



# SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY**  
(DEEMED TO BE UNIVERSITY)

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Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119  
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## SCHOOL OF BUILDING & ENVIRONMENT

### Department of Architecture

Board of Studies meeting for M.Arch.(Building Management) held on 02-07-2020

Venue: Virtual meet in ZOOM platform

Time: 9:20 AM – 12:00 PM

#### Members present:

External Members	Signature	Internal Members	Signature
<b>AR. SARATH C KANTH</b> Design Tech Architects Chennai		<b>DR. DEVYANI GANGOPHAHY</b> Dean & Head Department of Architecture School of Building & Environment	
		<b>DR. SURESH KUPPUSAMY</b> Senior Professor & Design Chair Department of Architecture	
		<b>AR.SUKIRTHA SURESH</b> Associate Professor	
		<b>AR.RAMESH KUMAR.A</b> Associate Professor	

#### Special invitees present:

S.No	Name and Designation	Signature
1.	<b>AR.EBIN HARRISON</b> Associate Professor	
2.	<b>AR.SURYA RAJKUMAR</b> Associate Professor	

The proposed curriculum and syllabus 2020 for M.Arch. (Sustainable Architecture) was accepted with the suggestions made by the external member as given below in the minutes of meeting.

## Minutes of the Board of Studies 2020 meeting

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A Board of Studies meeting was held as Virtual mode in ZOOM platform on 2<sup>nd</sup> July 2020 with the following agenda:

1. Welcome address, Opening remarks on the proposal to introduce REGULATION 2020 and the methodology adopted.
2. Comparative analysis of existing R 2015 and proposed R 2020 curriculum structure, R 2020 curriculum structure and Salient Features of Regulation 2020.
3. Detailed discussions on the proposed syllabus (from semester 1 to semester 4) and proposed Regulation 2020.
4. Any other matter with the permission of Chair.

### **Agenda notes for (R15 / 2) / 1 - Welcome address, Opening remarks on the proposal to introduce REGULATION 2020 and the methodology adopted.**

Dr. Devyani gangopadhyay welcomed the Board of Studies External member Ar. Sarath C Kanth and thanked him for accepting the invitation of SIST at a very short notice. She informed the member about the purpose of Board of Studies meeting with particular reference on the revision in M.Arch Building Management course. The syllabus is revised every 5 years to update the course with recent advancements on tools, techniques, and software's knowledge and to rectify the shortfalls in the current course structure. After the welcome note and introduction, the external committee member Ar.Sarath expressed his appreciation about the course that the M.Arch Building Management course is really doing good. Thanking note was given to the committee member by Dr.Devyani.

Dr. Devyani presented the Regulations 2015 - a retrospective, the good practices in the current curriculum about the importance of Dissertation and Pre-Thesis, documentation and analysis in Building management Studio, Professional training of 30 working days and providing common elective subjects to widen the professional choice. She further added the scope of improvement in the regulations 2015 to provide more importance in project scheduling, the need for more quantitative analysis modules and software's workshop for making the course more practical oriented and there is lack of knowledge in technology and sequencing of construction activities. Finally the methodology adopted in the formulation of the new regulations 2020 syllabus and curriculum is coordinated by Ar.Sukirtha Suresh with the discussions and comments from core committee under the guidance of our Design chair Dr.Suresh Kuppuswamy and myself.

**Agenda notes for (R2020) / 2 - Comparative analysis of existing R 2015 and proposed R 2020 curriculum structure, R 2020 curriculum structure and Salient Features of Regulation 2020**

Ar. Sukirtha Suresh presented the concepts involved in the proposed Regulations 2020 curriculum. She informed in tune with the SIST's requirement, the syllabus 2020 included the Programme educational Objectives (PEO), Programme outcomes and Programme specific outcomes (PSO) for all the courses and detailed for M.Arch Building Management. Course. She further discussed on the comparative analysis of R 2010, R 2015 and R 2020 and briefed on the inclusion of new theory and practical subjects, the subjects that are merged, the shifting of subject to other semesters.

After the detailed discussion on the comparative analysis of the current and proposed regulations, the external committee member Ar.Sarath remarked on the merging of all the building services to one semester is fine. The external member further added his query about the focus of the our Building Management course to be focused in one segment or to be focused on all the segments referred with the course focus of Building economics at NICMAR and Building services and Energy analysis at SPA, Newdelhi. The external committee member also highlighted his thought on the proposed curriculum of regulations 2020 that it has covered everything and its good thing to have choice based subjects as electives.

Furthermore the external committee member Ar.Sarath enquired to Dr.Devyani about the criteria for joining the M.Arch Building Management course and he wished to have a mix of candidates from civil engineering to learn more on managing of whole project in a more analytical approach. Dr.Devyani welcomed the suggestion. Ar.Sarath finalized on the changes are perfectly good and mix of all is good work. The focus can be to certain subjects required like Project Scheduling, Building services, Building economics and life cycle of building can be as elective. It is a good system to introduce electives in semester 3 and 4 to give strength to electives.

**Agenda notes for (R2020) / 3 – Detailed discussions on the proposed syllabus (from semester 1 to semester 4) and proposed Regulation 2020.**

Ar. Ramesh Kumar presented the detailed syllabus of all the subjects in semester 1. He highlighted the introductive of unit 5 included as constructive assignment to give exposure on the case studies or hands on exposure. He further explained the detailed syllabus of all the subjects in semester 1 and the importance of new course Construction technology for providing knowledge in technology and sequencing of construction activities, Research methodologies in built environment for introducing research activities in the early semester of the course, financial management for broader understanding on the project evaluation of feasibility and life cycle costing for linking up two different stake holders promoter and buyer, the practical subject for introducing project management software 1 to equip with the knowledge on the software's widely available.

After the detailed discussion on the semester 1 subjects, the BOS external committee member Ar.Sarath opened up with his suggestions to bring in industrial exposure to collaborate with industries for sponsored research projects and for all the constructive assignments and projects, the student can work on one small project to integrate between the subjects. Further the member added to include Energy management software's also in project management workshops.

Ar. Ramesh Kumar presented the detailed syllabus of all the subjects in semester 2. The BOS external committee member Ar.Sarath opened up with his suggestions to do project scheduling with limited resources in their Management studio because often project scheduling does not show on the resource constraints. The member added his comment on the subject Quantitative techniques for which the subject faculty from mathematics or civil engineering need to integrate and work out the statistics to be applicable for Building science. Further the member added a point to expose the students to more software's so that each group of students can explore and share their knowledge with rest of the class.

Ar. Sukirtha continued with the detailed discussion of the subjects in semester 3 and 4, the introduction of two new subjects the operations management, cost accounting and cost benefit analysis. The BOS external committee member Ar.Sarath opened up with his suggestions to mention the size of the company in which the students need to do their professional training. Further the member added a point in finalizing the dissertation topic before they proceed to professional training which helps the student to identify the right choice of the company.

Ar.Sukirtha enquired to the external member for the passing criteria can we mention one publication is mandatory for the candidate in the regulations. The external member Ar.Sarath commented instead of having a rule, the dissertation work is as good as a paper and he suggested to compile all the dissertation work into a journal.

