



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management
 Curriculum Structure and Evaluation Scheme (NEP 2020)
 To be implemented for 2025-27 & 2026-28 Batch

F. Y. M. Tech						Semester: I				
Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory Marks		Practical Marks	
							Max	Min. % for passing	Max	Min. % for passing
CCM 1015	Construction Project Management	3	--	--	3	ISE	30	40	40	--
						ESE	70	40		--
CCM 1031	Construction equipment	3	--	--	3	ISE	30	40	40	--
						ESE	70	40		--
CCM 1051	Construction Practices	3	--	--	3	ISE	30	40	40	--
						ESE	70	40		--
	Programme Elective-I	3	--	--	3	ISE	30	40	40	--
						ESE	70	40		--
	Programme Elective-II	3	--	--	3	ISE	30	40	40	--
						ESE	70	40		--
CCM 1256	Lab I Microsoft Project	--	--	4	2	ISE	--	--	50	50
						ESE	--	--		50
CCM 1276	Lab II Geographic information system	--	--	4	2	ISE	--	--	50	50
						ESE	--	--		50
SHP551 3	Technical Communication			2	1	ISE	--	--	100	50
TOTAL		15	--	10	20					

Total Contact Hours/week: 25

Total Credits : 20

ISE = In Semester Evaluation, ESE = End Semester Exam





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Program Elective-I

Sr. No.	Course Code	Course
1.	CCM1096	Management Information System
2.	CCM1135	Pavement Construction and Management
3.	CCM1152	Valuation of Immovable Properties
4.	CCM1181	Advanced Construction Materials

Program Elective-II

Sr. No.	Course Code	Course
1.	CCM1071	Quality Assurance and Quality Control in Construction
2.	CCM1116	Risk Management in Construction
3.	CCM1196	Pre-engineered Structures
4.	CCM1211	Advanced Concrete Technology





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F. Y. M. Tech						Semester: II					
Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory Marks			Practical Marks	
							Max	Min. % for passing		Max.	Min. % for passing
CCM 1021	Project Economics and Financial Management	3	--	--	3	ISE	30	40	40	--	--
						ESE	70	40		--	--
CCM 1041	Legal Aspects in Construction	3	--	--	3	ISE	30	40	40	--	--
						ESE	70	40		--	--
	Programme Elective – III	3	--	--	3	ISE	30	40	40	--	--
						ESE	70	40		--	--
	Programme Elective – IV	3	--	--	3	ISE	30	40	40	--	--
						ESE	70	40		--	--
CCM 1226	Research Methodology & IPR	2		1	3	ISE	30	40	40	--	--
						ESE	70	40		--	--
CCM 1246	Lab III Fundamentals of BIM Laboratory	--	--	4	2	ISE	--	--		50	50
						ESE	--	--		50	50
CCM 1266	Lab IV Primavera Laboratory	--	--	4	2	ISE	--	--		50	50
						ESE	--	--		50	50
CCM 1286	Mini Project	--	--	2	1	ISE	--	--		100	50
	Internship	-	-	-	-	-	-	-		-	-
	TOTAL	14	--	11	20						

Total Contact Hours/week: 25
Total Credits : 20

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***Note-** Student has to complete industry internship of two weeks after second semester however its evaluation will be carried out in third semester.





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Program Elective-III

Sr. No.	Course Code	Course
1.	CCM1061	Project Formulation and Appraisal
2.	CCM1080	Advanced Construction Techniques
3.	CCM1120	Quantitative techniques for civil Engineers
4.	CCM1106	Health and Safety Management

Program Elective-IV

Sr. No.	Course Code	Course
1.	CCM1148	Construction Resource Management
2.	CCM1150	Repair and Rehabilitation of Structures
3.	CCM1201	International Contracting
4.	CCM1236	Construction Waste Management





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S. Y. M. Tech						Semester: III					
Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory Marks		Practical Marks		
							Max	Min. % for passing	Max	Min. % for passing	
CCM 2016	Industry Internship	--	--	-	1	ISE	--	--	100	50	
	Open Elective	3	--	--	3	ESE	100	40	--	--	
CCM 2036	Dissertation Phase I	--	--	12	6	ISE	--	--	100	50	
CCM 2056	Dissertation Phase II	--	--	20	10	ISE	--	--	100	50	
						ESE	--	--	100	50	
	TOTAL	3	--	32	20						

Total Contact Hours/week : 35
Total Credits : 20

ISE = In Semester Evaluation, ESE = End Semester Exam

***Note-** Student has to complete industry internship of 02 weeks after second semester however its evaluation will be carried out in third semester.



