



**Dr. M.G.R.**  
**EDUCATIONAL AND RESEARCH INSTITUTE**  
**DEEMED TO BE UNIVERSITY**

**University with Graded Autonomy Status**

**(An ISO 21001 : 2018 Certified Institution)**

Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.



**M. ARCH**  
**CONSTRUCTION**  
**PROJECT MANAGEMENT**  
**SYLLABUS2021**

### Program Outcomes

<b>PO1</b>	Acquire outstanding fundamental knowledge in the field of Construction Project Management
<b>PO2</b>	Encompass the ability to work in collaboration with interdisciplinary teams.
<b>PO3</b>	Act and communicate ideas through drawings and data.
<b>PO4</b>	Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects
<b>PO5</b>	Acting with the innovative technical competence in the use of emerging trends in the building industry
<b>PO6</b>	Understanding the diverse needs of values and systems of society and providing sustainable solutions

### Mapping of Course Outcomes (COs) with Program Outcomes (POs)

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1						
	CO2						
	CO3						
	CO4						
3	Category	General (A)	Basic Sciences & Math (B)	Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)	
4	Approval					Meeting of Academic Council, May 2021	

**SEMESTER I**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21C001	Advanced building materials	3	0	0	3
2	MAR21C002	Construction Equipment and Method	3	0	0	3
3	MAR21C003	Construction Scheduling and control	3	0	0	3
4	MAR21C004	Statistical methods	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL01	Project I	0	0	14	7
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>19</b>

**SEMESTER II**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21C005	Computer Application in Project Management	3	0	0	3
2	MAR21C006	Construction contracts and Management	3	0	0	3
3	MAR21C007	Project Formulation and Appraisal	3	0	0	3
4	MAR21C008	Safety Management	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL02	Project II	0	0	14	7
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>19</b>

**SEMESTER III**

S. No.	Subject Code	Subject	Lecture	Tutorial	Studio	Credits
		<b>THEORY</b>				
1	MAR21C009	Economics and Finance Management	3	0	0	3
2	MAR21C010	Research Methodology	3	0	0	3
3	MAR21CE	Elective 1	3	0	0	3
4	MAR21CE	Elective 2	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL03	Dissertation	0	0	14	7
6	MAR21CL04	Practical Training	0	0	0	5
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>24</b>

**SEMESTER IV**

S. No.	Subject Code	Subject	Lecture	Tutorial	Studio	Credits
		<b>THEORY</b>				
1	MAR21CE	Elective 3	3	0	0	3
2	MAR21CE	Elective 4	3	0	0	3
		<b>STUDIO</b>				
3						
4	MAR21CL05	Thesis	0	0	14	7
		<b>Total Hours</b>	<b>20</b>	<b>Total Credits</b>		<b>13</b>

**TOTAL CREDITS 75**

## ELECTIVES LIST

<b>Sem</b>	<b>Subject Code</b>	<b>Elective list</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
	MAR21CE01	Current trends & technologies in Project Management	3	0	0	3
	MAR21CE02	Maintenance and Rehabilitation of structures	3	0	0	3
	MAR21CE03	Quality Management	3	0	0	3
	MAR21CE04	Resource Management	3	0	0	3
	MAR21CE05	Environmental Impact Assessment	3	0	0	3
	MAR21CE06	Infrastructure planning & Management	3	0	0	3
	MAR21CE07	Real Estate Management	3	0	0	3
	MAR21CE08	Risk Management	3	0	0	3

**SEMESTER I**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21C001	Advanced building materials	3	0	0	3
2	MAR21C002	Construction Equipment and Methods	3	0	0	3
3	MAR21C003	Construction Scheduling and control	3	0	0	3
4	MAR21C004	Statistical methods	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL01	Project I	0	0	14	7
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>19</b>

**MAR21C001****ADVANCED BUILDING MATERIALS**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Introduce modern advanced materials, their properties and applications. Using those materials to create resilient and sustainable structures.

**Expected Course Outcomes:**

CO1	To know the latest materials in the market and understand their properties
CO2	To understand the application based on durability, strength aesthetics and cost and also the technique / technology required.
CO3	To expose students to advanced materials used for various components of a building based on structural, insulation etc applications
CO4	To choose a sustainable, cost effective option of materials when a situation presents.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	M	H	M
	CO2	H	H	H	M	H	M
	CO3	H	H	H	M	H	M
	CO4	H	H	H	M	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1**.....**9**

Properties and uses of modern building materials: fly ash bricks, soil - cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC), glass reinforced gypsum

### **Unit 2**.....**9**

Properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals, paints, tiles, bricks, glass), metals, light - weight concrete, mass concrete, waste material-based concrete.

### **Unit 3**.....**15**

Introduction, properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, nuclear concrete, heat resisting & refractory concretes, pre-fabricated systems. Introduction, properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), Sulphur concrete and Sulphur - infiltrated concrete.

### **Unit 4**.....**7**

Introduction, properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials (thermal, sound and electrical insulating materials). Concept of polymer floor finishes.

### **Unit 5**.....**5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## References:

1. Ghambhir M.L. "Concrete Technology" Tata McGraw Hill education private Limited.
  2. A.R. Santhakumar, Concrete Technology, Oxford University Press.
  3. Building Materials, P.C. Varghese, Prentice-Hall India.
  4. Shetty, M. S., "Concrete Technology" S. Chand Publication.
  5. Krishnaraju .N., Advanced Concrete Technology, CBS Published.
  6. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
  7. Neville. A.M., Concrete Technology, Prentice Hall, Newyork.
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**MAR21C002****CONSTRUCTION EQUIPMENT AND METHODS**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Introduce the equipment and technologies available for executing work at site. Planning and scheduling based on equipment capacity and vice versa. Knowledge on commonly used construction equipment - costing and maintenance of the same.

**Expected Course Outcomes:**

CO1	To learn the practical aspect of construction management
CO2	To know about the various equipment and machineries used in construction
CO3	To understand the scientific principles and to maximize productivity
CO4	To know the cost, time and productivity, applicability for various equipment available

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	M	H	M	H
	CO2	H	H	M	H	H	M
	CO3	H	H	H	H	M	M
	CO4	H	H	H	M	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 ..... Construction Equipment ..... 7**

Introduction, significance of equipment in construction industry - laboratory setting including plan reading, specification reading, construction scheduling and estimating, Job layout and its importance.

### **Unit 2 ..... Construction Equipment Management 9**

Equipment Management- Introduction, Differences between men and manpower, Extent of Mechanization, Equipment planning, Selection of equipment, Forward planning, Purchase of Equipment, Specifications for ordering equipment. Maintenance Management – Introduction, Objectives, Functions, Maintenance planning, Maintenance control, Types of maintenance. Equipment cost – Operating cost – Cost Control of Equipment – Depreciation Analysis – Replacement of Equipment – Replacement Analysis – Safety Management.