Thereafter the discussion continued with the detail discussions on elective subjects by Ar.Ramesh kumar and Ar.Sukirtha. The BOS external committee member Ar.Sarath opened up with his suggestion to have expert's lectures from industry and government for all the elective subjects. Rework on the subject responsible community action to facilitate large community of people. He further added some of the elective subjects like Building energy analysis and management can be toned down as a principle to go about as a policy and application just as pin-pointed and also suggested to include facility management as an elective because it is important for post occupancy of buildings. Our external committee member Ar.Sarath finally confirmed with the curriculum and appreciated that the elective subjects have become business verticals for the aspirants.

### **Vote of Thanks**

Ar. Ramesh kumar thanked the expert member Ar. Sarath C Kanth for accepting the invitation of SIST in attending the BOS at a short notice. He thanked him for his valuable suggestions on the agenda items presented. He also thanked the Management, Chancellor Mam and President Sir for the support on conducting the BOS in the licensed digital platform, our Dean and Head, Dr. Devyani Gangopadhyay, Senior professor and Design chair Dr.Suresh Kuppusamy, Ar. Ebin Horrison, Ar. Sukirtha Suresh for coordinating the syllabus revision as Core committee and Ar.Surya Rajkumar for their contribution towards the conduct of this BOS meeting.

**Minutes approved by:**

**Dr. Suresh Kuppuswamy**

Senior Professor & Design Chair,  
School of Building & Environment

**Dr. Devyani Gangopadhy**

Dean & Head, Department of Architecture,  
School of Building & Environment

**External Expert Member**

**Ar. Sarath C Kanth**

Design Tech Architects, Chennai

SARA6101	PROJECT MANAGEMENT WORKSHOP I	L	T	P	Credits	Total Marks
		0	1	2	3	100
Continuous Assessment		University Viva			Min Pass Marks	
50		50			50	

#### COURSE OBJECTIVES:

- To augment the knowledge of software technologies in the areas of project management and familiarize the students on the use of software in a given context.
- To apply the learnings of software technologies in the live case study projects in the applicable areas where possible and compare with the actual scenarios to enable me to get hands-on experience.

#### WORKSHOP BRIEF

The project management workshop I aims to provide the students with the opportunity to learn the software pertaining to the project management applications like scheduling, tracking, resource optimizing & levelling, MIS management information system, RFI request for information and drawings / submittal approvals, quality checklist of construction, enterprise resource planning, BIM and BMS etc. The software technologies shall be used to create the detailed aspects of scheduling and controlling like creation of WBS and tasks, WBS schedule, milestone schedule, floats, planning resources rates with time, project cost, resource cost, work and material quantity, resource usage, resource graph, update of project progress, earned value analysis, work with multiple projects, critical path etc. And also to explore other areas where the aid of software is key in project management processes.

Students shall gather information from their live case studies related to buildings and use the software to do the project management related functions basis the data gathered. The information shall be discussed / presented among the group to see the relevance to the actual scenario and do the betterment in the process with the help of technologies available. Any open sources of software shall be explored by students to get hands on experience in the process.

#### DELIVERABLES

The students shall do the learnings in the software and should be aware of using the software for developing the project management functions. A small portion of project management activities or function will be defined to the students to develop the activities with the help of software basis their case study project. The software outputs of students will be validated with respect to the actual case study scenarios. The report containing the above should be submitted at the end of the semester for the evaluation.

#### TEXT / REFERENCE BOOKS

1. Dayal,S (2008), Earned value management using microsoft office project – A guide for managing any size project effectively, Cengage, New Delhi.
2. Harris,P.(2011), Planning and Scheduling using Microsoft project 2010. BPB Publications, New Delhi.
3. Stover, T (2004), Microsoft office project 2007, Inside out prentice Hall of India, New Delhi.
4. Harris, P. (2008) Project planning and control using Primavera P6.50 for all engineering and construction. BPB, New Delhi.
5. Harris, P (2012) Oracle Primavera P6 version 8.1 and 8.2 professional and optional client. BPB, New Delhi.
6. Software related books & journals
7. Internet resources

SARA5103	BUILDING SERVICES	L	T	P	Credits	Total Marks
		3	0	0	3	100

#### COURSE OBJECTIVES:

- To outline the basic concepts of planning, design, execution and maintainability of mechanical, electrical, plumbing and fire safety services so as to effectively co-ordinate preconstruction and construction phase of projects.
- To familiarize the students with integration and coordination of various internal building services and external infrastructure services such as electrical, storm water drainage, sewerage, communication system and other civil infrastructure facilitates.

<b>UNIT 1</b>	<b>WATER SUPPLY AND SANITARY ENGINEERING</b>	<b>9 Hrs</b>
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Water Quantity and Pressures - Water-Pipe Sizing Wastewater piping-Wastewater-System Elements - Layout of Waste Piping - Interceptors - Piping for Indirect Wastes - Waste-Pipe Sizing - Venting - Plumbing-System Inspection and Tests. Gas piping - Gas Supply – Gas pipe Sizes - Estimating Gas Consumption – Gas pipe Materials. building automation systems – components of BAS related to Water supply and sanitary system; water pump monitoring and control.

<b>UNIT 2</b>	<b>HVAC SYSTEM</b>	<b>12 Hrs</b>
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Factors in HVAC Design – Ventilation - Duct Design - Heat Losses - Heat Gains - methods of heating buildings – methods of cooling and air conditioning - Air-Conditioning Plant – Refrigeration - Cycles - Air-Distribution Temperature for Cooling - Condensers – Compressor Units.

Cooling Equipment – Central Plant - Zoning - Packaged Air-Conditioning Units –Ducts - Variable Air Volume (VAV) Systems – Variable Frequency Drive (VFD) – dampers - Air-Water Systems - Industrial -Air Conditioning - Chemical Cooling - Energy efficiency techniques- Air conditioning in office, hospitals, malls, and laboratory etc. - Air conditioning for green buildings. Building; automation systems – components of BAS related to HVAC, Control of HVAC systems-Direct Digital Control – chiller pumps, BTU monitoring & control. Vibrations from A/C equipment- vibration isolation - all, floor & ceiling, AC ducts - noise sources in ducts & preventive measures, fan room treatment, hangers, noise control in water piping system.

<b>UNIT 3</b>	<b>ELECTRICAL &amp; FIRE FIGHTING SERVICES</b>	<b>9 Hrs</b>
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Electrical - DC / AC system, electrical load and emergency power – electrical conductors and raceways – Substations – power distribution system – standby and alternate power supply system. Light and sight – quality of light – lighting methods – daylight – system design of lighting. Measuring Light and Illumination –selection of recommended Illuminance - Zonal Cavity Method of Calculating Illumination - Lamp characteristics and Selection Guide –Integration of services – Electrical power metering / monitoring.

Fire detection and Fire alarm system – fire protections and fire-fighting system and monitoring – sprinkler system - – Standpipes- Water Supplies – pump room design and system arrangements - safety and security systems – FAS, PAS – access control system- fire fighter telephone system – CCTV surveillance system – IBMS system. Components of BAS related to Electrical system and fire safety, security – Communication and Automation system

<b>UNIT 4</b>	<b>VERTICAL TRANSPORTATION &amp; EXTERNAL INFRASTRUCTURE SERVICES</b>	<b>9 Hrs</b>
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Escalators - Elevator Installations - Electric Elevators - Hydraulic Elevators –MRL type elevators - Planning for Passenger Elevators – Elevator systems in high-rise buildings - Planning and design of elevator lobby areas- Dumbwaiters - Conveyers and Pneumatic Tubes - Mail Chutes, recent development in elevator technology.