Open Elective

Sr. No.	Course Code	Course
1.	MOE2012	Artificial Intelligence and Machine Learning
2.	MOE2022	Creative Thinking: Techniques and Tools
3.	MOE2032	MOOC Course
4.	MOE2041	Energy Audit and Management
5.	MOE2062	Augmented Reality and Virtual Reality
6.	MOE2072	Industrial Instrumentation
7.	MOE2082	Advanced Mechatronics systems
8.	MOE2091	Disaster Management

Note for Open Elective

An Open Elective course is included in the curriculum of S. Y. M. Tech (Semester-III), under which students need to learn either MOOC course or courses offered by department.

Guidelines for MOOC course under Open Elective

1. If students opt for MOOC course as an Open Elective, he/she should select this course from NPTEL platform only.
2. As three credits are allotted to open elective, selected MOOC course must be of minimum 8 weeks or 30 hours.
3. Students need to solve assignments given by platform and also, give the final certification exam at allotted NPTEL exam center.
4. Student must secure certification of NPTEL platform within program duration, otherwise he/she will not be eligible for final evaluation.
5. If student fails in NPTEL certification course, he or she should re-register for the course in the next semester.

Guidelines for other courses mentioned under Open Elective:

1. Student can opt for courses mentioned in the curriculum.
2. While selecting the course, students must take care that selected course from the list is not learned in UG or PG first year curriculum.
3. Lectures of these courses will be conducted by concerned department faculty by online mode.
4. Evaluation of these courses will be as mentioned in the curriculum.



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S. Y. M. Tech						Semester: IV					
Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory Marks		Practical Marks		
							Max	Min.% for passing	Max	Min.% for passing	
CCM 2026	Dissertation Phase III	--	--	16	08	ISE	--	--	100	50	
CC M2 046	Dissertation Phase IV	--	--	24	12	ISE	--	--	100	50	
						ESE	--	--	100	50	
	TOTAL		--	40	20						

Total Contact Hours/week : 40

Total Credits : 20

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Class: F. Y. M. Tech.	Semester-I
Course Code : CCM1015	Course Name : Construction Project Management

L	T	P	Credits
3	--	--	3

Course Description:

This course introduces the fundamental concepts and processes of project management, focusing on engineering and construction projects. It covers project scope, time, cost, and quality management along with the role of the project manager throughout the project life cycle. Students will learn scheduling techniques such as CPM and Earned Value Management for effective project control. The course also emphasizes cost estimation, budgeting, and Activity-Based Costing methods. Human resource and communication management are explored to enhance team coordination and stakeholder engagement. Additionally, students will understand the use of Project Management Information Systems (PMIS) and the role of the Project Management Office (PMO) in supporting project success.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

- 1.Explain the fundamental concepts, life cycle, and organizational context of project management.
- 2.Apply project scope and time management techniques including WBS and activity scheduling.
3. Analyze and control project schedules using CPM, precedence networks, and Earned Value Management.
4. Estimate and manage project costs and quality using standard costing techniques and quality tools.
5. Plan and manage project human resources, communications, and information systems to ensure effective project execution and control.

Prerequisite: Possess basic knowledge of engineering economics and management.