### **Unit 3 ..... Equipment for Earthwork ..... 9**

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment Excavation equipment- Power Shovels, Back Hoe, Drag line, Clamshell; Excavating and Earth Moving Equipment – Scrapers, Bull Dozers, Tractors, Hauling Equipment– Dump trucks, Dumpers Loaders, trucks, Earth Compaction Equipment-Tamping Rollers, Smooth Wheel Rollers, Sheepsfoot Roller, Pneumatic-tired Roller, Vibrating Compactors, Vibrocompaction methods.

### **Unit 4 ..... Equipment for Concrete and Road-laying 15**

Introduction, properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials (thermal, sound and electrical insulating materials). Concept of polymer floor finishes.

**Other Equipment** –Pile driving Equipment - Erection Equipment – Cranes, Derrick Cranes, Mobile cranes, Overhead cranes, Traveler cranes, Tower cranes

Types of pumps used in Construction -Grouting - Material Handling Conveyors –Industrial Trucks, Forklifts and related equipment.

### **Unit 5 ..... Report ..... 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## References:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", McGraw Hill, Singapore, 2006.
  2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, New Delhi, 1988.
  3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.
  4. Dr. Mahesh Varma, "Construction Equipment and its planning and Application", Metropolitan Book Company, New Delhi. 1983.
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Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Introduce techniques of scheduling methods and their application; Monitoring and controlling a construction project using both schedule and cost estimates.

**Expected Course Outcomes:**

CO1	To learn about breaking down of activities, relationships and resource requirements
CO2	To learn the various scheduling technologies and their applications
CO3	To know about resources-based scheduling techniques & time cost trade-off
CO4	To understand the how the schedules are applicable to both - for estimation as well as monitoring and control of cost and time

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	H	H	M	M
	CO3	M	H	H	H	M	M
	CO4	H	H	H	H	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1** ..... **Bars and Milestones Charts** ..... **6**

Introduction to methods of planning and scheduling, Work Break Down Structures.

Bar charts and Milestone Charts – Development of Bar charts – Shortcomings – Remedial measures – Milestone charts

### **Unit 2** ..... **CPM** ..... **10**

CPM – Construction of network – Earliest Possible Occurrence time and Latest Possible Occurrence time – Start and Finish times of activities – Floats – Identification of Critical Path using floats. Cost Time Optimization – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing - Cost and Time Optimization.

### **Unit 3** ..... **PERT** ..... **9**

PERT- Elements of Networks – Event, Activity, and Dummy Activity – Guidelines for the construction of the network – Development of PERT network – Numbering - Fulkerson's rule - Skip numbering. Time estimates – Optimistic, Pessimistic and Most likely time estimates – Earliest Expected time and Latest Allowable Occurrence time. Critical Path – Slack – Identification of Critical Path – Probability of Completion of projects.

### **Unit 4** ..... **Resource Oriented Scheduling** **15**

Resource allocation – Resources – Usage profiles – Histograms – Resource Smoothing – Resource levelling. **Updating & Monitoring:** Monitoring and updating project progress through Earned value analysis

### **Unit 5** ..... **Report** ..... **5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## References:

1. Chitkara, K.K. "Construction Project Management planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 1998.
  2. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of Terms and Applications", Wiley, New York, 1995
  3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000
  4. Willis., E.M., "Scheduling construction projects", John Wiley and Sons 1986
  5. Halpin, D.W., "Financial and cost concepts for construction Management" , John Wiley and Sons, New York, 1985
  6. P.K.Joy "Total Project Management – The Indian Context" Macmillan India Limited 1998
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**MAR21C004****STATISTICAL METHODS**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To Introduce various statistical tools & concepts. To Understand the nature of data and apply appropriate testing and analysis. Use of excel and other simple soft wares for analyzing data.

**Expected Course Outcomes:**

CO1	To do Exercises involving eigen values and techniques for diagnosing a matrix
CO2	To Analyse characteristics and properties of two-dimensional geometric shapes
CO3	To obtain the ability to calculate areas and volumes of compound shapes
CO4	To Analyse statistical data samples and infer

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	M	M	H	H	-	-
	CO2	H	M	M	H	M	-
	CO3	H	M	M	H	M	-
	CO4	M	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
			✓				
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 Understanding Data 9**

Data and questions- Graphical displays- Numerical summaries- Graphical displays and numerical summaries

**Unit 2 Models for Data 12**

Random variables and probability - Probability distributions and describing them - The Bernoulli and binomial probability models - The normal distribution. Population means and variances - Independence of random variables - The geometric probability model - Two models for uniformity - Population quantiles.

**Unit 3 Point Estimation 9**

Principles of point estimation - Methods of estimation - The method of maximum likelihood - More about maximum likelihood estimation - Estimating a normal variance.

**Unit 4 Estimation with Confidence and Testing Hypothesis 9**

Samples of size - small samples - Confidence intervals for the parameters of a normal distribution - larger samples - Inference without a model. An approach using confidence intervals -Fixed-level testing - Significance testing - Comparing the means of two normal populations - Other comparisons.

**Unit 5 Use of Software 5**

Exercises involving case studies and statistical analysis and inference using software.

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**References:**

1. Applied Statistics and Probability for Engineers, Montgomery and Runger—Wiley, India.
  2. Probability and Statistics for Engineers, Miller, Freund-Hall, Prentice India Ltd. 2009
  3. Applied Mathematics for Engineers and Physicists, Pipes and Harvill. McGraw Hill International Edition, 1970
  4. Sampling techniques, Cochran, Wiley Series, 2008.
  5. Statistics-Concepts and Controversies, David S. Moore-Freeman Company, New York.
  6. Reliability Principles and practices, Calabro-McGraw Hill Book Company, 1963
  7. Shrivastava, Shenoy & Sharma, Quantitative Techniques for Managerial Decisions, Wiley, 1989.
  8. Applied Statistics for Civil and Environmental Engineers by Kottegoda., Stratford Books
  9. Elements of statistics, F. Daly D. J. Hand M. C. Jones A. D. Lunn K. J. McConway, The open university, prentice hall
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<b>MAR21CL01</b>	<b>PROJECT I</b>
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Lecture periods per week	0	Number of credits	7
Studio/Lab/Workshop /site visit per week	14	Internal Assessment	50
Total period per week	14	End Semester Exam	50
Total period	210	Total Marks	100

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**Subject Objectives:** The project aims to provide an opportunity for students to learn the process of applying project management techniques and efficient planning. Of multistorey buildings

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**Expected Course Outcomes:**

CO1	To understand construction project management from field studies
CO2	To know the various techniques, technologies and materials, services involved in making a building
CO3	To interact with various consultants and to see the process from their perspective
CO4	To identify and propose alternative solutions with better tangible or intangible benefits

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low								
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	
	CO1	H	H	H	H	H	M	
	CO2	H	H	H	H	H	M	
	CO3	H	H	H	H	H	M	
	CO4	H	H	H	H	H	H	
3	Category	General (A)	Basic Sciences & Math (B)	Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)		
				✓				
4	Approval					Meeting of Academic Council, May 2021		

**Course Content:**

The project involves two simultaneous case studies. Each case study shall be a piece of investigation work focused on the application of the concepts of project management and building construction respectively.