External infrastructure services for residential and institutional complexes –planning, design, construction aspects of water supply, sewerage, solid wastes, roads and storm water drainage and RW harvesting. Telecommunications, Structured Cabling Systems - Blown Optical Fibre Technology (BOFT) - Central Station Supervisory Systems-Integration of services

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Case study and presentation of large construction projects. Understanding and presenting the schematic of services and their integration in the complex and large project environment. Study and Presentation of BAS integration of various internal and external services. Study and presentation of noise control measures taken for various services equipment used in construction projects. Exploring the building services provisions and operations during pandemic conditions.

**Max. 45 Hours**

**COURSE OUTCOMES:**

<b>CO1</b>	Understand various concepts of ventilation systems, which includes, design, planning, execution, installation of the same in various building typologies.
<b>CO2</b>	Critically evaluate and study importance of lighting and appraisal of new technologies in design of lighting systems in complex buildings
<b>CO3</b>	Analyze and interpret various national and international codes for services and understand the concept of application of the same.
<b>CO4</b>	Integrate building services and demonstrate various energy saving practices.
<b>CO5</b>	Examine the various techniques for noise control and related construction methods.
<b>CO6</b>	Evaluate quantitative metrics for various building services.

**TEXTS / REFERENCE BOOKS**

1. Frederick S. Merritt, Jonathan T. Ricketts, Building design and construction Handbook, McGraw-Hill Inc., 5th edition, 1994
2. Fred hall and Roger Greeno, Building Services Handbook, Routledge, 7th edition, 2013
3. M.David Egan, Architectural Acoustics, J. Ross Pub., 2007
4. Gurcharan Singh, JagdishSingh, Water Supply & Sanitary Engineering, Standard Publishers Distributors, 2007
5. Shri V.K. Jain, Fire Safety in Buildings, New age publishers, 2010
6. Shan Wang, Handbook of Air Conditioning and Refrigeration, 2nd Edition, McGraw Hill, 2000

7. Krieder, J. F., Handbook of Heating Ventilation and Air Conditioning, Taylor & Francis, 2005
8. Barrie Rigby, Design of Electrical Services for Buildings, 4th Edition, Routledge, 2013
9. W. E. Steward, T. A. Stubbs, Modern Wiring Practice Design and Installation; 14 edition, Newnes, 2009
10. BIS, National Building Code 2005, New Delhi, 2005.

<b>SARA5101</b>	<b>CONSTRUCTION PROJECT MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

#### **COURSE OBJECTIVES:**

- The objective of the course is to introduce and disseminate the knowledge about project management and their application during the pre- construction and construction phase of a large construction project life cycle.
- To provide the basic understanding about the various project management methodologies used in various phases like initiation, feasibility, design phase, bid and award phases, construction and closeout phases of a project.

<b>UNIT 1</b>	<b>PROJECT MANAGEMENT FRAMEWORK</b>	<b>12 Hrs</b>
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Introduction - Project management, Project management versus Traditional management, Different forms of Project Management – Project Phases – Project Life Cycle – Project Management Process through Initiation, Planning, Execution, control and closure within the triple constraints of scope, time and cost with all inputs, tools & techniques and outputs. Construction project organisations, organisation structure and process; scope and services of PMCO, Roles and Responsibilities of Project Manager, client, promoter, consultant, contractor and the organisational procedures.

<b>UNIT 2</b>	<b>COMMUNICATION &amp; MANAGEMENT INFORMATION SYSTEM (MIS)</b>	<b>9 Hrs</b>
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Project Management plan - The Project Management Configuration Plan - Communication requirements analysis, Communication Technology –Communication models and methods: General Guidelines for Effective Communication - Conducting High-Quality Meetings - Communication Skills and the Project Manager - Key Project Documentation – Information distribution. Management Information Systems; Scope, significance, design criteria of MIS; Formats of MIS for construction stages; Information technology in MIS.

<b>UNIT 3</b>	<b>PROJECT COST AND PORTFOLIO PLANNING</b>	<b>9 Hrs</b>
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Building Economics; Cost components of a construction project; Direct & Indirect costs; Distribution of hard cost in the project, Factors that influencing the construction cost, cost estimation tools, Interpretation of cost information; use of cost indexes etc., Defining and Implementing Project Portfolio Management – Objectives, practices and organizational roles – evolution of PPM - Bridging the Gap between Operations management and Project Management for multiple projects - Project Portfolio Optimization- PPM tools -Standardization, measurement and process improvement, Project Selection and Risk.

<b>UNIT 4</b>	<b>QUALITY MANAGEMENT</b>	<b>9 Hrs</b>
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Quality concepts; Evolution of modern concept of Quality management process approach; TQM. Introduction, Concept and philosophy of TQM -Statistical Quality control-Quality control operations – concepts – norms, techniques and procedures – quality and time – concept of quality in building design, construction and concepts of project management Gurus. Quality assurance & control, information needs at different levels of project organization – organizational functions – types of information. Quality management system, Quality System standards elements, Contractual implications of quality systems– quality management systems – concepts and meaning.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Case study and presentation of large construction projects. Understand and develop site organisation structure, develop site logistics plan for the project planning activities. Develop and present the WBS of the project for various trade packages and prepare a schedule basis CPM technique using scheduling software like MS Project and Primavera Project Planner and find the critical path of the project.

**Max. 45 Hours**

#### **COURSE OUTCOMES:**

<b>CO1</b>	Understand the basics of traditional management systems, management skills and project planning including initiation and execution.
<b>CO2</b>	Critically evaluate various management methods in planning, execution considering scope verification and control
<b>CO3</b>	Outline various work breakdown structure and other activities with reference to project scope, time and cost.
<b>CO4</b>	Analyse and assimilate communication and coordination skills to handle complex projects during different phases.
<b>CO5</b>	Comprehend various objectives, practices and roles of an organization executing multiple projects.

**TEXTS / REFERENCE BOOKS**

1. Chitkara, K.K, Construction Project Management, Planning, Scheduling and Controlling, 3rd Edition, Tata McGraw Hill Publishing Co., New Delhi, 2014
2. Calin M. Popescu, ChotchaiCharoenngam, Project planning, Scheduling and Control in Construction: An Encyclopaedia of Terms and Applications, John Wiley, New York, 1995
3. JuriSutt , Manual of Construction Project Management, John Wiley and Sons, 2011
4. Willis E.M., Scheduling Construction projects, John Wiley and Sons, 1986
5. George J. Ritz, Sidney M. Levy, Total Construction Project Management, Second Edition, McGraw-Hill Professional, 2013
6. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide), Project Management Institute, Incorporated, 2013
7. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling and Controlling, 10thEdition, Wiley India Pvt. Ltd., 2013
8. Jonathan F. Hutchings, Project Scheduling Handbook (Civil and Environmental Engineering), CRC Press, 2003
9. Asma Khan and Sean Burn, Project Portfolio Management in Construction Industry, Booktango, 2013
10. Peter Fewings and Christian Henjewe, Construction Project Management, An Integrated Approach, 3rd edition, Swales & Willis Ltd, Exeter, Devon, UK, 2019.
11. Saleh Mubarak, Construction Project Scheduling and Control, Willey & Sons, 2015.

