Roles and the responsibilities of stakeholders; Critical Appraisal of the Conditions of Contract; Comparison of the contract conditions; Determination of Special Conditions of Contact for projects; Tendering and contractual procedures; Indian Contract Act 1872; Contract Administration; Delay protocol; Change order analysis; professional ethics;

Unit III Value engineering in projects 30

Analysis of Function; Life Cycle Costing techniques; Value Engineering on Architectural Planning, Selection of Materials (green) for finishes, Selections of MEP System out of various alternatives;

Unit IV Risk and Scope Management 45

Claim management, resolving disputes, and compensation; Dispute and Resolution Techniques; Arbitration and Conciliation Act 1996; Arbitration Case Studies;

Unit V Cost Benefit Analysis of Project 30

Applicability of cost benefit analysis and the review of Project feasibility.

Total: 225 Periods

Outcome:

The student will have a clear picture on financial aspects of the project like cost, feasibility of the project and also on different types of contracts used in executing a project with live case studies.

MBEM122 - Project Cost Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: The objective of the course is to disseminate knowledge about the application of project management processes during the pre-construction phase of a project life cycle. The competence is also aimed to be developed for efficient and effective decision making in each of the project management areas. The course is structured to research and develop understanding about the costing in construction projects.

Unit I Cost Management 9

Cost management processes; Cost determination, management and control; Risk in cost; Life Cycle Cost analysis; Time-cost assessment; Estimation types, parametric and elemental methods of estimation, preliminary cost estimations, cost indices, analysis of rates, analysis of material, labour and equipment component, rationale of contingencies, detailed estimation, schedule of rates, preparation of bills of quantities and justification documentation;

Unit II Value Engineering 9

Value engineering; Valuation for building projects, basic elements of land & building methods for Valuation methods including Income Capitalization Method, market analysis; Principles of change of scope and change management; Performance reporting and risk response; Project closing, administrative closure and contracts close out;

Unit III Cost Analysis 9

Cost analysis - direct cost, indirect costs, and slope of the project activities, optimization of cost and schedule through network contraction – applications in construction industry.

Cost control in construction projects, importance of cost control and its objectives, classification and codes.

Unit IV Accounting 9

Management Accounting, Nature and scope of management accounting, cost accounting, financial accounting and its limitation, accounting procedures

Unit V Fund 9

Meaning of fund and fund flow analysis, advantages of fund flow statements, limitation and preparation of fund flow statement and cash flow statement. Price forecasting benefits and its methods: Average method, moving average method, weighted average method, exponential smoothening.

Total: 45 Periods

Outcome:

The student will knowing how to manage a project in terms of cost management, cost analysis, accounting and fund flow analysis.

Reference Books

1. M. N. Arora: "Management accounting", Himalaya Publishing House.
2. Mueller, F.W. Integrated cost and schedule control for construction projects.
3. Pilcher, R. "Project Cost Control in Construction." Collins, London, 1992
4. Gobourne: Cost control in the construction industry.

5. Chris Hendrickson and Tung Au: Project Management for Construction
6. Shutt R.C. (1995), “Economics for the construction industry,” Longman Scientific and Technical, England.

MBEM123 - Research Methodology	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical’s	-
	Total Periods per Week	03

Objective:

1. To impart the basics of research methods in architecture
2. To enable students to write research papers
3. To equip students with skills to articulate findings of their research

Unit-I: Introduction to Research **9**

What is research? Research versus faith, research versus project, philosophical and theoretical basis; Research philosophies – positivistic, phenomenological, anthropological; Research terminology; Types of Research – exploratory, descriptive, analytical, predictive; Research approaches – quantitative/ qualitative/mixed, basic/ applied, deductive/ inductive.

Unit-II: Research Components **9**

Elements of research process: finding a topic - Writing an introduction - Stating a purpose of study identifying key research questions and hypotheses - Reviewing literature using theory, defining, delimiting and stating the significance of the study, advanced methods and procedures for data collection and analysis - illustration using research samples.

Unit-III : Review of Literature **9**

Library and archives - Internet: new information and the role of internet, finding and evaluating sources of misuse - Test for reliability ethics.

Unit-IV: Data Collection and Analysis **9**

Methods of data collection - From primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling - Problems encountered in collecting data from secondary sources, processing and analysis of data.

Unit-V: Technical Writing **9**

Writing & publishing the research work in journals - Research writing in general - Components: referencing - Writing the bibliography - Developing the outline – presentation etc. - Case studies - illustrating how good research can be used from project inception to completion - Review of research publications. Ethics in Research – Plagiarism – Thesis Chapter Development – Time Schedule – Publication and Peer Review Process related to particular subject domain.

Total: 45 Periods

Outcome:

End of the course the student will be trained to write a technical paper on the topics taken of their choice.

References

1. Wayne C Booth, Joseph M Williams, Gregory G Colomb, The Craft of Research, 2nd Edition, Chicago guides to writing, editing and publishing, 1995
2. Iain Borden, Kaaterina Ruedi, The Dissertation: An Architecture Student's Handbook, Architectural Press, 2000
3. Ranjith Kumar, Research Methodology - A step by step guide for beginners, Sage Publications, 2005
4. John W Creswell, Research design: Qualitative, Quantitative and Mixed method approaches, Sage Publications, 2002
5. Linda N. Groat, David Wang, Architectural Research methods, Wiley, 2nd edition, 2013

MBEM124 - Construction Occupational Health and Safety Administration	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To study and understand the various safety concepts and requirements applied to construction industry. To study the various construction safety problems and safety programs. To study the various laws related to safety in construction industry.