In the course of the project, students may be required to conduct measurements and undertake surveys. When required, students are expected to interact with the relevant parties or persons such as Architects, engineers, operation and maintenance staff or building occupants in a professional and ethical manner

Students are expected to identify an actual problem in a multistorey building, on any one or more of the following aspects: design, construction methods, technology, techniques, materials etc. and submit a solution with cost and time estimates using software

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**SEMESTER II**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21C005	Computer Application in Project Management	3	0	0	3
2	MAR21C006	Construction contracts and Management	3	0	0	3
3	MAR21C007	Project Formulation and Appraisal	3	0	0	3
4	MAR21C008	Safety Management	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL02	Project II	0	0	14	7
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>19</b>

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To train students in software that have become integral part of construction project management.

**Expected Course Outcomes:**

CO1	To understand the importance of computer applications in PM
CO2	To use software for effective office management
CO3	To schedule and monitor projects through software
CO4	To create edit and save various documents required in a project

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	M	H	H	M
	CO2	M	H	H	H	H	M
	CO3	H	H	H	H	H	M
	CO4	M	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - Effective Use of Ms Office for Business Administration 10**

Professional documents and User Inputs with MS-Word – Business Presentations with MS-PowerPoint – Template – Organizing and Protecting Documents – Business management with Microsoft Access

**Unit 2 - Scheduling and Updating 15**

Project schedules using PM software- resource loading- scheduling and updating for monitoring

**Unit 3 - Data Handling and Processing 10**

MS-Excel for sorting and analyzing cash flows., pay back calculation - ranking of factors- plotting graphs, charts - appropriate methods of presenting data

**Unit 4 - Paper Writing 10**

MS-Word- End note - for referencing - other software for paper writing, editing and formatting

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**Reference:**

1. Microsoft Office 2019 Step by Step, Joan Lambert Curtis Frye, Microsoft Press; 1st edition
  2. Microsoft Project 2019 Step by Step, Book by Carl S. Chatfield, Cindy Lewis, and Timothy D. Johnson, Microsoft Press; 1st edition
  3. Microsoft Project 2019 For Dummies, Cynthia Snyder, Wiley, 2019.
  4. Mastering MS Office, Bittu Kumar, V&S Publishers
  5. Microsoft Excel Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Press; 5th edition, 2016
  6. <https://rmit.libguides.com/endnote>
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Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To learn about contract types, formulation, applicability and validity of contracts under various acts. To understand the various dispute resolution mechanisms in construction.

**Expected Course Outcomes:**

CO1	To learn about contract types and laws relevant to construction contracts
CO2	To learn about, formulation, applicability and validity of contracts.
CO3	To introduce students to FIDIC documents
CO4	To know and understand means of dispute resolution mechanisms

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	M	H	M	M	H	M
	CO2	H	H	M	H	M	M
	CO3	M	H	H	H	M	M
	CO4	H	H	H	M	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - Construction Contracts ..... 9**

Indian Contract Act (1872) -Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. (From model 5), Clauses 1 to 75- Contract formation, contract performance, valid excuses for nonperformance, Breach of contract, effects of breach- understanding the clauses and applying them to situations/scenarios on construction projects. Importance of the Workmen's Compensation Act on construction projects

**Unit 2 - Contract Formation ..... 12**

Standard forms of contracts, methods of inviting tenders, pre-bid meetings, pre-qualification system, scrutiny of tenders and comparative statement. Contract formation, conditions of contracts, contracts with various stakeholders on a major construction projects, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure.

**FIDIC** : ICE conditions-Introduction, FIDIC conditions- evolution of FIDIC document, types based on whether design is of employer or contractor, Design & Build contract, EPC contract, short forms of contract- Colour Code. Various conditions of Red Book. Model forms of contract.

**Unit 3 - Claims and Dispute Resolution ..... 9**

Construction Claims: Extra items and causes of claims. Types of construction claims, documentation. settlement of claims Dispute Resolution: Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards

**Unit 4 - Conciliation and Arbitration ..... 9**

Indian Arbitration and Conciliation Act 1996 Difference between 1940 Act and 1996 Act. Extent of application of 1996 Act. Objectives, general provisions. Composition of the arbitral tribunal, jurisdiction of arbitral tribunal, duties, power of arbitrators. Conciliation: Conciliation and its provisions in the Act, Conduct of conciliation and arbitral proceedings, grounds for challenge. Arbitral award and its enforcement. Procedure of appeal against the awards

**Unit 5 Report ..... 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**Reference:**

1. Civil Engineering Contracts and Estimates - B. S. Patil – Universities Press- 2006 Edition, reprinted in 2009.
  2. The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.
  3. The Arbitration and Conciliation Act,(1996), 1996 (26 of 1996)- 2006 Edition, Professional Book Publisher.
  4. Law of contract Part I and Part II, Dr. R.K. Bangia- 2005 Edition, Allahabad Law Agency.
  5. Arbitration, Conciliation and Alternative Dispute Resolution Systems- Dr. S.R. Myneni- 2004 Edition, reprinted in 2005- Asia Law House Publishers.
  6. The Workmen's Compensation Act, 1923 (8 of 1923) Bare Act- 2005- Professional Book Publishers.
  7. Standard General Conditions for Domestic Contracts- 2001 Edition- Published by Ministry Of Statistics and Program Implementation, Government of India.
  8. FIDIC Document (1999).
  9. Dispute Resolution Board foundation manual-[www.drpf.org](http://www.drpf.org).
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**MAR21C007****PROJECT FORMULATION AND APPRAISAL**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To study and understand the formulation, costing of construction projects, appraisal, finance and private sector participation.

**Expected Course Outcomes:**

CO1	To learn the process of various feasibility studies required for project formulation
CO2	To understand the project cash flows and concepts of time value of money
CO3	To learn assessment and selection of projects through payback period calculations
CO4	To study the PPP model and to understand the stakeholders and their roles.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	H	H	H	M
	CO3	H	H	H	H	H	M
	CO4	H	H	H	M	M	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 - Project Formulation** .....9

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

### **Unit 2 - Project Costing & Appraisal** .....9

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

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.

### **Unit 3 - Project Financing** .....9

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

### **Unit 4- Private Sector Participation** .....9

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

### **Unit 5 Report** .....5

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## References:

1. Barcus, S.W. and Wilkinson.J.W., "Hand Book of Management Consulting Services", McGraw Hill, New York, 1986.
  2. Joy P.K., "Total Project Management - The Indian Context", New Delhi, Macmillan India Ltd., 1992
  3. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation Review", McGraw Hill Publishing Company Ltd., New Delhi. 2006.
  4. "United Nations Industrial Development Organisation (UNIDO) Manual" for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.
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**MAR21C008****SAFETY MANAGEMENT**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To study and understand the various safety concepts and requirements applied to construction projects. To study the of construction accidents, safety programs, contractual obligations, and design for safety.