SARA6201	PROJECT MANAGEMENT WORKSHOP II	L	T	P	Credits	Total Marks
		0	1	2	3	100
<b>Continuous Assessment</b>		<b>University Viva</b>			<b>Min Pass Marks</b>	
50		50			50	

**COURSE OBJECTIVES:**

- To apply the learning of software technologies in the live case study projects in the applicable areas where possible and compare with the actual scenarios to enable to get hands on experience.
- To do the coordination of services with help of software to understand the areas where the attention of project managers required to do the basic planning in a complex projects.
- To train students for the managerial soft skill developments required for managing project management functions.

**WORKSHOP BRIEF**

The project management workshop II aims to provide the students with the opportunity to use the software applications for developing project management and services coordination activities. Students shall gather information from their live case studies and use the software to develop comprehensive project management information related to projects like detailed schedule, critical path, resource optimization procedure, cash flow details, and the services coordination activities etc. The outcome of the workshop shall be discussed / presented among the group to see the relevance to the actual scenario and debated to do the betterment in the process. Any open sources of software shall be explored by students to get hands on experience in the process.

Also seminars and workshops shall also be conducted to develop career management skills and students shall present their understanding in the group on interview skills, group discussion skills, carrier developments, overcoming adversity in career; personal effectiveness skills like time management, stress management, problem solving, positive attitude and confidence, learning and self-development, self-behavior; Team management skills like team building, leadership skills, motivation, conflict management skills, decision making, change management, art of delegation and feedback.

**DELIVERABLES**

The students shall develop the required project management learnings in the software for the case study project and present the same in the workshop. Also they have to work on the co-ordination aspects of services with the help of suitable software and the level of co-ordination required at various stages of construction shall be discussed and debated in the workshop. Students should also present their understanding on the soft and managerial skills required for project management in the complex projects. The report containing the above should be submitted at the end of the semester for the evaluation.

**TEXT / REFERENCE BOOKS**

1. Adair, J, (2013) creating success; Develop your leadership skills, 2<sup>nd</sup> Edition, Viva Books
2. Florence, S (2009), How to resolve conflicts at work, 1<sup>st</sup> Edition, PHI Learning
3. Mc.Grath, E.H. (2006), Basic managerial skills for all, Prentice Hall India. Delhi

4. Owen, J (2012), The leadership skills handbook, 2<sup>nd</sup> Edition, Kogan Page.
5. Wallace, Masters (2006), Personality development, Cengage Learning, New Delhi.
6. Whitear, Ribbens (2007), Handling difficult people and difficult situations, CIPD, London
7. Software related books & journals
8. Internet resources

<b>SBA5141</b>	<b>FINANCIAL MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OBJECTIVES:**

- The objective of the course is to familiarize the fundamentals of financial management concepts and their applications in the various phases of the project cycle of construction projects.
- To provide a basic knowledge to carry out the financial feasibility of projects, selection of building systems and equipment's and evaluation of project investment decisions.

<b>UNIT 1</b>	<b>PRINCIPLES OF FINANCIAL MANAGEMENT</b>	<b>9 Hrs</b>
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Nature of finance management - objectives and principles - various financing decisions - Business firms and their financing - types of business units - capital sources and structures - marginal cost of capital - optimum capital structures.

<b>UNIT 2</b>	<b>PROJECT EVALUATION</b>	<b>12 Hrs</b>
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Evaluation of alternatives – present value method – rate of return method -time value of money –Net present value method, Profitability index and IRR method, Cost Volume benefit analysis - life cycle costing – structural cost – finishing cost – operating cost.

<b>UNIT 3</b>	<b>BUDGETING AND ESTIMATION</b>	<b>9 Hrs</b>
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Budget as management control techniques - requirement of a good budget - budget planning - budget process - cash budget - cash flow analysis - financial ratio analysis - interpretation and return on investment- Contract costing estimation of profit -Percentage completion method – completed contract method. Basis of accounting – accounting for tax reporting & financial reporting purposes. method of recording - cash method, accrual method. Taxation on construction contract.

<b>UNIT 4</b>	<b>PROJECT FINANCE</b>	<b>9 Hrs</b>
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Working capital management needs and computation. Long term fund- Stages of project finance management. - Financing international projects - project cash flow - progress payments and expenditures risk in international contracts - accounting and economic exposure -joint ventures and BOT projects.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Case study and Presentation on -Interpretation on performance of a company through ratios. Presentations on - How capital structure of various companies are arranged and suggesting the best capital structure, how to choose the best project from alternatives & how to decide profit on a contract, identifying various sources available for both domestic and international projects and the risk associated with it. Presentation on joint venture and BOT.

**Max. 45 Hours**

**COURSE OUTCOMES:**

<b>CO1</b>	Able to apply the acquired knowledge in mobilizing best possible sources of fund and its effective utilization
<b>CO2</b>	Combat with current changing economic conditions and be able to predict and estimate the future financial requirement.
<b>CO3</b>	Identification of best project proposal to invest.
<b>CO4</b>	Involve in international projects.

**TEXTS / REFERENCE BOOKS**

1. Andrew Ross, & Williams, P. (2012). Financial Management in Construction Contracting. Wiley & Blackwell,.
2. Hillebrandt P.M. (2000). Economic Theory and Construction Industry. London: Macmillan Publishing House.
3. Kuchhal. S.C. (1999). Financial Management; an Analytical and Conceptual Approach,. Chaitanya Publishing House.
4. Levinson, M. (2001). Guide to financial markets. London.: Economist Profile Books.
5. Madura, J. (2008). Financial markets and institutions. Ohio: Thomson Publications.
6. Peterson, S. J. (2010). Construction Accounting and Financial Management. Pearson Education.
7. Tenah, K. A., & Guevara, J. M. (1985). Fundamentals of Construction Management and organization,. Brady Company.
8. Tompkins., B. G. (1985). Project cost control for managers, . Gulf Pub. Co., .
9. Block. Stanley, B. and Geoffrey, A. (2001), Foundations of financial management. London : McGraw- Hill.
10. Chandra. P. (2008). Financial management -Theory of practice. New Delhi : Tata McGraw - Hill.
11. Damodaran, A. (2008). Corporate finance theory and practice. New Delhi.: Wiley India.
12. Khan. M. and Jain. P. (2008). Financial management. New Delhi. Tata McGraw-Hill,
13. Myers, B.. Allen, S. and Mohanty, P. (2010). Principles of corporate finance. New Delhi. Tata McGraw -Hill,

14. Pandey, 1. (2009). Financial management. New Delhi. Vikas Publishing House,  
 15. Van. Home, J. and Wachowicz, J. (2005). Fundamentals of Financial management. New Delhi. Pearson,  
 16. Vishwanath, S. (2007). Corporate Finance theory and practice. Response Books, New Delhi

SARA9121	BUILDING MANAGEMENT STUDIO I	L	T	P	Credits	Total Marks
		0	0	12	6	300
Continuous Assessment		University Viva			Min Pass Marks	
200		100			150	

#### COURSE OBJECTIVES:

- To augment the knowledge imparted through lectures by discussion of practical cases to determine practice, critically analyze application of knowledge in the professional context, experience simulated application procedure in a limited context.
- Live case studies are to be undertaken and various aspects of the course to be taken up in the studios. Emphasis is given to interaction with project technical staff and other stakeholders. Application of software and other IT tools on actual real life cases are undertaken to enable hands on experience.