Course Content

Unit No.	Description	Hrs.
01.	Project Management Framework: Concept Of Project And Project Management. Role of the project manager. Organizational influences on project management and project life cycle. Project management processes.	06
02.	Project Scope and Time management: Project scope planning- Project requirements, WBS etc. Project time management-defining activities, sequencing activities, estimating activity resources and durations.	06
03.	Advanced Project Scheduling: CPM scheduling, Precedence network and	06



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	it's applications. Earned value management to Control the Projects.	
04.	Project Cost control and Management: Planning of project costs-estimating cost, determining budget and control costs. (Activity Base Costing) Introduction to quality management tools	06
05.	Project Human Resource and Communication Management: Planning human resources-Acquire, develop and manage project team. Planning project communications- Manage and control communications.	06
06.	Project Management Information System (PMIS): Importance of PMIS, PMIS framework, project data structuring, Information retrieval and communication using project management software. Project document management. Role of project management office. (PMO) Factors influencing PMIS success.	06

References:

Text Books:

- A Guide To A Project Management Body of Knowledge – Published By Project Management Institute.
- K. Chitakara “Construction Project Management (Planning, scheduling and controlling)” McGraw Hill Education (India).
- B. Sengupta and H. Guha “Construction Management and Planning”, McGraw Hill Education (India), 1995.
- B. C. Punmia & K. K. Khandelwal Project Planning and Control with PERT & CPM

Reference Books:

- K.K. Khandelwal and Dr. B.C.Punmia “PERT AND CPM”, Laxmi Publication, New Delhi.
- L. S. Srinathan “PERT AND CPM (Principles and Applications)”, Affiliated east-west press Pvt Ltd, Third edition.



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1031	Course Name: Construction Equipment

L	T	P	Credits
3	-	-	3

Course Description:

This subject deals with construction equipment used on construction projects. This course is designed to fulfill the requirements of construction managers to select appropriate equipment based on the construction technique and site condition. Major emphasis in the course is on earthwork operations by using different equipment and equipment performance and management.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Select equipment/plant for particular task.
2. Perform productivity analysis for equipment.
3. Design equipment fleet for construction task.
4. Perform economic analysis of equipment use.

Prerequisite: Possess basic knowledge of construction activities

Course Content

Unit No.	Description	Hrs.
01.	Earthwork equipment: Fundamentals of earth work task, Earth moving equipment details and operations, Tasks performed by equipment, Equipment fleet combinations.	06
02.	Rock excavation equipment: Methods and practices in rock excavation, Drilling and blasting method, ripping, splitting and mechanical methods of rock excavation and their applications in construction.	06
03.	Equipment productivity analysis: Computing production of earth moving equipment- Dozer, Hoe, Shovel, Loader and Trucks, Concept of fleet, Computation of fleet production and cost, Designing fleet for construction tasks.	06
04.	Hoisting & Conveying Equipment: Types of Cranes- Mobile, Tower, Gantry, Girder launching, Segmental Launching, Conveying Equipment- Belt conveyor, Bucket & Screw Conveyers.	06
05.	Construction plants: Ready mix concrete plants, Hot mix asphalt plants, Aggregate production plants. Operations and production planning.	06
06.	Equipment economics:	06



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M. Tech. Construction Management Syllabus
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Equipment records, Cost of capital, Investment alternatives, Elements of ownership and operating cost, Replacement decisions, Rent or lease.	
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References:

Text Books:

- Peurifoy C., R. L. Ledbetter, W. B. and Schexnayder, "Construction Planning, Equipment and Methods", Tata Mc-Graw Hill, Singapore.
- Sharma S. C., "Construction Equipment and Management", Khanna Publishers, New Delhi.
- Deodhar S. V., "Construction Equipment and Job Planning", Khanna Publishers, New Delhi.
- Sankar S. K. and Saraswati S., "Construction Technology", Oxford University Press, New Delhi.

Reference Books:

- James O'Brien, John A. Havers and Frank W. Stubbs, "Standard hand book of Heavy Construction", Mc-Graw-Hill Publication.
- Patrick Powers., J., "Construction Dewatering: New Methods and Applications", John Wiley & Sons.
- Jerry Irvine, "Advanced Construction Techniques", California Rocketry.



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Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1051	Course Name: Construction Practices

L	T	P	Credits
3	-	-	3

Course Description:

This course deals with construction practices adopted on heavy construction projects, the course covers most used techniques in majority projects to enable student's ability to complete the construction tasks effectively. Emphasis is on increasing efficiency of the student to control and monitor the tasks on construction projects.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Develop method statement for various construction activities.
2. Differentiate among various practices used to complete construction activities.
3. Apply/Justify appropriate technique for particular construction activity.