**Expected Course Outcomes:**

CO1	To learn the causes and impacts of accidents at construction sites
CO2	To study and understand the various safety concepts and requirements applied to construction projects
CO3	To study safety programmes and how to ensure safety at all levels
CO4	To understand the importance of contractual obligations, and to design for safety

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	M	H	H
	CO2	H	H	H	M	H	H
	CO3	H	H	H	M	H	H
	CO4	H	H	H	M	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - Construction Accidents ..... 10**

Accidents and their causes – Human factors in construction safety – cost of construction injuries – Occupational and Safety hazard assessment – Legal implications

**Unit 2 - Safety Programmes ..... 12**

Problem areas in construction safety – elements of an effective in safety program – Job site safety assessment safety meetings – safety incentives

Safety in construction contracts – substance abuse – safety record keeping

**Unit 3 - Contractual Obligations ..... 9**

Safety culture – Safe workers – Safety and first line supervisors – Safety and middle managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual obligation – Project Coordination and Safety Procedures – Workers Compensation

**Unit 4 - Designing For Safety ..... 9**

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

**Unit 5 Report ..... 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**Reference:**

1. Jimmy W. Hinze, “construction Safety”, Prentice Hall Inc.
  2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, “Construction Safety and Health Management”, Prentice Hall Inc.
  3. Raymond Elliot Lecitt and Nancy Morse Samelson, Construction Safety Management.
  4. Charles D. Reese, Occupational; Health and Safety Management: A Practical Approach, Second Edition
  5. Tamil Nadu Factory Act.
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<b>MAR21CL02</b>	<b>PROJECT II</b>
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Lecture periods per week	0	Number of credits	7
Studio/Lab/Workshop /site visit per week	14	Internal Assessment	50
Total period per week	14	End Semester Exam	50
Total period	210	Total Marks	100

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**Subject Objectives:** The project aims to provide an opportunity for students to learn the process of applying project management techniques and efficient planning for optimizing the construction process

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**Expected Course Outcomes:**

CO1	To understand advanced and modern concepts construction project management through field / case studies
CO2	To provide a solution which will reduce the scheduled duration and or budgeted cost of the project chosen
CO3	To interact with various consultants and to see the process from their perspective
CO4	To create a crashed schedule and modified budget using software

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	H	H	H	M
	CO3	H	H	M	M	H	H
	CO4	H	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

The project involves two simultaneous case studies. Each case study shall be a piece of investigation work focused on the application of the concepts of project management and building construction respectively.

In the course of the project, students may be required to conduct measurements and undertake surveys. When required, students are expected to interact with the relevant parties or persons such as Architects, engineers, operation and maintenance staff or building occupants in a professional and ethical manner

Students are expected to identify an actual problem in a multistorey building, on any one or more of the following aspects: design, construction methods, technology, techniques, materials etc. and submit a solution with cost and time estimates using software.

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**SEMESTER III**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21C009	Economics and Finance Management	3	0	0	3
2	MAR21C010	Research Methodology	3	0	0	3
3	MAR21CE**	Elective 1	3	0	0	3
4	MAR21CE**	Elective 2	3	0	0	3
		<b>STUDIO</b>				
5	MAR21CL03	Dissertation	0	0	14	7
6	MAR21CL04	Practical Training	0	0	0	5
		<b>Total Hours</b>	<b>28</b>	<b>Total Credits</b>		<b>24</b>

**ELECTIVES LIST**

<b>Sem</b>	<b>Subject Code</b>	<b>Elective list</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
	MAR21CE01	Current trends & technologies in Project Management	3	0	0	3
	MAR21CE02	Maintenance and Rehabilitation of structures	3	0	0	3
	MAR21CE03	Quality Management	3	0	0	3
	MAR21CE04	Resource Management	3	0	0	3

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To help the students to develop cognizance of the importance of Financial Management in corporate evaluation. To enable students to synthesize related information and evaluate options for most logical and optimal solution such that they would be able to predict and control Debt Equity incurrence and improve results. To provide the student with an in-depth understanding of the link between company decision-making and the operation of capital markets. To ensure the student understands and appreciates the strong linkages between finance and globalization. To help the student explore the financial environment in which firms and managers must operate.

**Expected Course Outcomes:**

CO1	Demonstrate the applicability of the concept of Financial Management to understand the managerial Decisions and Corporate Capital Structure
CO2	Analyze the complexities associated with management of cost of funds in the capital Structure
CO3	Demonstrate how the concepts of financial management and investment, financing and dividend policy decisions could integrate while identification and resolution of problems
CO4	Critically Analyze construction claims and how risk is assessed.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	
	CO2	H	H	H	H	M	M
	CO3	H	H	H	H	H	M
	CO4	H	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### Unit 1 - Principles of Economics .....9

Importance of the economic background to measurement, objectives of business firm. Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms, Study of present economy.

**Capital:** Analysis of need for working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Corpus Fund

### Unit 2 - Economic Analysis .....9

Cost implication to different forms of construction and maintenance, replacement lives of material, Installation and running cost of services, Capital investment in project, Cost analysis by traders and by functional element, Cost planning techniques, Cost control during design and Construction, Depreciation, Various Appraisal Criteria Methods. Break-even analysis, Cash flow analysis, Risk Analysis and Management Practice, Role of Lender's Engineer. Cost pricing method

### Unit 3 - Financial Planning: Need and Sources of Finance .....9

Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves. **Budget:** Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual. Accounting Information System: Project Commentary, project Running Commentary

**Corporate Sector :** Corporate tax planning, public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction sector, SEBI regulation., GST, CGST, SGST, Direct Tax Court System

### Unit 4 - Construction Accounts .....13

Accounting process, preparation of profit and loss account and balance sheet as per the companies Act 2013, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis. Escrow Account for PPP Project.

**Case Studies (Any Two):** Case studies for 1) PPP projects 2) Dams and Canals 3) Mass Transit System 5) Government Funded Projects with respect to a) Project Appraisal b) Raising of funds c) Cost to complete analysis

### Unit 5 Report .....5

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## References:

1. Construction Management & PWD Accounts --- D Lal, S. K. Kataria & Sons, 2012
2. Construction Management and Accounts -- Singh H. Tata McGraw Hill, New Delhi, 1988
3. Construction Management: Planning and finance-- Cormican D. Construction press, London, Feb 2002.
4. Principles of Corporate Finance, Brealey R.A. Tata McGraw Hill, New Delhi, 2003.
5. Engineering Economics—Kumar---Wiley, India.
6. Engineering Economy, Leland T. Blank. Anthony Tarquin. McGraw Hill, 2008.
7. Engineering Economics, David Bedworth, Sabah Randhawa. McGraw Hill, 1996.