#### STUDIO BRIEF

The Building Management studio I aims to provide an opportunity for students to get introduced to project management and familiarize with the building project services through studies of project drawings & documents and extracting the inferences for group projects on the various aspects like Project brief - Area Usage - FAR / Area statement - Bye laws - Soil Investigation - Architectural appraisal, Configuration of spaces, plans, sections, elevations, levels, landscaping etc., -Structural appraisal: Foundation system, Structural system, Details on structural members including sizes and material specifications - MEP appraisal: Conceptual drawings, SLDs, and actual drawings showing location of services. Interaction of MEP with other aspects of project in terms of sequencing, layout etc. The study of internal and external co-ordination aspects required in various areas of construction and services to be understood practically through site visits. Students shall gather information through their investigation from the live case studies related to the building techniques, building services and analyze the details with respect to industry standards and owner requirements to have better understanding on the key factors determining the process of project management at various stages of the project life cycle. The inferences of the study also to be compared with the building codes and standards and recommend the suitability.

#### DELIVERABLES

The students shall define and record the case study documentation in project management context with reference buildings and related services, infrastructure with the project phases, project stakeholders and project organization and their roles, responsibilities, scope and services of team. The final report to comprise in-depth analysis of existing building services in the form of drawings, sketches, photographs, relevant details, referral codes, schematic charts, reports, cognitive analysis diagram, empirical documentation, detailed narratives and appraise the suitability and efficiency of design and application. The proposal for modification and enhancement of system based on their case analysis.

#### TEXT / REFERENCE BOOKS

1. National Building Code of India 2016 (NBC Volume 1 & 2)
2. National Fire Prevention Association standards
3. Bureau of Indian Standards ( BIS )
4. British Standards ( BS )
5. Energy conservation building code (ECBC)
6. Bureau of Energy Efficiency ( BEE )
7. American Society of Heating, Refrigeration and Air conditioning Engineers ( ASHRAE )
8. SP 72: National Lighting Code 2010.

SARA5201	PROJECT PLANNING AND CONTROL	L	T	P	Credits	Total Marks
		3	0	0	3	100

#### COURSE OBJECTIVES:

- To understand Project planning control of project realization processes.
- Develop awareness on network analysis, scheduling and costing in project planning process and introduce comprehensive planning in complex projects.

<b>UNIT 1</b>	<b>NETWORK ANALYSIS</b>	<b>9 Hrs</b>
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Work break down structure-assessing duration - Project scheduling, Job layout, Bar charts, Milestone charts, Network schedule, time limited and resource-limited schedule, schedule hierarchy. Activity Definition and Sequencing, The critical path method - Calculations for critical path scheduling – PERT vs CPM; Duration estimating – PERT, CPM, Network elements, Time Estimates, Activity float and schedules.

<b>UNIT 2</b>	<b>SCHEDULING</b>	<b>12 Hrs</b>
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Schedule development, Resource oriented scheduling – Scheduling with resource constraints – Use of Advanced Scheduling Techniques-Scheduling with uncertain durations., Control – Factors affecting work scheduling, forecasting inputs and outputs, schedule hierarchy- Relevance of construction schedules, management through networks- Purpose of work scheduling, Bar chart method of work scheduling, Scheduling the network plan, Line of Balance technique of scheduling repetitive projects.

<b>UNIT 3</b>	<b>COSTING AND CONTROL</b>	<b>9 Hrs</b>
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Cost planning: Cost Estimating Process, Inputs, Tools & Techniques classification of costs, financial forecasting, budgeting- BOQ-unit rate costing standards of resources, work-package standard cost, standard 'S' curve forecasting tool  
 Cost control, Cost accounting system, cost control preliminaries, Control approach, revenue or sales control, direct cost control, indirect cost control, project budgetary control systems, control responsibility, risk cost management  
 Project time control, Time progress monitoring methodology, what if analysis, reviewing time progress, time-cost relationship, Time -Schedule control, Time reduction techniques, work progress reviewing procedure.

<b>UNIT 4</b>	<b>COMPREHENSIVE PLANNING FOR COMPLEX PROJECTS</b>	<b>9 Hrs</b>
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Project definition–Objectives-Strategy-Technology and design-External factors, finance and duration – Political and social issues-Planning and control, environmental, and economic factors – Attitudes–Implementation – Organization- Contract Strategy –Strategic issues for enterprises working on multiple projects with thrust on high-rise constructions - Project closeout - Learning from past experience -Releasing people and equipment -Recognizing and rewarding people - Some guidelines for future projects -Questions for getting started.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Prepare work breakdown structure for the project and basis the understanding on the project execution sequence. List the sequential activities and workout the time required for accomplishing each task and activities. Develop a resource allocation data and optimise the timeline using the resource balancing techniques. Apply crashing techniques to reduce the timeline on the project while doing the tracking as a part of project control.

**Max. 45 Hours**

**COURSE OUTCOMES:**

<b>CO1</b>	Familiarizing on the work breakdown structure in a construction project and imparting knowledge on project scheduling.
<b>CO2</b>	In-depth understanding on project scheduling with required inputs, tools and techniques applied and outputs achieved.
<b>CO3</b>	Practical application of CPM, PERT analysis in time scheduling through network diagram of construction activities.
<b>CO4</b>	Knowledge on the relationship between cost and time, the pros and cons of cost overrun and cost under run and the techniques adopted for cost control.
<b>CO5</b>	Application of crashing in a construction project to understand the various costs involved and cost overrun through calculations and analysis.
<b>CO6</b>	Understanding the comprehensive planning involved in complex projects through various parameters and creating a detailed schedule for a construction project.

**TEXTS / REFERENCE BOOKS**

1. Chitkara, K.K. Construction Project Management, Planning, Scheduling and Controlling, 3rd Edition, Tata McGraw Hill Publishing Co., New Delhi, 2014
2. Calin M. Popescu, ChotchaiCharoenngam, Project planning, Scheduling and Control in Construction: An Encyclopaedia of Terms and Applications, John Wiley, New York, 1995
3. JuriSutt , Manual of Construction Project Management for owners and clients, John Wiley and Sons, 2011
4. Willis., E.M., Scheduling Construction projects, John Wiley and Sons, 1986
5. George J. Ritz, Sidney M. Levy, Total Construction Project Management, Second Edition, McGraw-Hill Professional, 2013
6. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide), Project Management Institute, Incorporated, 2013
7. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling and Controlling, 10<sup>th</sup>Edition, Wiley India Pvt. Ltd., 2013
8. Jonathan F. Hutchings, Project Scheduling Handbook (Civil and Environmental Engineering), CRC Press, 2003

9. Peter Fewings and Christian Henjewe, Construction Project Management, An Integrated Approach, 3<sup>rd</sup> edition, Swales & Willis Ltd, Exeter, Devon, UK, 2019.
10. Saleh Mubarak, Construction Project Scheduling and Control, Willey & Sons, 2015.

<b>SARA5204</b>	<b>CONTRACT MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

#### **COURSE OBJECTIVES:**

- To expose the students to the selection process of different contract types, legal compliance, various international and national contract forms for different types of project.
- To outline the contractual procedures including tendering process, pre-qualification of contractors, evaluation of contract bids, preparation of contract documents, and awarding of contracts.
- To expose the students to the contractual issues and related contract administration and dispute resolution procedures.