Prerequisite: Basic knowledge of infrastructural engineering and construction techniques.

Course Content		
Unit No.	Description	Hrs.
01.	Pile Construction: Pile, Types, Functions, Construction of bored and driven piles, Construction aspects and details of precast piles, Pre stressed piles, Steel piles and friction piles, Patented Piles.	06
02.	Trenchless Technology: Introduction to trench-less technology, Concept, Methods used in trench-less technology, Equipment and applications of trench-less technology.	06
03.	Dewatering: Introduction, Various methods of dewatering, Pumps for dewatering, Design of dewatering system, Cost of dewatering.	06
04.	Offshore Construction: Dredging operation, Methods and Equipment, Construction of Docks and Harbor, Floating docks.	06
05.	Cofferdam and Caisson Construction: Types, Construction of single, double wall cofferdam, Sheet pile cofferdams, Concrete wall movable cofferdam, Cofferdams with touching and interlocking piles and diaphragm wall.	06
06.	High Rise Building Construction: Concept, Methods and techniques used in construction of high rise buildings, Services in High Rise Structures.	06



M. Tech. Construction Management Syllabus
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References:

Text Books:

- Peurifoy C., R. L. Ledbetter, W. B. and Schexnayder "Construction Planning, Equipment and Methods", Tata Mc-Graw Hill, Singapore.
- Sharma S. C., "Construction Equipment and Management", Khanna Publishers, New Delhi.
- Sankar S. K. and Saraswati S., "Construction Technology", Oxford University Press, New Delhi.
- Roy Chudley and Roger Greeno, "Construction Technology", Prentice Hall publication.
- Gupta, Y.P., "High rise structures ; design and constructions practices for middle level cities", New Age International Publishers, New Delhi.

Reference Books:

- James J.O'Brien, John A. Havers and Frank W. Stubbs, "Standard hand book of Heavy construction", Mc-Graw-Hill Publication.
- Patrick Powers. J., "Construction Dewatering: New Methods and Applications", John Wiley & Sons.
- Jerry Irvine "Advanced Construction Techniques", California Rocketry.





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Program Elective-I

Class: F.Y. M. Tech.	Semester: I	L	T	P	Credits
Course Code : CCM1096	Course Name: Management Information System	3	-	-	3

Course Description: This course provides students with an overview of the utilization of business application software and problem-solving using that software. Topics include computer systems, management information systems, microcomputer operating systems, word processing, electronic spreadsheets, database management, business graphics, networks, and integrated packages. Industry accepted microcomputer software will be used.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Apply system development methodologies, such as SDLC and structured analysis, to design information systems suited for construction management applications.
2. Apply project management and enterprise information systems to enhance decision-making, coordination, and data management in construction projects.
3. Analyze the integration of information systems across functional areas—such as finance, HR, procurement, and scheduling—in a construction organization.
4. Examine risks, control mechanisms, and audit procedures related to the implementation and operation of construction information systems.

Prerequisite: Basic knowledge of project life cycle is expected.

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Information systems, Establishing the framework, Business models, Information system architecture, Evolution of information systems.	06
02.	System Development: Modern information system, System development life cycle, Structured methodologies, Designing computer based methods, Procedures, Control - Designing structured programs.	06
03.	Information Systems: Integrated construction management information system, Project management information system, Functional areas, Finance, Marketing, Production, Personnel levels, DSS, EIS, and ES comparison, Concepts and knowledge representation, Managing international information system.	06
04.	Implementation And Control: Control testing security, Coding	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	techniques, Defection of error, Validating cost benefit analysis, Assessing the value and risk of information system.	
05.	System Audit: Software engineering qualities, Design, Production, Service, Software specification, Software metrics, Software quality assurance.	06
06.	Systems Methodology: Objectives, Time and logic, Knowledge and human dimension, Software life cycle models, Verification and validation.	06

References:

Text Books:

- Joyce J Elam, "Case series for Management Information Systems", Custom Publishing.
- Ralph H Sprague and Hige J Watson, "Decision Support for Managers", Prentice Hall.
- Michael W. Evans and John J Marciniah, "Software Quality Assurance and Management", John Wiley and Sons.