Unit I Site Management 9

Organization of site operations, temporary structures, site management procedures and documentation; Health safety and environmental management; Safety procedures and management responsibilities; Principles, systems and Practices of safety Management, occupational health and hygiene in construction; Project Environmental management;

Unit II Safety problems in Construction 9

Safety problems in construction, Hazards in construction projects, Accident: definition, causes, cost, measurement, investigation and prevention of accidents, Legal and financial aspects of accident, Safety Program: Need,

Unit III Safety in use of construction equipment 9

Vehicles, cranes, hoists and lifts etc., Safety of scaffolding, ladders, working platforms etc, safety while using electrical appliances, explosives, blasting etc, fire safety, Fire safety Causes and safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, high rise constructions etc., safety measures for storage and handling of building materials.

Unit IV Laws related to safety in construction industry 9

Laws related to the Industrial Safety, Safety Provisions in the Factory Act, Labour laws. Measurement of Safety Performance, Safety Audit. Experience modification rating, workers insurance.

Unit V Safety programs 9

Elements of an Effective and safety program, general safety program in construction industry. Hazard Identifications and Control Techniques – HAZOP, FMEA, FMECA

Total: 45 Periods

Outcome:

The students will have knowledge of different safety concepts learnt from various case studies and safety contracts/laws to be implemented in construction industry.

Reference Books

1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, “Construction Safety and Health Management ", Prentice Hall Inc., 2001. Internal continuous assessment: 100 marks Internal continuous assessment is in the form of periodical tests, assignments
2. Kwaku A., Tenah and Jose M.Guevera, “Fundamental of Construction Management and Organization ", Prentice Hall of India, 1995.
3. Juran Frank, J.M. and Gryna, F.M. " Quality planning and Analysis ", Tata McGraw Hill, 1982.
4. Hand book on Construction Safety Practices, SP:70, BIS,2001.
5. Safety Management in Construction Industry- A manual for project managers, NICMAR, Mumbai

MBEM125 - Construction Contracts, Specifications and Legal Issues	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical’s	-
	Total Periods per Week	03

Objective: The objective is to elaborate the construction contracts and legal issues related to construction contracts. To understand the tendering process and legislations related to construction labour. To understand the disputes which may arise during construction and standard procedures for dispute resolution. The objective is also to define the specifications for various types of construction works.

Unit I Introduction to Construction Law 12

Need for legal issues in Construction in the Indian Judicial System – Context of Construction Industry, Principles of a Contract, Indian Contract Act 1872 – Provisions for Construction Industry, Essentials of a Valid Contract, Types of Contracts, Alternate Contract Methods, Concept of Completion of a Contract, IT Law 2000 and its Influence on construction Contracts

Unit II Construction Tendering Process 9

Introduction to Construction Process, need for tendering, process of Tendering in Construction, Concept of completion of the contract, Sub-Contracts and requirements, Tendering Models and Strategies, Prequalification of Bidders, Documents forming a BID and a Contract, Agreements and Bonds in Tendering Process.

Unit III Specifications 12

Importance of Specifications and Estimates in Construction, Methods of Specification writing, classification of specifications, specifications of typical items, standard specifications, typical space for building works, implications of variations and incomplete specifications, impact on building costs.

Unit IV Disputes and Liabilities in Construction 6

Major sources of disputes in construction, Delays – Types, Claims and solutions, Labor Laws in India, Worker Compensation and Insurance laws, Construction Liabilities and Litigations, Disputes in Land Development

Unit V Dispute Resolution in Construction 6

Dispute Resolution in Construction, Judicial Process in Dispute Resolution, Alternate Dispute resolution methods, Arbitration and Conciliation Act 1996, Importance of Arbitration in Construction, Arbitration Process, Arbitration Clause in Contracts

Total: 45 Periods

Outcome:

The student will have enough knowledge on different contracts related procurement, labour, safety and standard procedures to be adopted for dispute resolution that arise in the construction project.

Reference Books

1. K. Dutta: Materials Management: Procedures, Text and Cases, Prentice Hall of India Private Limited, New Delhi, 2nd edition, 2004
2. Gopalkrishnan & Sundarsan: Material Management: An Integrated Approach, Prentice Hall of India Private Limited, New Delhi, 2003 B.
3. Introduction to Materials Management, Arnold, Chapman, Pearson, 5th edition, 2008
4. Purchasing principles & Techniques by Buity, P.J.H.and Farmer
5. Purchasing management by Borry H.A.
6. Inventory management in India by R. S. Chadda
7. Inventory management by Enrick N.L.

ELECTIVE I

MBEM1210 - Building Facilities Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To develop students' capability to manage various building services and to increase safe and healthy utilization of buildings with minimal breakdown time.

Unit I Planning norms for various Services and Utilities 9

Planning norms for various Services and Utilities, Township facilities; Schools, Hospitals, Housing, Commercial Complexes etc. Importance of building services, type of services required to keep the facility usable, planning of services, organization structures of services management. Role and administrative functions of Supervisors.

Unit II Fire Fighting and Circulation 9

Firefighting – Basic requirement for the work firefighting system, Various components of the firefighting system, maintenance required of the system, fire lighting in high-rise buildings, commercial / industrial complexes, public buildings, checklist for fire safety, firefighting.

Lifts / elevators, Escalators, permissions & procedures, legal formalities for Elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

Unit III Plumbing Services 9

Basics of Plumbing systems, Requirement of Plumbing works, Agency, Activity Flow chart for Plumbing work, Quality, checking of materials. Water Supply distribution system in high-rise buildings and other complexes, pumps and pumping mechanism, operation & maintenance of fittings and fixtures. Do's and Do not's for water pipe networks

Unit IV Building Facilities – I 9

Sewage Treatment Plants, Landscaping & Horticulture, Building maintenance management. Air - conditioning and Heating, Flowcharts of air conditioning & heating. Centralized systems, monitoring working of these equipment, checklist of Inspection, Performance testing.