<b>UNIT 1</b>	<b>LEGAL FRAMEWORK AND CONTRACTS</b>	<b>9 Hrs</b>
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Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Insurance and Bonding – Income Tax, Goods and Service Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations. Indian Contracts Act – Types of Contracts – formation of contracts - Elements of Contracts – potential contractual problems – contracts for engineering and architectural services – contracts for construction.

<b>UNIT 2</b>	<b>CONTRACT DOCUMENTS AND TENDERS</b>	<b>12 Hrs</b>
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Various types of construction contracts, general and special conditions of contract, comparative study of contract conditions - construction contract as a legal proposal, agreement, consideration, contract Planning, tender documents, tendering process - pre-tendering, bid organization, invitation, receipts and evaluation negotiations, award of work,- prequalification methods (rating/ evaluation and enlisting of construction agencies), bid review and evaluation, methods of subcontracting; Contract close-out; Defect liability and performance guarantee; Undertaking works at Contractor's risk and cost; Construction Contract Documents – drawings as construction contract document – specifications as construction document – construction contract conditions – construction specification\_ list of approved materials and makes.

<b>UNIT 3</b>	<b>LABOUR REGULATIONS, INSURANCES AND CONTRACT ADMINISTRATION</b>	<b>9 Hrs</b>
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Construction specific labour laws and regulations, The Building and Construction Workers (regulation of employment and conditions of service) Act, 1996, Workmen's Compensation Act, Payment of Wages Act, The Employees Provident Fund and Miscellaneous provisions Act 1996;

Insurance in construction works; CAR (contractor all risk policy) Premium determination and risk reduction; duties of employer, contractor, interpretation of contract, Breach of contract – changes during the contract – changes dealing with differing site conditions – Force majeure – delay analysis – claims - cost escalation – time delays and extensions, compensation, notices and termination.

<b>UNIT 4</b>	<b>DISPUTES AND ARBITRATION</b>	<b>9 Hrs</b>
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Types of disputes in construction contracts – methods of dispute resolution processes – alternative dispute resolution and dispute review mechanisms – Dispute Resolution Board proceedings - arbitration and conciliation act 1996 – Arbitration proceedings - managerial approach to dispute minimization – conduct of arbitration proceedings – arbitration award and termination proceedings – powers of arbitrator – setting aside of awards and enforcement of awards – appeal, revision and court proceedings.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Study the conventional and emerging contract types like CPWD, MES, FIDIC, AIA, NEC, JCT and other international contract types and do the comparative analysis - Prepare a bidding model and strategies for medium / large-scale project cases. Critical appraisal of the conditions of contract for the project; Comparison of contract conditions; determination of special conditions of contract for the project and Professional Ethics.

**Max. 45 Hours**

#### **COURSE OUTCOMES:**

<b>CO1</b>	Understand legal requirements and compliance of construction contracts for the sale and use of urban and rural lands.
<b>CO2</b>	Classify different types of contract and tenders, and preparation of contract documents.
<b>CO3</b>	Categorize the role of labor regulations, insurances in the contract documents for contract administration.
<b>CO4</b>	Analyze the causes and effect of cost and time overruns and relating them to the relevant clauses of contract to

	prevent litigations.
<b>CO5</b>	Identify the process of negotiation, claims management, conflicts and dispute management.
<b>CO6</b>	Identify issues causing legal disputes between parties and resolution of disputes through arbitration.

### TEXTS / REFERENCE BOOKS

1. Gajaria G.T and Kishore Gajaria, Laws Relating to Building and Engineering Contracts in India, LexisNexis Butterworths India, 2000
2. Jimmie Hinze, Construction Contracts, 3<sup>rd</sup> Edition, McGraw-Hill, 2010
3. Joseph Bockrath and Fredric Plotnick Contracts and the Legal Environment for Engineers and Architects, 6th Edition, McGraw-Hill, 2010
4. Kwaku A. Tenah and Jose M Guevara., Fundamentals of construction Management and organization, Reston Publishing Company, 1985
5. Construction Specifications Institute, Construction Contract Administration Practice Guide, John Wiley & Sons, 2011
6. Greg Goldfay, Construction Contract Administration, UNSW Press, 2004.
7. CPWD-General conditions of contract 2019\_construction works / specifications.

SARA9221	BUILDING MANAGEMENT STUDIO II	L	T	P	Credits	Total Marks
		0	0	11	6	300
<b>Continuous Assessment</b>		<b>University Viva</b>			<b>Min Pass Marks</b>	
200		100			150	

### COURSE OBJECTIVES:

- To augment the knowledge acquired through lectures and through live case studies, critically analyze the application of knowledge in the Project Management context with reference to building construction and related infrastructures with topics on project phases, characteristics of the project life cycle, project stakeholders and project organization their roles, responsibilities, scope and services of team members.
- To ensure the logical understanding of the project management procedures and the use of software to prepare, monitor and track the project activities with schedule.
- To understand and devise the quality parameters for the execution of construction activities, services, external infrastructure and co-ordination basis the live case studies and interaction with the construction professionals and consultants.

### STUDIO BRIEF

Time Management; Development of Construction Logic; Work out alternatives of construction sequence logic considering project and site constraints, design requirement, services interaction, resource requirement etc.; Study of existing approach to construction logic; Analyse strengths and weaknesses; Preparation of Work Breakdown Structure (WBS).

Visualizing strategic breakdown of project into work packages; Identify approach of work breakdown for the project considering ease of coordination, cost savings etc.; Developing and presenting WBS of respective projects as a hierarchy of deliverables that collectively constitute the project; Presenting WBS in MS-Project with appropriate linkages; Project Planning & Scheduling; Identification of Activities, Milestones and Construction Sequencing considering: Activities, Non work activities, Characteristics of repetitive activities and projects, Typical and non-typical activities, Repetitive and non-repetitive activities.

Development of hierarchy of networks showing detailed activities, milestones using MS project; Calculation of quantities, cost and productivity data; Determine activity durations based on productivity data; Determining activity durations through deterministic and probabilistic durations; Parametric Estimating; Analogous Estimating (Top Down Estimating); Expert Judgement; Three Point Estimates etc.; Determining time duration and labour/equipment resources of all activities in the project using MS project; Utilization of network techniques for project planning, scheduling and control like; Time calculation of AON Network, PERT, PNET, Line of Balance Method and Monte Carlo simulation; Developing Project Schedule on MS Project.

Time Cost Analysis; Calculation of costs related to activities for calculating the cost of crashing a project; Determining costs associated with activities over a time graph; Calculate the costs associated with crashing the activities; Develop project and activity costing schedule on MS Project; Earned Value Management; Developing Planned Value, Actual Cost, Earned Value and Variances; EVM application for project progress; Resource and Material Management; Resource Histograms and Resource levelling; Developing resource histograms for projects; Achieve uniform resource allocation; Application of Multiple Resource Allocation Procedure, PACK method, Branch and Bound Method; Developing a revised resource based schedule; Application of MS Project.

TQM approach for the projects using quality parameters for the project; develop / devise project specific specifications; role of BOQ / contract conditions / special conditions / make of materials; develop quality check parameter for activities / trade packages; activities to be followed for ensuring quality in project execution. Discussion on the current practices and proposal for new techniques to be employed / suggested for quality. Quality test procedures for various construction activities – Site test – Lab test – Interpretation of test results. Procedure for rejecting non-quality / Non-conforming works. NCN procedures. etc.