Reference Books:

- Kenneth C Laudon and Jane Price Laudon, "Management Information Systems - Organization and Technology", Prentice Hall.
- Gordon B. Davis, "Management Information System: Conceptual Foundations, Structure and Development", McGraw Hill.
- Card and Glass, "Measuring Software Design quality", Prentice Hall.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-I

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1135	Course Name: Pavement Construction and Management

L	T	P	Credits
3	-	-	3

Course Description:

This elective, deals with the construction and management of pavements. The course is designed to provide in depth knowledge and skills required to plan, execute and monitor Highway infrastructure projects.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Conduct highway condition assessment surveys.
2. Develop method for pavement management using PMS system.
3. Select material as per MORTH and IRC specifications.
4. Describe, plan and design pavement structures.
5. Articulate pavement construction techniques as per respective IRC specifications.

Prerequisite: Student needs basic knowledge infra structural engineering.

Course Content

Unit No.	Description	Hrs.
01.	Highway condition surveys: Purpose and Need of Condition Surveys, Serviceability and Roughness, Distresses in Flexible Pavements and Causes, Distresses in Rigid Pavements and Causes, Methods and Equipment for Pavement Condition Surveys.	06
02.	Pavement management system: Key Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance & rehabilitation policies, HDM III, IV, Paver, PMS implementation & operation issues.	06
03.	Quality Control of pavements: Quality Assurance; Quality Control – ISO 9000, quality assurance plan, quality control check list for road construction, IRC SP 011 specifications	06
04.	Construction of Pavement sub structure: Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilized Sub Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction, Drainage system.	06
05.	Flexible pavement construction: Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Dense Asphalt Concrete-Interface Treatments and Overlay (White topping) Construction, IRC Specifications, design of flexible pavement.	
06.	Rigid Pavement Construction: Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay (Micro surfacing) Construction, design of rigid pavement, over lay design.	06

References:

Text Books:

- S K Khanna, "Highway Engineering", Publisher-Nem Chand & Bros.
- T.D Ahuja, "Highway Engineering", Rajsons Publications Pvt. Lt. Daryaganj, Delhi.
- IRC 37: Design of flexible Pavement.
- IRC 58: Design of rigid pavement.

Reference Books:

- Ghazi G. Al-Khateeb, "Highway Planning, Survey, and Design", CRC Press.
- Byrne Austin, "Highway Construction", T Publisher Forgotten Books.
- T.W. Faw , "Handbook of Highway Engineering", publisher Taylor & Francis NY.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-I

Class: F. Y. M. Tech.	Semester: I	L	T	P	Credits
Course Code : CCM1152	Course Name : Valuation of Immovable Properties	3	---	--	3

Course Description:

The process of figuring out an asset's or company's present value is called valuation, and there are numerous methods for doing so. To ascertain the amount owed, immovable property must be evaluated for both purchase and sale. Banks, moneylenders, and other financial institutions require the appraisal of real estate in order to determine the available margin and the value of the security provided for loans. It is required in order to finance home loans. While tax authorities follow valuation according to tax rules and the land and building technique, financial institutions or home financing firms typically use their appointed approved values.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Conduct property inspections, identify physical characteristics, and assess property condition to incorporate these factors into the valuation.
2. Effectively apply different valuation methods (cost, market, income approach) to determine property value in various scenarios.
3. Present valuation findings clearly and confidently to clients, stakeholders, and other professionals
4. Create precise and expert valuation reports that give concise, convincing justifications for the value determination.

Prerequisite: Basics of estimation and valuation.