Unit V Building Facilities – II 9

Water Proofing, Damp Proofing and Termite proofing. Working Procedure and Stages of work of water proofing for Water Closets, Bathrooms, Terrace, Sloping roof, Basements, Tanks. Use of chemicals for water proofing treatment. Damp proof course, Causes and precautions for Dampness.

Total: 45 Periods

Outcome:

The student will gain enough capability to manage various building services and to increase safe and healthy utilization of buildings with minimal breakdown time.

Reference Books

1. Principles of Fire Safety Engineering- Akhil Kumar Das, PHI Publishers
2. Lifts, Elevators, Escalators and Moving Walkways/Travelators by M Y H Bangash, T Bangash- ISBN-13: 978-0415364379
3. Plumbing design and practice- Y Deolalikar- McGrawHill Publishers
4. Waste water Treatment: Concepts and Design Approach- Karia G L- PHI Publishers
5. Building Construction – Rangwala – Charotar Publisher

MBEM1211 - Waste Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To understand problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc; To provide knowledge of legal, institutional and financial aspects of management of solid wastes; To make aware of Environment and health impacts solid waste mismanagement; To understand engineering, financial and technical options for waste management

Unit I Introduction 9

General introduction including definitions of solid waste including municipal, hospital and industrial solid waste; legal issues and requirements for solid waste management and health and environmental issues related to solid waste management. Health and environmental issues related to solid waste management.

Unit II Characterization, Collection, Storage and Transportation 9

Sampling and characterization of solid waste; Analysis of hazardous constituents in solid waste including QA/QC issues; Methods of waste collection, collection techniques, waste container compatibility, waste storage requirements, transportation of solid wastes.

Unit III Treatment and disposal techniques 9

Treatment and disposal techniques for solid wastes–composting, vermin-composting, autoclaving, microwaving, incineration, non-incineration thermal techniques, use of refuse derived fuels, land-filling.

Unit IV Waste Management 9

Waste reduction at source – municipal and industrial wastes Material and resource recovery/recycling from solid wastes Waste minimization and concept of industrial ecology and industrial symbiosis; Economics of on-site vs. off-site waste treatment and disposal (individual vs. common disposal).

Unit V Case Studies 9

Integrated waste management practices. Case Studies

Total: 45 Periods

Outcome:

The student will be having an idea on different types of waste and will gain knowledge how to deal with waste in terms of technical and financial aspects

Reference Books

1. Batstone R., Smith J.E. (Jr.) and Wilson D. (1989) The Safe Disposal of Hazardous Wastes-the Special Needs and Problems of Developing Countries, The World Bank Technical Paper No. 93, Vol. I, II and III, Washington, DC, The World Bank.
2. Central Public Health and Environmental Engineering Organization (CPHEEO) (2000) Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications.
3. Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill.
4. Prüss A., Giroult E. and Rushbrook P. (1999) Safe Management of Wastes from Health-care Activities, Geneva, World Health Organization.
5. SW-846 (1980) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Washington, DC, USEPA, Available at http://www.epa.gov/epawaste/hazard/ testmethods/sw846/index.htm.
6. Tchobanoglous G., Theisen H. and Vigil S. (1993) Integrated Solid Waste Management: Engineering Principles and Management Issues, New York, McGraw-Hill.
7. Vesilind P.A., Worrell W.A. and Reinhart D.R. (2001) Solid Waste Engineering, Australia, CL-Engineering.

MBEM1212 - Healthy Buildings	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To understand the Fundamentals healthy buildings and the aspects related to it. To learn to assess the building performance based on its impact on health of occupant connecting with the productivity of the individual. To understand the performance of the building services against standards.

Unit I Introduction 6

Healthy buildings theory, Healthy buildings theory, Performance of building services against standards, Building Related Illness (BRI), Sick Building Syndrome (SBS). Work place standards of health.

Unit II Performance of building 9

Observation and analysis of health risk in buildings, and maintenance requirements, Environmental and health impact of building materials. Investigations of healthy living practices: washing people, washing clothes, removing waste, improving nutrition, reducing crowding, separating people from animals, vermin or insects, reducing dust, controlling temperature and reducing trauma.

Unit III Natural ventilation 12

Supply of fresh air, physiological cooling and night time cooling of buildings. Ventilation requirements of various buildings & spaces, Ventilation standards, Ways of natural ventilation – single side ventilation, cross ventilation, stack effect and reverse stack effect. Dissipation of structural heat. Ventilation strategies for various climatic zones in India. Air movement around the buildings and through the buildings. Effects of building form and orientation, Fenestration design of buildings to enhance air movement and ventilation, NBC, ASHRAE guidelines for ventilation.

Unit IV Indoor Air Quality 9

IAQ and health, Causes of Sick Building Syndrome, International standards, IAQ in offices, residential and commercial and Industrial buildings etc., Accepted IAQ for different functional spaces and uses, indoor air quality survey, ventilation standards for IAQ v/s energy conservation, enthalpy at selected pollution levels,

Unit V Administrative and legislative response 9

Outdoor and indoor air quality standards (NBC, ASHRAE, etc.), urban air, indoor environment and human exposure. Indoor climate, urban context and energy use, heat islands, Mechanical ventilation, dilution method, systems and equipment, air conditioning, ventilation rate procedure for multiple spaces and ambient air quality standards.

Total: 45 Periods

Outcome:

Students will be aware of Fundamentals healthy buildings and the aspects related to it. They will also be will be familiar to assess the building performance based on its impact on health of occupant connecting with the productivity of the individual and the performance of the building services against standards.