## DELIVERABLES

The students shall define and record the case study documentation in project management context with reference to buildings and related services, infrastructure considering different project phases. The final report to comprise in-depth analysis of project management approach and preparation of schedule using MSP, Cost Analysis, EVM, Resource Analysis and balancing, schedule crashing with time cost tradeoff. Students should also analyze and prepare the quality control / quality assurance plan for the selected project & services studied to have better quality standards, compare and infer the quality management system adopted for the investigated project.

## TEXT / REFERENCE BOOKS

1. National Building Code of India 2016 (NBC Volume 1 & 2 )
2. National Fire Prevention Association standards
3. Bureau of Indian Standards ( BIS )
4. British Standards ( BS )
5. Energy conservation building code (ECBC)
6. Bureau of Energy Efficiency ( BEE )
7. American Society of Heating, Refrigeration and Air conditioning Engineers ( ASHRAE )
8. SP 72: National Lighting Code 2010.

SARA5102	CONSTRUCTION TECHNOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

## COURSE OBJECTIVES:

- To introduce and give a comprehensive coverage on all aspects of construction technologies related to building projects.
- To develop awareness and understanding to do the selection of appropriate technology for various building and building related infrastructure projects through planning, design and management approach.

<b>UNIT 1</b>	<b>FOUNDATION &amp; BASEMENT TECHNOLOGY</b>	<b>9 Hrs</b>
Geo-technical investigations, geo-informatics and interpretation of soil investigations; Soil / ground improvement techniques, deep excavations in various conditions; Foundation systems, effect in aggressive soil conditions, special foundation techniques; Planning and design considerations of foundation and superstructure systems for Multi-storeyed, tall and super tall buildings; Construction of basements and waterproofing techniques.		
<b>UNIT 2</b>	<b>CONCRETE TECHNOLOGY</b>	<b>12 Hrs</b>
Concrete Technology, Durability and mix design, production and placement of concrete, including mechanization, Ready Mixed Concrete; Special concrete (High performance concrete, self-compacting concrete, impervious concrete, architectural finishes and aesthetic concrete); Alternative aggregates; Quality Control laboratory facilities and processes, experimental investigations; In-situ tests on concrete (including Non – Destructive Testing), Field laboratory tests.		
<b>UNIT 3</b>	<b>CONSTRUCTION CHEMICAL &amp; STRUCTURAL STEEL</b>	<b>9 Hrs</b>
Coatings, Construction chemicals, Admixtures, Waterproofing chemicals, Painting systems; Waterproofing and moisture / dampness prevention; Formwork systems (including slip-form), temporary works and enabling works; Re-bar technologies and structural steel materials and jointing; Fabrication and erection of steel structures; Design and detailing of joints; Quality assurance in jointing, including welding and fabrication; Pre-engineered buildings; Repair technologies and materials for strengthening and retrofitting for existing / distressed buildings, heritage buildings.		
<b>UNIT 4</b>	<b>PRE-FABRICATED CONCRETE AND INFRASTRUCTURE CONSTRUCTION</b>	<b>9 Hrs</b>
Pre-cast, pre-stressed concrete and composite constructions; Pre-fabricated and off-site technologies (including pre-engineered construction); Technologies for roads and pavements; Development of road infrastructure (including allied works such as drainage, culverts etc.); Construction technologies for affordable housing; Appraisal and performance assessment of construction technologies; Innovations and emerging in technologies for smart infrastructure and buildings; Performance standards of building systems; Concrete versus steel technology suitability.		
<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>

Analysing and presenting various typology of buildings with their structural components and analysing the suitability of possible and economic alternative solutions and combinations. Justifying the selection of technology over the conventional combinational approach and also exploring alternative technology for the implementation.

**Max. 45 Hours**

**COURSE OUTCOMES:**

<b>CO1</b>	Familiarizing on the various types of soil and substructure technology used in the building projects
<b>CO2</b>	In-depth understanding on concrete technology and the various types of usage in the building projects
<b>CO3</b>	Analysing the steel components in the structure and use of steel in various forms in building projects
<b>CO4</b>	Knowledge on the various types of construction chemicals available and their application areas and usage in the building projects
<b>CO5</b>	Understanding and application of various types of techniques for the building construction using the wide range of techniques learnt.
<b>CO6</b>	Comprehensive understanding of technology and the knowledge to use various technology combination for the successful execution of construction project from planning, design and execution stages

**TEXTS / REFERENCE BOOKS**

1. Brown.R. (1995). Practical foundation engineering hand book. McGraw-Hill, New York.
2. Christian.J. (1981), Management machines and methods in civil engineering. John Wiley and Sons, New Jersey.
3. Das.B. (2007), Principles of foundation engineering, Cengage Learning, Stamford USA.
4. Doran, D. (2006), Site engineering manual. Whittles Publishing, Scotland.
5. Mantri Institute A to Z of practical building construction and its management. Mantri Project and Consultancy Pvt.Ltd.
6. Mehta. P and Monteiro P. (2006). Concrete –Microstructure, properties and materials. McGraw-Hill, New York.
7. Rangwala S., Rangwala K. and Rangwala K. (2000), Construction of structure and management of works, Charotar Publishing House, Anand.
8. Shetty, M (2005), Concrete Technology, S Chand, New Delhi.
9. Singh, J. (2009), Heavy construction planning, equipment's and methods. Vol.I.II.CRC Press, New Delhi.

<b>SARA5202</b>	<b>RESOURCE MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OBJECTIVES:**

- To understand the necessity of resource like men, materials and equipment management construction industry.
- To familiarize the students with varied equipment commissioned for various activities at site during different phases of a project.
- To impart and train rigorously the students for human resources management and to familiarize the knowledge of labour regulations and laws to manage the construction activities.

<b>UNIT 1</b>	<b>EQUIPMENT PLANNING AND ECONOMICS</b>	<b>9 Hrs</b>
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Nature of work in construction projects, site constraints, rate of daily output, equipment suitability, equipment output capability, equipment productivity, future use of equipment; equipment owning costs, equipment operating costs, equipment engineering - standard equipment, minor equipment, operating reliability repair and maintenance considerations, safety features - safety management - equipment acquisition - purchasing plant / equipment, hiring equipment, leasing and hire-purchase equipment, replacing equipment, depreciation analysis.

<b>UNIT 2</b>	<b>CONSTRUCTION EQUIPMENT MANAGEMENT</b>	<b>12 Hrs</b>
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Earth moving equipment - excavation and lifting equipment- earth cutting and moving equipment- transportation equipment - Compacting and finishing equipment. Production Equipment - concrete batching plants, concrete mixers, and transportation equipment – concrete placing equipment - Pre-casting special equipment - pre-stressing equipment, GRC equipment, steam curing equipment, shifting equipment, erection equipment - concrete vibrating, repairing and curing equipment, concrete laboratory testing equipment.

Material hoisting plant- cranes - support and utility services equipment's- pumping equipment's, sewage treatment, compressed air equipment, carpentry equipment - special purpose heavy construction plant- aggregate production plant & rock blasting equipment, piles and pile driving equipment.

<b>UNIT 3</b>	<b>CONSTRUCTION MATERIALS MANAGEMENT</b>	<b>9 Hrs</b>
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Importance of material management - classification and codification of materials, Inventory control - managing the inventory and flow of raw materials, work-in-process, finished goods, and supplies for competitiveness and profitability, ABC analysis in inventory control, Inventory management safety stock, stock outs. stores management- quality control, use of materials management systems - purchase order - indents - marketing, registration of sellers - selection, placement of order - follow up - physical training - contract materials - physical inspection and verification - fixation of the re-order level.