8. Real Estate, Finance and investment, Bruggeman. Fishr, McGraw Hill, 2010.
  9. Foundations of Financial Management, Block Hirt. McGraw Hill, 2009.
  10. Case studies in finance, Burner, McGraw Hill, 2009.
  11. Cases in Finance, DeMello McGraw, 2003.
  12. Financial Managementl – Indian Institute of Banking and Finance – MacmillanPublications.
  13. Project's planning, Analysis Selection, Implementation and Review, PrasannaChandra Tata McGraw Hill, New Delhi, 2005
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Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To make the students to distinguish various theoretical ideologies influencing the philosophy and values of architecture. To establish the sense of systematic inquiry in students' mind to analyze and infer the issues and aspects relating to Architecture. Understand research terminology. Be aware of the ethical principles of research, ethical challenges and approval processes. Describe quantitative, qualitative and mixed methods approaches to research. Identify the components of a literature review process. Critically analyze published research. To enable the participants in conducting research work and formulating research synopsis and report.

#### Expected Course Outcomes:

CO1	The student will develop the skill to identify, decipher and interpret the issues relating to construction project management, based on research enquiry methods.
CO2	The student will widen the information and will prepare the students for scientific method of researching and research process
CO3	The student will be able to demonstrate knowledge of research processes (reading, evaluating, and developing); and perform literature reviews
CO4	The students will be able to define and develop a possible research interest area using specific research designs; compare and contrast quantitative and qualitative research paradigms, describe, compare, and contrast descriptive and inferential statistics, and explain use of each in research

#### Mapping of Course Outcomes (COs) with Program Outcomes (POs):

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	H	H	H	H
	CO3	M	M	H	H	H	H
	CO4	H	H	H	H	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - Introduction ..... 12**

Basic research issues and concepts- orientation to research process- types of research: historical, qualitative, co-relational, experimental, simulation and modeling, logical argumentation, case study and mixed methods- illustration using research samples

**Unit 2 -Research Process ..... 12**

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 3 -Researching and Data Collection ..... 12**

Library and archives- Internet: New information and the role of internet; finding and evaluating sources- misuse- test for reliability- ethics

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

**Unit 4 - Report Writing ..... 9**

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

**Unit 5 Report ..... 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**References:**

1. Linda Groat and David Wang; Architectural Research Methods;
  2. Wayne C Booth; Joseph M Williams; Gregory G. Colomb; The Craft of Research, 2nd Edition;
  3. Chicago guides to writing, editing and publishing;
  4. Iain Borden and KaaterinaRuedi; The Dissertation: An Architecture Student's Handbook; Architectural Press; 2000
  5. Ranjith Kumar; Research Methodology- A step by step guide for beginners; Sage Publications; 2005
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**MAR21CL03****DISSERTATION**

Lecture periods per week	0	Number of credits	7
Studio/Lab/Workshop /site visit per week	14	Internal Assessment	50
Total period per week	14	End Semester Exam	50
Total period	210	Total Marks	100

**Subject Objectives:** The Dissertation involves critical problem statements and aims to Introduce strategies for bridging the gap between the beginning research and thesis writing. Understand the rhetorical situation of the thesis proposal and common elements of such proposals. Introduce practical rhetorical and grammatical principles of writing effective proposals. Provide with tips for drafting and revising individual sections of the proposal

**Expected Course Outcomes:**

CO1	Understanding the strategies for bridging the gap between research and thesis writing.
CO2	Understanding the rhetorical situation of the thesis proposal and various methods of data collection and filtering
CO3	Knowledge on practical rhetorical and grammatical principles of writing effective proposals
CO4	Understanding research and writing are different and awareness on how to draft and revise individual sections of the proposal for report and journal papers

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	M	M	H	H
	CO3	M	H	H	H	M	M
	CO4	M	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)
					✓		
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:****Topics of Study:**

Students may choose a topic related to Construction Project Management and allied subjects. The topics must be vetted by the faculty. Emphasis must be on critical understanding, logical reasoning and structured writing. Students may be encouraged to select the topic which may eventually culminate in the Construction Project Management Thesis of the subsequent semester. Students can thus utilise this as an opportunity for pre-Thesis study, amounting to literature review and relevant case studies which are otherwise required for Thesis.

**Method of Submission:**

By the end of the semester, students are expected to submit a written paper of approximately 3500 words. Standard referencing conventions and technical writing norms must be adhered to. Students are expected to present the progress of the study at various stages of the semester. Final assessment of the students' work may be based on written Paper as well as oral communication. However, greater weightage may be given for writing skills and research content of the study.

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**References:**

1. Anderson, J. and Poole, M. (1998). Thesis and assignment writing. Brisbane : John Wiley.
  2. Borden, I. and Ray, K. R. (2006). The dissertation: an architecture student's handbook. 2nd Ed. Oxford : Architectural Press.
  3. Fink, A. (1998). Conducting research literature reviews: from paper to the Internet. Thousand Oaks : Sage.
  4. Murray, R. (2005). Writing for academic journals. Berkshire:Maidenhead, Open University Press
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**MAR21CL04****PRACTICAL TRAINING**

Lecture periods per week	0	Number of credits	7
Studio/Lab/Workshop /site visit per week	14	Internal Assessment	50
Total period per week	14	End Semester Exam	50
Total period	210	Total Marks	100

**Subject Objectives:** The aim of the ‘Practical Training’ is to enable the students to gain the kind and range of practical experience which will prepare them for their likely responsibilities, immediately after the completion of the program. The student should try to seek a variety of experiences in his/her ‘Training office’ to acquaint himself/herself with various works, procedures etc. of building trade - such as preparation of various estimates, scheduling and monitoring, updating and control, documentation etc.,

**Expected Course Outcomes:**

CO1	To learn to work on multiple projects in an office and learn all aspects relating to making of a building starting from Concept Development, Assessments, Working Drawings, Specifications, Estimation, scheduling and monitoring etc. and through site visits.
CO2	To learn to work with other consultants through good communication skills
CO3	To be able to work with basic software that are used in construction project management
CO4	In addition to this, students also learn about modern methods of construction using the latest technology and how to handle large scale projects onsite.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low								
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	
	CO1	H	H	H	H	H	H	
	CO2	H	H	H	H	H	H	
	CO3	H	H	H	H	H	H	
	CO4	H	H	H	H	H	H	
3	Category	General (A)	Basic Sciences & Math (B)	Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)		
							✓	
4	Approval					Meeting of Academic Council, May 2021		

**Course Content:**

The internship program would be done in offices empaneled by the Institution and in firms registered under the Council of Architecture. The progress of practical training shall be assessed internally through submission of log books supported by visual documents maintained by students every month along with the progress report from the employer/s of trainees.