Reference Books

1. Batstone R., Smith J.E. (Jr.) and Wilson D. (1989) The Safe Disposal of Hazardous Wastes-the Special Needs and Problems of Developing Countries, The World Bank Technical Paper No. 93, Vol. I, II and III, Washington, DC, The World Bank.
2. Central Public Health and Environmental Engineering Organization (CPHEEO) (2000) Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications.
3. Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill.
4. Prüss A., Giroult E. and Rushbrook P. (1999) Safe Management of Wastes from Health-care Activities, Geneva, World Health Organization.
5. SW-846 (1980) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Washington, DC, USEPA, Available at http://www.epa.gov/epawaste/hazard/ testmethods/sw846/index.htm.
6. Tchobanoglous G., Theisen H. and Vigil S. (1993) Integrated Solid Waste Management: Engineering Principles and Management Issues, New York, McGraw-Hill.
7. Vesilind P.A., Worrell W.A. and Reinhart D.R. (2001) Solid Waste Engineering, Australia, CL-Engineering.

MBEM1213 - Equipment Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: Importance and application of different equipment in construction and their management.

Unit I Introduction 9

Importance of construction equipment their classification, selection and contribution rate of production. Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks etc.

Unit II Hoisting equipment 9

Hoist winch, hoisting chains and hooks, slings. Various types of cranes - tower crane, mobile crane, and derrick crane, safety in crane operations, their characteristics performance and applications to building process.

Unit III Concrete mixers 9

Truck mixers, pneumatic concrete placer, vibrators for concrete, batching plants. Their characteristics performance and applications in construction process. Equipment for Dewatering and Grouting – Equipment for Demolition. Under water concreting equipment.

Unit IV Conveying equipment 9

Package conveyor, screw conveyor, bucket conveyor and different types of belts, their Characteristics, performance and applications. Latest technologies in construction equipment.

Unit V Maintenance, cost and Safety 9

Maintenance, cost and Safety of equipment, Equipment cost – Operating cost – Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment and Replacement Analysis - Safety instructions and procedures.

Total: 45 Periods

Outcome:

Students will have a knowledge on different equipment's and their usage with respect to the project. They will also have an idea of management of the equipment as per the usage.

Reference Books

1. Peurify, R.L.(1996). "Construction, Planning, Equipment and Methods." McGraw-Hill Book Company, Inc, NY
2. Mahesh Varma (1997) "Construction Equipment and its planning & applications." Metropolitan Book Co (P) Ltd, New Delhi, India.
3. U.K. Srivastava (1999). "Construction Planning and Management." Galgotia Publications Pvt., ltd, New Delhi, India
4. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
5. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.

THIRD SEMESTER

MBEM211 - Project Procurement Management Studio	Subject Category	SC
	Number of Credits	15
	Lecture Periods per Week	-
	Tutorials per week	-
	Studio/Lab/Workshop/Practical's	15
	Total Periods per Week	15

Objectives: The intent of the course is to augment the knowledge imparted through lectures by discussion of practical cases to determine practice, critically analyze application of knowledge in professional context, experience simulated application procedure in a limited context. Live case studies are undertaken and various aspects of the course are taken up in the Studios. Emphasis is given to interaction with project technical staff and other stakeholders.

Unit I Contract Management for Project Managers **30**

Contract Management; Familiarisation with National and International Contract Forms; Study and documentation contract forms in International bidding; Identifying key differences between various contract forms; Risks in Contract Management for Project Manager;

Unit II Documentation for Projects **30**

Bidding Documents/ NIT; Developing notice inviting tender; Selecting bidding methodology; Developing bidding documents for projects;

Unit III Professional Services **30**

RFP/RFQ for Professional Services; Conceptualization and deciding requirements of Services desired for a project; Developing Quotation for Professional Consulting Services; Preparing a request for proposal / request for quote for professional consulting services

Unit IV Procurement of Equipment's and Documentation **30**

Preparation of equipment, plant and machinery plan; Develop detailed specifications based of project needs; Develop procurement documents for equipment, plant and machinery; RFP/RFQ and selection of suppliers;

Unit V Construction Logics **30**

Construction Logic for pre-construction phase of projects; identifying detailed activities, milestones based on Work Breakdown Structure;

Unit VI Codes of Practices **30**

Code of Professional Practice and Ethics in Project Management; Models for procurement of Project Management service

Unit VII Quality Management **45**

Quality Assurance Plans and Quality Control; Understanding evolution and significance of quality assurance plans and quality control mechanisms; Developing on the importance of Cost of Quality and Risks of Rework; Preparation of quality assurance plans for organizations and quality control

checklists for various items of works; Developing control mechanisms for ensuring quality management within organizations and project sites

Total: 225 Periods

Outcome:

The student will have a clear knowledge on documentation, code of practices, professional services and quality management in executing a project with live case studies.

MBEM212 - BIM Based Construction Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical's	01
	Total Periods per Week	03

Objective: To equip the students with necessary BIM based construction management background to comprehend the aspects of construction elements and management skills. To recap students about the computer based concepts of building engineering, structures and management concepts related to architecture on BIM based platform.

Unit I Fundamentals of BIM **9**

Fundamentals and practical use of information technologies in the construction industry; basic concepts of building information modelling (BIM);

Unit II Review of BIM based technology **9**

Review of software and technology available for BIM; practical use of BIM including design and clash detection;

Unit III Impacts and Functions of BIM **9**

Impact of BIM on construction management functions; construction scheduling and sequencing using BIM; cost estimating using BIM;

Unit IV Facility Management with BIM **9**

Facility management with BIM; integrated approach to navigate BIM as a multi-disciplinary design, analysis, construction, and facility management technology;

Unit V Class Exercise **9**

Class exercise to create a BIM model and to use it in scheduling, sequencing, cost estimating, management, and simulation of a construction project.