<b>UNIT 4</b>	<b>HUMAN RESOURCES AND MANAGEMENT</b>	<b>9 Hrs</b>
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Introduction – organization– management – employees – human resource management - personnel management – manpower planning, recruitment and selection, in-service training – training inputs, principles, types and assessments. Wages and salary administration – wage rate, wage payment methods, incentive plan, fringe benefits, productivity earnings, profit sharing, bonus payment, wage legislation and wage administration. Productivity in construction, measuring productivity, factors affecting productivity, responsibility for productivity. Employee's relation in an organization, motivating employees, hierarchy of motivation; Labour legislation, labour laws in construction, laws regulating wages, social security law, Industrial relations and trade unions.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSESSMENTS</b>	<b>6 Hrs</b>
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Prepare and present equipment and material planning schedule, checklist and productivity analysis for various earth moving equipment, production equipment, Material hoisting for a high rise building. Also prepare and justify the requirement of human resources with the help of histogram and organisation chart for the major construction site.

**Max. 45 Hours**

**COURSE OUTCOMES:**

<b>CO1</b>	Understanding the need and importance of equipment management under different task considerations in projects
<b>CO2</b>	Analysis of the options in selection of equipment and commissioning of the correct type of equipment at project site.
<b>CO3</b>	In-depth understanding on the different methods of production & material hoisting equipment, working under different site conditions.
<b>CO4</b>	Exposure towards material management techniques with the inventory control procedures at construction site
<b>CO5</b>	Surveying the factors influencing the labour productivity and applying the same in the construction site.
<b>CO6</b>	Comprehending the role of human resources including the various regulations to be followed in construction projects

**TEXTS / REFERENCE BOOKS**

1. Peurifoy, R.L., Ledbetter, Schexnayder, C.W.B., Construction Planning, Equipment and Methods, 5th Edition, McGraw Hill, Singapore, 1995
2. Sharma S.C. Construction Equipment and Management, Khanna Publishers New Delhi, 1988
3. Mahesh Varma, Construction Equipment and its Planning and Application, Metropolitan Book Company, New Delhi, 1983
4. Frank Harris and Ronald McCaffer, Management of Construction equipment, Macmillan Publication, 1991
5. Chitkara K.K. Construction Project Management: Planning, Scheduling and Controlling, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2014.
6. Mamoria C.B and ,S. V. Gankar, Personnel Management, Himalaya Publishing House 2003
7. Stephen E. Condrey, Handbook of Human Resources Administration, Jossey - Bass, 2010
8. Gopalakrishnan, Handbook of Materials management, PHI Learning Pvt. Ltd., 1993.
9. Carlton Coulter and Jill Justice Coutler, The complete standard handbook of construction personnel management, Prentice-Hall, Inc., New Jersey, 1989.
10. Mamoria C.B and S.V.Gankar, Personnel Management, Himalaya Publishing House. 2003.
11. Stephen E. Condrey, Handbook of Human Resources Administration, Jossey – Bass, 2010
12. Dwivedi R.S., Human Relations and Organisational Behaviour, Macmillan 2001.
13. Austen A.D., Managing Construction Projects: A guide to Processes and Procedures, International Labour Organisation, 1984.
14. Geoffrey D.Taylor, Materials in Construction, Longman, 2002.
15. Gopala Krishnan, Handbook of Materials management, PHI Learning Pvt. Ltd., 1993.

<b>SARA5203</b>	<b>REAL ESTATE AND MARKETING MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OBJECTIVES:**

- To provide a comprehensive understanding about real estate practice, financial markets, legal aspects and marketing management.
- To formulate and appraise capital investments for developers for different types of projects and to be able to prepare DPRs.
- To acquire competence in managing real estate and infrastructure assets and interpretation of valuation methods.

<b>UNIT 1</b>	<b>PRINCIPLES AND PRACTICES OF REAL ESTATE MANAGEMENT</b>	<b>9 Hrs</b>
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Real and personal property, Characteristics of real estate; Affordable housing; Laws affecting property development, Real estate contracts; Leases; Fair housing and ethical practices; Property management, Environmental issues and real

estate transactions; Financial services, markets and institutions- - structure and role; Banking institutions and non-bank financial companies, development & housing finance institutions, Micro finance, Financial regulatory bodies.

<b>UNIT 2</b>	<b>BUSINESS DEVELOPMENT AND MARKETING MANAGEMENT</b>	<b>12 Hrs</b>
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Business development process; Real estate/property markets, forecasting and business cycles, Analytical tools for selection of new business; Market Analysis and Demand Forecasting, Technical analysis including Value Engineering, Economic Analysis, (EIA), Project risk analysis & cash flow analysis, estimation from contractors view and clients View, PPP projects and life cycle perspective from developers aim; DPR from various stakeholders perspective. Project Appraisal; SCBA. Project marketing concepts, Twin-track approach towards project marketing, Project marketing mix.

<b>UNIT 3</b>	<b>REAL ESTATE DEVELOPMENT PRACTICE</b>	<b>9 Hrs</b>
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Development control regulations; Zoning; Rent control Act; Building byelaws; Permissions; Changing land use; Real estate types; Location selection; relevant ownership flats/apartments act; Planning for single, mixed use, planned use, specialized Special Economic Zones (SEZ) projects; Choosing vendors, contract terms; Facilities mix management; Integrating environmental issues in development.

<b>UNIT 4</b>	<b>VALUATION AND ASSET MANAGEMENT OF PROPERTIES</b>	<b>9 Hrs</b>
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Value, valuation and importance of Value, Appraisal/valuation cycle, Valuation principles and factors, Major Approaches to Valuation-Market approach, Cost approach and Income approach, Valuation techniques/methods Valuation for Contemporary Issues viz., Energy and Environment, Contemporary issues in valuation.

Asset management strategy and objectives; Overview of asset management standards: British Standard Institution (BSI), Publicly Available Specification (PAS) 55.ISO 55000; Asset management policy, Deterioration modelling; Maintenance - objectives models and maintenance requirements determination; Life cycle costing; Economic life of asset; Replacement analysis; Decision tools for asset management; Prioritization and optimization; System reliability.

<b>UNIT 5</b>	<b>CONSTRUCTIVE ASSIGNMENTS</b>	<b>6 Hrs</b>
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Individual assignments on valuation, EIA, cash flow, project formulation, DPR and case study analysis.

**Max. 45 Hours**

#### **COURSE OUTCOMES**

<b>CO1</b>	Summarize the scope of the existing real estate industry in the current business environment and to classify the various statutory and legal regulations applicable to real estate market.
<b>CO2</b>	Outline the roles, responsibilities, rights and liabilities of different real estate stakeholders.
<b>CO3</b>	Get exposure to the various documentation procedures for different real estate transactions, appraisals and valuation of properties.
<b>CO4</b>	Apply quantitative methodology used in different transactions.
<b>CO5</b>	Delineate project development process, compare the different sources of real estate funds and classify the risks.
<b>CO6</b>	Formulate a real estate project by assessing its feasibility and evolving strategies for effective management.

#### **TEXTS/ REFERENCE BOOKS**

1. Madura, J. (2008). *Financial markets and institutions*. Ohio: Thomson Publications.
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