- Adherence to time schedule, Discipline.
- Ability to carry out the instructions on preparation of schematic drawings, presentation drawings, working drawings.
- Ability to work as part of a team in an office.
- Ability to participate in client meetings and discussions.
- Involvement in supervision at project site.

**Report and Submissions:**

At the end of the Internship program a portfolio of work done during the period of internship along with certification from the offices are to be submitted for evaluation by a viva voce examination. This will evaluate the understanding of the students about the drawings, detailing, materials, construction method and service integration and the knowledge gained during client meetings, consultant meetings and site visits.

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**ELECTIVES:****MAR21CE01 CURRENT TRENDS & TECHNOLOGIES IN PROJECT MANAGEMENT**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To study and understand the strategies involved from preplanning to execution stage. Using tools to analyse and prioritize. To gain knowledge about Critical, supply chain management systems, and fast track construction management.

**Expected Course Outcomes:**

CO1	To learn about current strategies and trends
CO2	To study and analyse using SWOT to make decisions
CO3	To understand SCM and CCM for better resource management
CO4	To know about Fast track constructions and how such system works

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	M	M	H	H
	CO2	M	H	M	M	H	H
	CO3	M	H	H	H	H	M
	CO4	H	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval				Meeting of Academic Council, May 2021		

**Course Content:**

**Unit 1 - Project Pre-Planning and Partnering .....16**

Project Influence cost diagram. Need for project preplanning in the context of time and cost overruns, reduction in economic benefits. Definition selecting pre-planning team and evaluation of alternatives. Decision whether to invest in project design Concept of PDRI—Project definition rating index. PDRI for residential and industrial buildings. Utility of PDRI with respect to benchmarking. Any case study on Project pre—planning. Delimitation, partnering as an effective risk sharing mechanism, partnering charter, partnering workshop. Advantages of partnering role in preventing construction disputes, risk management and QM. C Critical success factors for implementation Any case study on project partnering.

**S. W. O. T**

Strengths, Weaknesses, opportunity Modules, threats analysis. Conduct S. W. O. T. for individual construction organization, Indian Construction industry. Advantages, S. W. O. T. matrix utility of S. W. O. T. matrix on strategic planning and management.

**Unit 3 - Supply Chain Management ..... 6**

Concept of Supplier and customer in context of ISO. Identifying the chain associated connecting various processes between the supplier and the customer in context of construction project. Management strategy for implementing S. S. C. M. in construction organizations and on construction projects. Benefits of S. C. M.

**Unit 4 - Critical Chain Management (CCM) ..... 9**

Concept of critical chain in construction projects based on the theory of constraints. Developing critical chain plans for a single project and multiple projects. Measuring, monitoring and controlling the critical chain. Advantages of CCM.

**Unit 5 - Fast Track Construction ..... 9**

Diagrammatic representation of the concept of the fast-tracks constructions. Advantage, suitability of fast-track construction. Form of contract suitable for fast-track projects. Concept of guaranteed maximum pricing (GMP). Any one case study on fast-tracks construction.

**Unit 5 Report ..... 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**References:**

1. Pre-project planning handbook, published by Construction Industry Institute (CII) USA. ASCE journal papers on project pre-planning to be used. ASCE journal papers on project partnering to be used.
  2. Project Management, Financial evaluation with strategic planning, networking and control, Bhavesh Patel, 2nd edition 2010, reprinted in 2011, Vikas publishing House Pvt. Ltd.
  3. Scheduling Construction Projects, Principles and practices, Sandra Weber, Indian edition published in 2012, Pearson Publication.
  4. Construction Project management, Planning, Scheduling and controlling. K.K. Chitkara, Eight reprint 2004, Tata McGraw Hill Publishing Company Limited.
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Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Learn how to identify various deterioration mechanisms or damage mechanisms in concrete structures. To know about the various non-destructive, partially-destructive tools to assess the condition of the structure.

**Expected Course Outcomes:**

CO1	Understanding the importance of maintenance of structures and to learn various distress and damages to concrete structures.
CO2	Knowledge of various types and properties of repair materials and to assess the damage to structures using various tests.
CO3	Knowledge of evaluation and repair/retrofitting methods for extending the service life of concrete structures.
CO4	Knowledge of preventive maintenance practices (instead of corrective maintenance practices) and various repair techniques of damaged structures, corroded structures.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H				H	H
	CO2	H		H	H	M	M
	CO3	H	M	H	M	H	H
	CO4	H				H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 - Influence of serviceability and Durability** ..... 10

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

### **Unit 2 - Maintenance and repair strategies** ..... 9

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

### **Unit 3 - Materials and techniques for repair** ..... 9

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

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

### **Unit 4 - Examples of repairs** ..... 12

Repairs to overcome low member strength, Deflection, Cracking, chemical disruption, weathering wear, fire, leakage, marine exposure. Engineered demolition techniques for Dilapidated structures – Case studies.

### **Unit 5 Report** ..... 5

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

## Reference

1. Denison Campbell, Alien and Harold Roper, "Concrete Structures", Materials, Maintenance and Repair, Longman Scientific and Technical UK.
2. R.T. Alien and S.C. Edwards, " Repair of Concrete Structures", Blahie and Sons, UK.
3. M.S. Shetty, "Concrete Technology – Theory and Practice", S. Chand and Company, New Delhi.

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To understand the systems and tools available for ensuring quality in constructions. To learn about the application of statistical tools in quality management.

**Expected Course Outcomes:**

CO1	Understanding the strategies for Quality management systems and policies
CO2	Explore and understand the general principles of TQM and ISO standards.
CO3	Knowledge on quality control operations and quality during building's life.
CO4	Understanding of Norms, Techniques and Procedures of quality control and different concepts of QC such as 6 sigma etc

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	M	H	M	H	H	M
	CO3	H	H	H	H	H	M
	CO4	H	H	H	H	H	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 - Concept of Quality** ..... 6

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

### **Unit 2 - Quality Control Tools and Statistical Quality Control** ..... 6

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

### **Unit 3 - Training and development of Human Resources** ..... 12

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

Development of quality circles, quality inspection team, inspection reports, monitoring and control, 360° feedback for quality. Purpose of ISO Standards. Difference between ISO 9001 and ISO 9004. Certification process for ISO 9001

### **Unit 4 - Achieving TQM on Construction Projects** ..... 12

Advantages, barriers, principles, steps in implementation, seven types of construction defects. Determining cost of poor quality including hidden cost. Quality functions deployment (QFD). Importance of third party quality audits. CIDCCQRA quality rating systems, customers satisfaction surveys, Non Conformity reports (NCR), remedial strategy for reducing NCR's.