Total: 45 Periods

Outcome:

Students will be equipped with the software-based construction management background to comprehend the aspects of construction elements and management skills.

References:

1. Eastman, C.; Teicholz, P.; Sacks, R.; Liston, K. (2011) BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors. New York: Wiley. 626 pp.
2. Hardin, B., & McCool, D. (2015). BIM and construction management: proven tools, methods, and workflows. John Wiley & Sons.
3. Krygiel, E., & Nies, B. (2008). Green BIM: successful sustainable design with building information modeling. John Wiley & Sons.
4. Issa, R. R., & Olbina, S. (Eds.). (2015, May). Building Information Modeling: Applications and Practices. American Society of Civil Engineers.
5. Teicholz, P. (Ed.). (2013). BIM for facility managers. John Wiley & Sons.
6. Kymmell, W. (2007). Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations (McGraw-Hill Construction Series). McGraw Hill Professional.

MBEM213 - Project Finance and Risk Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: The objective of the course is to familiarize the fundamentals of finance and risk management concepts and their applications in the various phases of the project cycle of construction projects. The course aims to provide a basic knowledge to carry out the financial feasibility of projects, evaluation of project investment decisions.

Unit I Finance Management **9**

Finance Management; Time value of money; Taxation; Depreciation, amortization and inflation; Capital budgeting techniques; Management of working capital; Cash flow forecasting and cash flow management of projects; Understanding and analysis of financial ratio; NPV, ROR, and IRR; time value of money; basis of comparisons; discounted cash- flow; Cost-benefit analysis; replacement analysis; break-even analysis; financial statement analysis; balance sheet; income statement; project-loss statements; profit after taxation

Unit II Financial Models **9**

Financial investment alternative models; comparative analysis; assessing financial health of projects; concept of capita budgeting and working capital management for projects, risks; risks and uncertainties in capital budgeting; budgetary controls; performance budgeting; Financial Planning; preparation of financial feasibility report; project investment decisions; financial risk analysis; Practical problems; case studies, and application to projects

Unit III Norms & Procedures for finance **9**

National economic status and impact on construction; Financial accounting and budgeting; Forms of business organisation (including joint ventures, consortiums) International finance; Role of financial institutions; Project financing norms and procedures of International financial institutions; Financial management of international projects;

Unit IV Risk Management **9**

Introduction, probability, basics of decision analysis, Risk analysis concepts, methodology and application.

Unit V Risk Management Plans **9**

Risk communication, risk registers, risk charters and risk management plans, risk management planning case studies.

Total: 45 Periods

Outcome:

Student will be attaining basic knowledge to carry out the financial feasibility of projects, evaluation of project investment decisions.

Reference Books:

1. Roy Pilcher (1985) “Project Cost Control in Construction,” Collins Professional and technical books, London.
2. Humphreys, K.K., and Wellman, P. (1996) “Basic Cost Engineering,” Marcel Dekker, Inc. New York.
3. M Pandey, Financial Management, Vikas Publishing house pvt ltd9th Edition.
4. Donald Newnan, Engineering Economics analysis, Oxford University Press
5. Roy Pilcher, Principles of Construction Management, Mc Graw Hill London.
6. A.H. Taylor & H Shearing, Financial & Cost Accounting for Management Mac Donald & Evans Ltd, London 8th.

MBEM214 - Project Administration and Organizational Behaviour	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical’s	-
	Total Periods per Week	03

Objective: To know the students about the construction administration and Quality aspects. To understand the lines of authority in construction projects. To have the idea of different risks associated with construction industry and remedial measures. To properly understand the IS specifications and drawings in construction projects. To visualize and understand pre-construction operations and its limitations.

Unit I Construction Administration **9**

Introduction to Construction Administration, Control of Quality in Construction, Organizational Structure, Design Build Contracts, Responsibility for Coordination of the trades Role of owner, Contractor, Engineer, and Construction Manager.

Unit II Introduction to Authorities **9**

Introduction to authority, Lines of Authority in Construction administration on Construction Projects, Responsibility, and Familiarization with construction documents, Staffing responsibilities, Limitations of their duties/functions.

Unit III Risks in Administration **9**

Reasons for the risks, Certainty, Risk, and Uncertainty, Risk Management, Identification and Nature of Construction Risks, Contractual allocation of Risk, Types of Risks, minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis and their applications.

UNIT – IV Management and organizational Behaviour **9**

Definition models for organizational Behaviour, Tiers of management, management functions, skills needed by good managers, definition of personality, motivation, communication, how to use traits to predict behaviour in the work place, the role of emotion in the workplace, definition of organizational culture

UNIT – V Leadership in Organizational Behaviour **9**

The role of leaders, types of positional and personal power, influence tactics, Types of leaders, including task-oriented, people-oriented, transformational, servant and transactional, leadership styles, influential approach to leadership, individual and organizational approaches to coping with stress

Total: 45 Periods

Outcome:

Students will have knowledge on construction administration and Quality aspects. They aslo understand the lines of authority in construction projects. The idea of different risks associated with construction industry and remedial measures. And also to properly understand the IS specifications and drawings in construction projects.

Reference Books:

1. Fisk, E.R. (2000) "Construction Project Administration," Prentice Hall International, London.
2. Kwakye, A.A. (1997), "Construction Project Administration", Adisson Wesley Longman, London.
3. Stephen P. Robbins, Timothy A. Judge (2012), Organizational Behavior, 15th Edition, Prentice Hall
4. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
5. Ivancevich, Konopaske & Maheson, Oranisational Behaviour & Management, 7th edition, Tata McGraw Hill, 2008.

MBEM215 - Construction Procurement and Inventory Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: The intent is to disseminate knowledge about Procurement Management Processes with emphasis on consulting services. The procurement could also include design stage services. During the "Bid and Award Phase" of the project life cycle in different project types in terms of organizational settings, contractual arrangements and building typologies. In addition, the course covers the monitoring and control processes. The course includes procurement of equipment supplies.

Unit-I Project procurement management process **9**

Study of procurement guidelines of international institutions (e.g. World Bank, ADB); Design & construction (EPC and other forms) of contracts; Preparation of contract documents (RFP, RFQ); Pre-qualification of contractors; Evaluation of technical and financial bid proposals; Negotiation and award; Overview of dispute resolution mechanisms (Alternate dispute resolution, DRBs; Arbitration procedures; issues related to contract administration, etc.)

Unit-II Contracts for procurement of professional services **9**

Selection of professionals for professional services (Design, Project Management services); Fee structures and contractual conditions; Joint ventures of professional teams (including equity in construction organizations in EPC / design build contracts); Norms for engagements of international Consultants; Performance guarantees; Bank guarantees and other fiscal aspects; Project delivery systems (including PPP / Swiss Challenge, DBB, DB, EPC)

Unit-III Procurement procedures **12**

Procurement procedures for various supplies, equipment, machineries; Warrantees and tax issues; Inspections, testing and release of payments; Fiscal aspects of supplies; Material Management; Scope, Objective and function of material management; Material classification; Supply Chain Management; Procurement strategies and purchase procedures; Inventory control and management; Responsibilities of project management organisation; Procurement of Project Management services; Standard PMC consultancy agreement forms, fee structure; Code of professional practice; Issues of inter-disciplinary interaction and coordination and professional ethics;

Unit IV Inventory Management **9**

Inventory Control techniques. EOQ, Advantages and limitation of use of EOQ, Periodic ordering, order point control, safety stock, stock outs, application of AC analysis in inventory control, concept

of (JIT)- Just in time management, Indices used for assessment of effectiveness of inventory management.

Unit V Stores Management **6**

Receipt and inspection, care and safety in handling, loss on storage, wastage, Bulk purchasing, site layout and site organization, scheduling of men, materials and equipment

Total: 45 Periods

Outcome:

Student will have knowledge about Procurement Management Processes with emphasis on consulting services. The procurement will also include design stage services. During the “Bid and Award Phase” of the project life cycle in different project types in terms of organizational settings, contractual arrangements and building typologies.

Reference Books:

1. Purchasing and Inventory Control- by K. S. Menon, Wheeler Publication.
2. Materials Management, P. Gopalkrishnan, Prentice Hall
3. Handbook of materials management, P. Gopalkrishnan, Sundershan, Prentice Hall.
4. Inventory Management, Lc. Jhamb, Everest Publications

MBEM216 - Dissertation	Subject Category	JC
	Number of Credits	03
	Lecture Periods per Week	-
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical’s	03
	Total Periods per Week	03

Objective:

the objective of dissertation is to research on the chosen topics which could be in continuation with the earlier research or different. Students are expected to come out with more specific findings and recommendations and better innovative solutions. This should lead to better performance in the Thesis to be undertaken in the fourth semester.

Description

The state of art report prepared on the chosen topic and develop hypothesis to be tested through the research methodology designed for the purpose. A comprehensive seminar report is prepared with the identification of areas for further research and development. Students are required to test their outcome proposals through various methods, including questionnaire surveys and case studies. It is encouraged that students identify topics for the seminar work which can be further developed into a thesis work as well. Students must create an innovative insight on the specific issues.

The state of art report prepared on the chosen topic and develop hypothesis to be tested through the research methodology designed for the purpose. A comprehensive report is prepared with the identification of areas for further research and development. Students are required to test their outcome proposals through various methods, including questionnaire surveys and case studies. It is encouraged that students identify topics for the work which can be further developed into a another Project research in the next semester in Thesis for more in-depth research. Alternatively, This Project can be an independent research topic. Students must create an innovative insight on the specific issues.

Project work includes processes such as: Research area identification; hypothesis of research topic; literature sourcing and search; aim and objective definition; formulation of methodology; field study planning; survey data collection, analysis and result presentation; literature study; compilation and inference drawing; research study validation through case studies, field application and simulation models; discussion of findings of research findings; study conclusion and recommendation formulations.

The progress of the work is presented and discussed by the student periodically in the classroom environment and progress monitored continuously. The work develops the comprehension and presentation skills of the students. The students are provided guidance from the faculty to channelize their thoughts.

Total: 45 Periods

Outcome:

Undertaking research in specific topics, presenting literature studies, presenting analysis and making proposals for recommendations for application will helps the student further to develop into a another Project research in the next semester in Thesis for more in-depth research.

MBEM217 - Summer Training	Subject Category	JC
	Number of Credits	01
	Lecture Periods per Week	-
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical's	-
	Total Weeks	6

Objective:

Description:

Practical Training of 6 weeks is to be carried out during the Summer Vacation after the Second Semester. During Practical Training students are required to study various aspects, as discussed during preceding semester course and submit a report on the following aspects:

1. General Information

   Name of student
   Placement of Training
   Duration of training

2. Nature of organizational enterprise (explain type of design, construction, PM activities the organizations involved)
3. Organization structure and position of Trainee
4. Chronological list of responsibilities assigned to the Trainee
5. List of the Works done during training (enclose typical work outputs)
6. Experiences and inferences drawn during Training
    1. Typical project work stages followed
    2. Time management process adopted
    3. Cost management process adopted
    4. Quality management process adopted
    5. Scope management process adopted
    6. HR management process adopted
    7. Communication systems, practices and management processes adopted
    8. Procurement management policies and processes adopted
    9. Health, safety, environment management processes adopted
    10. Risk management processes adopted

        Type of consultancy (architecture, PM, construction contract followed) (enclose typical documents) Special features of the project / work (enclose documents to explain and highlight peculiarities)

    11. Any other information

Total: 6 Weeks

Outcome:

The students will be exposed to the industry and they will learn different types of contracts, laws that are considered in initiating and completing the projects.