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

### **Unit 5 Report** ..... 5

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## Reference:

1. International Standards Organization – ISO 9001 and ISO 9004
  2. Mantri Handbook – A to Z of Construction – Mantri Publications
  3. Juran's Quality Handbook – Joseph M. Juran, A. Blanton. Godfrey – McGraw Hill International
  4. Edition (1998)
  5. Probability and Statistics for Engineers – Miller, Freund-Hall, Prentice India Ltd.
  6. Quality Control and Total Quality Management, P.L.Jain, Tata McGraw Hill Publications
  7. Igenhaum Av., Total quality Control, McGrawHill, New York.
  8. Kwakuy a. Tenah & Jose M.Guevara., Fundamentals of construction Management and organization, Prentice Hall, Virginia.
  9. Ferguson Ian & Mitchell Eric., Quality on site, B.T. Batsford Ltd., London.
  10. Crosby Philip B., Quality is Free., McGraw Hill, New York
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**MAR21CE04****RESOURCE MANAGEMENT**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Planning and procurement of various resources required in a project in an effective and efficient manner. Understanding the laws and regulation concerning with labors.

**Expected Course Outcomes:**

CO1	Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes
CO2	Administer and contribute to the design and evaluation of the performance management program.
CO3	Awareness in the rational design of compensation and labour laws.
CO4	Administer and contribute to the design and evaluation of the site organization planning.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	M	M	H	H
	CO3	H	H	H	H	M	M
	CO4	H	H	H	H	M	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core (D)	Professional Elective (E)	Project/Seminar/ Internship (H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 - Construction Equipment Management** ..... 6

Identification – Planning – Equipment Management in Projects – Maintenance Managements – Replacement – Cost Control of equipment – Depreciation Analysis – Safety Management

### **Unit 2 - Construction Material Management** ..... 9

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 to ensure / enhance the organization's competitiveness and profitability, Application of ABC Analysis in inventory control, Inventory Management Safety Stock, Stock Outs.

Stores Management: Quality control, Use of (MMS) – Materials Management Systems

### **Unit 3 - Human Resource Development** ..... 9

Introduction – Organization – Fulcrum of the modern enterprise – informal groups – Management – Employees – Human resource management.

### **Unit 4 - Managing Personnel and Relations** ..... 16

Personnel management – nature and scope – personnel plan – personnel department – manpower planning, recruitment and selection. In-service training – Training Inputs – Principles – Types – Assessments. Wages and salary administration – Wage rate – Wage payment methods – Incentive plan – Fringe benefits – Productivity earnings and profit sharing – Bonus payment – Wage legislation – Wage administration. Productivity in construction – measuring productivity – Factors affecting productivity – Responsibility for productivity. Employee's relation in an organization – Characteristics of groups – Roles of project manager – Communication – Types of communication – Communication process – Effective communication – the art of listening – Motivating employees – Hierarchy of motivation.

**Industrial Relations and Labour Laws :** Labour legislation – Nature and scope – Indian constitution and labour – Labour laws for the building Industry – Laws regulating wages and payments to workers – Social Security laws – Industrial relations laws – Miscellaneous laws – Industrial relations and trade unions.

### **Unit 5 Report** ..... 5

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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## Reference:

1. Carleton Counter II and Jill Justice Coutler, The Complete Standard Handbook of construction Personnel Management, Prentice – Hall, Inc., New Jersey, 1989.
  2. Memoria, C.B., Personnel Management, Himalaya Publishing Co., 1992.
  3. Josy. J. Familaro, Handbook of Human Resources Administration, McGraw – Hill International Edition, 1987.
  4. Pringle Charles, Management Longenecker Emerricle Publishing Company, 1981.
  5. R.S. Dwivedi, Human Relations and Organisational Behaviour, BH – 1987.
  6. Austen A D & Neale R H, Managing construction projects, Dialogue publication, 1985
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**SEMESTER IV**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
		<b>THEORY</b>				
1	MAR21CE**	Elective 3	3	0	0	3
2	MAR21CE**	Elective 4	3	0	0	3
		<b>STUDIO</b>				
3						
4	MAR21CL05	Thesis	0	0	14	7
		<b>Total Hours</b>	<b>20</b>	<b>Total Credits</b>		<b>13</b>

**ELECTIVES LIST**

<b>Sem</b>	<b>Subject Code</b>	<b>Elective list</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Studio</b>	<b>Credits</b>
	MAR21CE05	Environmental Impact Assessment	3	0	0	3
	MAR21CE06	Infrastructure planning & Management	3	0	0	3
	MAR21CE07	Real Estate Management	3	0	0	3
	MAR21CE08	Risk Management	3	0	0	3

Lecture periods per week	0	Number of credits	7
Studio/Lab/Workshop /site visit per week	14	Internal Assessment	50
Total period per week	14	End Semester Exam	50
Total period	210	Total Marks	100

**Subject Objectives:** The thesis proposal should include an overview of the proposed plan of work, including the general scope of your project, your basic research questions, research methodology, and the overall significance of your study. In short, the proposal should explain what to study, how to study this topic, why this topic needs to be studied.

**Expected Course Outcomes:**

CO1	Identification of areas that requires further study/research both from field and academics
CO2	Justification for the need of the study with data
CO3	Show how the project contributes to existing research.
CO4	Demonstrate how to discipline –Specific research within an acceptable time-frame with the use of various tools like software and testing methods.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low								
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	
	CO1	H	H	H	H	H	H	
	CO2	H	H	H			H	
	CO3	H	H	H	H	H	H	
	CO4	M		M	H			
3	Category	General (A)	Basic Sciences & Math (B)	Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)		
							✓	
4	Approval					Meeting of Academic Council, May 2021		



**Course Content:**

The thesis proposal should include an overview of the proposed plan of work, including the general scope of your project, your basic research questions, research methodology, and the overall significance of your study. In short, the proposal should explain what to study, how to study this topic, why this topic needs to be studied.

Thesis proposals are designed to:

- Justify and Plan (or contract for) a research project.
- Show how your project contributes to existing research.
- Demonstrate to your advisor and committee that you understand how to conduct discipline – Specific research within an acceptable time-frame.

**Method of Submission:**

The Thesis Project shall be submitted in the form of drawings, project report, models, slides etc.

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**ELECTIVES:****MAR21CE05 ENVIRONMENTAL IMPACT ASSESSMENT**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To Understand strengths & limitations of environmental management. To Know the procedures. To Understand screening & scoping processes. Interpret options for evaluating environmental and social impacts.

**Expected Course Outcomes:**

CO1	To Understand strengths & limitations of environmental management
CO2	To learn about the methods used for identification
CO3	To assess the impacts leading to selection
CO4	To predict and assess the impact on environment and on society

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	H	H	H	H
	CO3	H	H	H	H	H	H
	CO4	H	H	H	H	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - .....16**

Concept of Environment – Definition of EIA and EIS – Elements of EIA – Guidelines for the preparation of EIS – Governmental policies for environmental protection.

Environmental setting – Environmental attributes – air, water, soil, noise, ecological, social, economical, cultural, human and aesthetic aspects – Environmental indices.