FOURTH SEMESTER

MBEM221 - Thesis	Subject Category	TC
	Number of Credits	24
	Lecture Periods per Week	-
	Tutorial Periods per Week	-
	Studio/Lab/Workshop/Practical's	24
	Total Periods per Week	24

Objective: The objective of the thesis is to provide an opportunity to the students to prepare independent and original study of a special project of his own choice.

The subject for special study may be conceptual or practical but pertaining to Building Engineering and Management. This should however, offer scope to adopt a fresh approach in formulating a concept or developing a methodology effective and useful. Each student will prepare the Thesis under the guidance of a principal advisor with regular reviews by the faculty of the department. The Thesis will be presented in the accepted form of a thesis report duly supported by copious References, sketches, graphs, statistical data, details of survey if any, detailed account of experimental / analytical procedures adopted. Each student is required to defend his Thesis at a Viva Voce Examination by jury.

1. Building Engineering 2. Construction technology 3. Structural systems 4. Energy efficient building materials & techniques 5. Construction project management 6. Time management 7. Cost management 8. Quality management 9. Safety management 10. Contract Administration	11. Design management 12. Construction financial management 13. Human resource management 14. Quantitative techniques 15. Energy management 16. Building services 17. Building management systems 18. Infrastructure services 19. Management information systems 20. Project planning and feasibility 21. Disaster management

Total: ___ Periods

Outcome:

Student will prepare independent and original study of a special project of his own choice from the all the knowledge they have gained from the course.

MBEM402 - Quality and Human Resource Management	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: The intent of the course is to give an insight into the concepts of Quality Management System and develop applications relevant to planning, design, construction and management of buildings projects. It also aims to develop competence to manage human resource and enhance its potential in the interest of individual of the organisation. The course should help in developing the necessary skills and sensitivity towards working in teams and organizations.

Unit I Quality Management Concepts **9**

Quality concepts and stakeholder concerns for building and construction; Evolution of modern concept of Quality management process approach; Quality assurance & control; Quality management system and ISO 9000 : 2000 requirements; Quality system standards for construction elements; Inspections & tests; Quality management tools; Environmental Management System Standards and their application in construction; EMS - QMS relationships; Concept and philosophy of TQM; Quality circle, Quality cost; Practical aspects of quality control of building projects. Good practices and managerial responsibilities;

Unit II Quality Management Standards **9**

ISO 9000 Quality system standards (family discussion); applicability of ISO 9000 series standards world-wide, India and Indian Building sector; Elements of quality systems standards elements; Aspects of quality control & assurance of major building items like RCC, brickwork, woodwork, steelwork, flooring, finishing, internal water supply, sanitary electrical services, external services like roads, sewers et.; quality of maintenance works, checklists; Contractual implications of quality systems;

Unit III Quality Management Tools **9**

Quality Tools; SWOT analysis, Ishikawa Diagram, Pareto Analysis, Statistical Quality Control, Brainstorming, Delphi Technique; Quality cost; Quality system and Total Quality Management philosophy as applied to building sector; Human resource management for TQM; Business Process Re-engineering; Benchmarking; Partnering; Quality Circles; Quality Function Deployment; Just in Time technique; Six-Sigma; Analysis and design tools for management, including, Quality Function Deployment, Brain storming, Parametric Modelling);

Unit IV Organizational Behaviour **9**

Concepts of organisational and individual behaviour; Perception and attitudes; Communication process and information management; Motivation concepts and processes; Group behaviour and teams; Leadership; Conflict management, Stress management. Nature of organisations; Organisational development; Principles of organisation structure;

Unit V Human Resource Management 9

Human resource policies & practices; Selection, training and assessment; Performance Appraisal; Training need assessment and dissemination of training; Post-training performance assessment.

Total: 45 Periods

Outcome:

The students will develop competence to manage human resource and enhance its potential in the interest of individual of the organization. They also will help in developing the necessary skills and sensitivity towards working in teams and organizations.

Reference Books:

1. Juran Frank, J.M. and Gryna, F.M., Quality Planning and Analysis Tata McGraw Hill 1982.
2. Grant E.L. and Leavens Worth Statistical Quality Control McGraw Hill 1984, Hutchins G, ISO 9000, Visa Books, New Delhi, 1993.
3. Ron Baden Hellard, Total Quality in Construction Projects, Thomas Telford, London.

ELECTIVE II

MBEM2210 – Prefabricated Structures	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective:

Units

Total: ___ Periods

Outcome:

_____

_____

MBEM2211 - Structural System and Design	Subject Category	TC

Number of Credits	03
Lecture Periods per Week	02
Tutorial Periods per Week	01
Studio/Lab/Workshop/Practical's	-
Total Periods per Week	03

Objective: The objective of the course is to introduce the structural system concepts and design processes methodology in relation to architectural and services systems peculiarities of building projects. These concepts will help in the selection of the appropriate structural systems and the broader understanding of the design process and structural detailing aspects which are essential for the design management and construction management responsibilities. Planning, design emphasis would consider life cycle cost economics and sustainability issues.