**Unit 3 - .....6**

Methodology for the identification of Impacts – Criteria for the selection of methods –Methodologies- Adhoc, checklist, Overlaying, Matrix and Network methods.

**Unit 4 - .....6**

Prediction and Assessment of Impacts on – air, water, soil, noise, ecological, social, economic, cultural, human environments and aesthetic aspects.

**Unit 5 - .....12**

Review of Environmental Impact Statement – Cost benefit analysis – Measures for environmental impact mitigation and control – Case Studies.

**Unit 5 Report .....5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**References:**

1. Environmental Impact Analysis by Urban and Jain.
  2. Environmental Impact Analysis by Canter.
  3. Environmental Impact Assessment Methodologies by Y Anjaneyulu, and Valli Manikkam, BSP Books PVT Ltd
  4. Environmental Impact Assessment by Anji Reddy, BSP Books PVT Ltd.
-

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To understand and explain concepts of infrastructure, private involvement in infrastructure, challenges to successful infrastructure planning and implementation, strategies for successful infrastructure project implementation, sustainable development of infrastructure.

**Expected Course Outcomes:**

CO1	To understand the concepts of infrastructure
CO2	To learn the contribution of private sector in infrastructure development
CO3	To study and learn about the challenges faced by infrastructure development
CO4	To know about strategies used for successful completion of projects using case studies

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	M		H	M
	CO2	H	H	H		H	M
	CO3	H	H	M		H	H
	CO4	H	H	H	M	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

## Course Content:

### **Unit 1 - An Overview of Basic Concepts Related To Infrastructure 9**

Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India. , an overview of the Telecommunications Sector in India. ,an overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and layers in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance.

### **Unit 2 - Private Involvement in Infrastructure: 9**

A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

### **Unit 3 - Challenges to Successful Infrastructure Planning And Implementation 15**

Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

### **Strategies for Successful Infrastructure Project Implementation**

Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects.

### **Unit 4 - Sustainable Development of Infrastructure 9**

Information Technology and Systems for Successful Infrastructure Management, - Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

### **Unit 5 Report 3**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**References:**

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
  2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).
  3. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997). 15
  4. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment? Proceedings of a Conference Held in June (1990).
  5. World Development Report 1994: Infrastructure for Development (1994).
  6. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).
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Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** Students should gain a comprehensive understanding of the real estate sector in India. To Acquire the knowledge about the policies, laws and processes involved in the development and management of real estate sector. To gain knowledge of property development, the key players and methods and tools related to target definition, feasibility studies and needs assessments.

**Expected Course Outcomes:**

CO1	Gain a comprehensive understanding of the real estate sector in India.
CO2	Acquire the knowledge about the policies, laws and processes involved in the development and management of real estate sector
CO3	knowledge of property development, the key players and methods and tools related to target definition, feasibility studies and needs assessments
CO4	knowledge of trends, financial and market assessments of property projects

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H	H	H	H	H
	CO2	H	H	M	M	H	H
	CO3		H	H	H	M	M
	CO4	H	H	H	H	M	M
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1- Real Estate Market 9**

Real Estate Scope; classification of real estate activities and peculiarities; Factors affecting real estate market; Role of Government in real estate market; Statutory provisions, Laws, rules, and regulation, land use controls in property development, registration And licensing requirements – Knowledge base for assessment and forecasting the Real Estate market – environmental issues related to Real Estate Transactions.

**Unit 2- Participants And Stake Holders 9**

Role, Scope, working characteristics and principal functions of real estate participants and stakeholders; real estate consultants and their activities, role and responsibilities of property mangers; Code of ethics for Real Estate participants; Good practices and managerial responsibilities.

**Unit 3- Real Estate Development 9**

Functions of real development like project formulation, feasibility studies, developing, costing and financing, managing including planning, Scheduling and monitoring of real estate projects, risk management , Facilities management, marketing/advertising, post construction management etc – Real estate investment, Sources and related issues.

**Unit 4- Documentation 9**

Interests in real estate; Documentation in real estate processes; Transfer of titles and records; Real estate appraisal and valuation; Types of agreement between the consultants and principal – closing the real estate transactions.

**Unit 5 Report 9**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**Reference:**

1. David M.M. Geltner, Commercial real estate analysis and investments, South western Educational & Professional.
  2. John Ratcliffe, Urban planning and real estate, Taylor & Francis, Inc.
  3. Mike E. Miles, Gayle Berens, and Mark Eppli, Real Estate Development : Principles and Process
  4. Stephen P. Peca, Real Estate Development and Investment: A Comprehensive Approach.
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**MAR21CE08****RISK MANAGEMENT**

Lecture periods per week	3	Number of credits	3
Studio/Lab/Workshop /site visit per week	0	Internal Assessment	50
Total period per week	3	End Semester Exam	50
Total period	45	Total Marks	100

**Subject Objectives:** To identify potential risks before they occur so that risk-handling activities may be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives, by applying various strategies.

**Expected Course Outcomes:**

CO1	To learn about risks and their types
CO2	To know how to identify the risks involved in a project
CO3	To learn the process of risk management
CO4	To learn risk allocation and risk handling

**Mapping of Course Outcomes (COs) with Program Outcomes (POs):**

(H/M/L indicates strength of correlation) H- High, M- Medium, L- Low							
1	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6
	CO1	H	H			H	H
	CO2	H	H	H		H	H
	CO3	H	H	H	H	H	H
	CO4	H	H	H	H	H	H
3	Category	General (A)	Basic Sciences & Math (B)		Professional Core(D)	Professional Elective(E)	Project/Seminar/ Internship(H)
						✓	
4	Approval					Meeting of Academic Council, May 2021	

**Course Content:**

**Unit 1 - Introduction 9**

General – Importance of Risk, types of risks, quantifiable and un-quantified risks. Micro, market, project level risk analysis approach.

**Unit 2 - Identification 13**

Risk analysis and Management for projects (RAMP) Identifying risk events. Probability distribution. Stages in Investment, life-cycle; determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows.

**Dealing With Uncertainties** : Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty index method, point estimated method.

**Unit 3 - Risk Allocation 9**

Use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment. Risk Mitigation – by elimination, reducing, transferring, a voiding, absorbing or pooling.

**Unit 4 - Residual Risk Handling 9**

Residual risk, mitigation of un-quantified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI). Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.

**Unit 5 Report 5**

Students must study and submit a Journal review/ Net study/ live study on any of the topics outlined in the syllabus

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**Reference:**

1. Project Risk Analysis And Management Guide By John Bartlett APM Publishing Limited, 2004 2nd Edition
  2. Industrial Engineering And Management Of Manufacturing Systems.-Dr.Surendra Kumar Satya Prakashan
  3. RAMP Handbook By Institution Of Civil Engineers And The Faculty And Institute Of Actuaries.
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