Unit I Introduction to Structure Systems **9**

Principles of structural analysis, design and detailing, static and dynamic loading concepts, concept of prescriptive versus performance based design;

Unit II Structural Requirements **9**

Study of structural requirements of buildings, Basis of Design;

Unit III Various Structural Systems **9**

Various structural systems for low-rise (including confined masonry), multi-storeyed, tall and super tall buildings and their planning and design considerations including cost economics;

Unit IV Various Studies **9**

Seismological studies, Landslide vulnerability; Earthquake and wind resistant design and detailing of buildings including codal provisions; Seismic-resistant architecture design; Technologies for seismic risk reduction; Technologies for hills and Himalayan region;

Unit V Structural System Properties **9**

Durability of structures, service life of structure; Structural fire safety; Special structure systems including large span structures, blast resistance; Computer aided structural analysis and design process; Constructability review and construction method statement; Assessment of distressed structures and forensics; Sustainable structure system design; Performance based design of structures; Analysis of special buildings (including tall and super tall);

Total: 45 Periods

Outcome:

The students will gain knowledge on structural system concepts and design processes methodology in relation to architectural and services systems peculiarities of building projects. These concepts will help in the selection of the appropriate structural systems and the broader understanding of the design process and structural detailing aspects which are essential for the design management and construction management responsibilities.

Reference Books:

1. Zalewski, Waclaw, and Edward Allen (1998). *Shaping Structures: Statics*. New York, NY: Wiley,
2. Schodek, Daniel (2000). *Structures*. 4th ed. Upper Saddle River, NJ: Prentice Hall,
3. A.K. Chopra, "Dynamics of Structures", 5th Edition, Pearson, 2017.

MBEM2212 - Environmental Impact Assessment	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: To introduce Environmental Impact Assessment concepts, methodology and regulations.

Unit I Introduction to Environment Aspects **9**

Definition, basic concepts and principles of EIA. Regulatory frame work in India. Environmental inventory, base line studies, over view of EIA studies.

Unit II Assessment and Methodologies **9**

Physical, biological assessment, Socio economic and cultural environmental assessment, EIA methodologies– Adhoc, matrix, checklist approaches. Economic evaluation of impacts-cot benefits of EIA, Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement.

Unit III Environmental Assessment **9**

Introduction, process, Basic steps involved, Description of environmental setting – Base line data collection, possible impacts due to water resources projects. Impact prediction and assessment – methods of impact assessment, Matrix and check list method, Selection of proposed action. Preparation of environmental impact statement.

Unit IV Legislations and Regulations **9**

Rationale, concerns, legislative data systems, safe drinking water act, clean water act, clean air act, noise control act, resource conservation and recovery act, comprehensive environmental response, compensation and liability act.

Unit V Municipal Solid Wastes **9**

Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

Total: 45 Periods

Outcome:

The student will gain knowledge on Environmental Impact Assessment concepts, methodology and regulations.

Reference Books:

1. Canter, L.W. (1996), 'Environmental Impact Assessment', McGraw- Hill Book Company, New York.
2. Corbitt Robert A. (1999), Standard Hand Book of Environmental Engineering' McGraw Hill Book Company, New York.
3. Marriott, 'Environmental Impact Assessment: A Practical Guide', McGraw-Hill Book Company, New York.
4. Sabins F.F. Jr. (1978), 'Remote Sensing Principles and Interpretations' W.H. Freeman and Company, San Francisco
5. Jensen John R. (1986), 'Introductory Digital Image Processing', Prentice-Hall of India, New York
6. A K Srivastava, Environment impact Assessment, APH Publishing, 2014 2.
7. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc., New York, 1995.
8. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification.

MBEM 2213 - Lean Construction	Subject Category	TC
	Number of Credits	03
	Lecture Periods per Week	02
	Tutorial Periods per Week	01
	Studio/Lab/Workshop/Practical's	-
	Total Periods per Week	03

Objective: Lean can be defined as creating predictable, reliable, and uninterrupted workflow by eliminating no value-added activities. Objective of this course is to introduce the lean project delivery system (LPDS) applied to the construction industry.

Unit I Introduction to Lean Philosophy **45**

Introduction to lean philosophy, definition of lean, overview of history of lean principles, lean principles in other sectors, lean practices in construction, process orientation versus task orientation, transformation value-flow, production view of design and construction

Unit II Lean Principles & Practices **45**

Lean principles and practices in construction, designing with lean principles, lean in design process, designing for lean construction, linkages of lean and green concepts in design of the built environment.

Unit III Lean Culture **45**

Enhancing lean construction culture, lean in procurement, lean in production planning, lean in coordination and logistics, lean and offsite, lean for real estate and infrastructure projects

Unit IV **45**

Lean construction techniques such as Waste avoidance and reduction, partnering, Target Value Design and Set Based Design, Building Information Modelling (BIM), Pull Planning and Last Planner System, Huddle Meetings, 5S, Visual Management, Work Structuring, Continuous improvement, Pokea-yoke, Just in Time, A3 Reports, Value Stream Mapping

Unit V Lean Project Delivery **45**

Lean project delivery, value of lean for design and construction organizations, implementation issues, drivers and barriers to lean implementation in the construction sector, linkages of lean paradigm to other industry initiatives

Total: 45 Periods

Outcome:

The student will have knowledge on lean project delivery system (LPDS) applied to the construction industry. Through which they can create predictable, reliable, and uninterrupted workflow by eliminating no value-added activities.

Reference Books:

1. Sacks, Rafael, Samuel Korb, Ronen Barak (2017) Building Lean, Building BIM: Improving Construction the Tidhar Way. Routledge.
2. Garbutt Charlie (2017), lean construction, a small contractor's journey, Advantage Media Group
3. Blokdyk Gerardus (2018), lean construction, a complete guide, 5starcooks