Course Content		
Unit No.	Description	Hrs.
01.	Unit 1: Introduction to Property Valuation Overview of property valuation and its significance in real estate markets, Types of property valuations: market value, investment value, fair value, Key stakeholders in property valuation (buyers, sellers, lenders, appraisers), Ethical and professional standards in property valuation.	06
02.	Valuation Methods and Approaches Cost Approach: Estimation based on the replacement or reproduction cost of a property, Sales Comparison Approach: Comparing the subject property to similar properties that have recently sold, Income Approach: Valuation based on the property's income-generating potential (relevant for commercial properties).	06
03.	Market Analysis and Data Collection Identifying key factors influencing property values (location, market	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	conditions, demand-supply dynamics), Data collection methods for real estate analysis (sales data, rent data, market trends), Tools and resources for property valuation (real estate databases, online platforms, and market surveys).	
04.	Property Inspection and Condition Assessment Importance of physical property inspection in valuation, Key aspects to assess during property inspection (structural integrity, condition of facilities, age, and depreciation), Impact of property condition on valuation.	06
05.	Legal and Regulatory Framework in Property Valuation Understanding legal factors affecting property valuation (zoning, land use, ownership rights), Regulatory compliance (building codes, environmental laws, property taxes), Impact of legal issues on the value of immovable properties.	06
06.	Preparation of Valuation Reports and Communication Structuring and writing a professional property valuation report, Communicating valuation findings to clients and stakeholders, Presentation of data and rationale for the determined value.	06

References:

Text Books:

- Public-Private Partnerships: Principles of Policy and Finance, E. R. Yescombe, First Edition 2007, ISBN: 978-0-7506-8054-7, Elsevier's Science & Technology Rights, Department in Oxford, UK

Reference Books:

- Theory & Practice of Valuation, Dr. Roshan H. Namavati, 4th edition 2010, Lakhani Book Depot





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-I

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1181	Course Name: Advanced Construction Materials

L	T	P	Credits
3	-	-	3

Course Description:

Materials play important role in projects; they cost around 60% of total project cost. Type and quality of materials will influence the performance and sustainability of construction. It is important to study new materials being developed by industry for application in project construction.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Justify the need of new material development.
2. Choose material for construction process based on material properties.

Prerequisite: Construction materials are important, student should be aware of basic properties of materials used in construction.

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Necessity and importance of sustainable construction materials. Material composition and properties, production, storage, distribution, testing, acceptance criteria, limitations of use, economic consideration and recent development related to the following materials to be studied.	06
02.	Construction Chemicals: Various construction chemicals/admixtures , Fly ash and its use in concrete ,Silica fume concrete ,Self-compacting concrete, Fiber Reinforced plastics and concrete ,Light weight concrete.	06
03.	Modified Materials: Crumb modified bitumen Rubber, Glenium Concrete, Materials used in nuclear-containment structures.	06
04.	High Performance Materials: High performance concrete, Nano technology in cement concrete, Ferro cement Technology.	06
05.	Ceramic Materials: Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistant materials, Uses and application New types of floor finishes and tiling, liquid granite.	06

06.	Non Structural Materials: Thermal insulation and acoustic absorption materials, Sound barriers used on motorway railways. Materials for intelligent buildings- Sensitile, aluminums radiant barriers, solar panel roof tiles, use of old jeans for roofing, flexi comb-electrical installation, kinetic glass, unfired clay bricks, richlite (recycled paper), carbon fibers, application of waste materials.	06
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References:

Text Books:

- Mehta P.K & Mantreio P.J.M, "Concrete Structure properties & Materials", Prentice hall.
- M L Gambhir, Neha Jamwal, "Building Materials", Tata McGraw Hill Publ.
- Neville, "Concrete Technology", Pearson publ..
- Dr. B.N.Divekar, "Ferrocement Construction Mannual", Ferrocete society of India Pune

Reference Books:

- William P Spence, Yesdee, "Construction Materials, Methods & Techniques".
- Ashby, M.F. and Jones. D.R., H.H., "Engineering Materials: An introduction to Properties, applications and designs", Elsevier Publications.
- Mamlouk, M.S. and Zaniewski, J.P., "Materials for Civil and Construction Engineers", Prentice Hall.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-II

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1071	Course Name: Quality Assurance and Quality Control in Construction

L	T	P	Credits
3	-	-	3

Course Description:

This course provides a systematic development of skills and knowledge required for QA Manager as per the industry requirements including preparation of QCP's, stage wise inspection of QA/QC activities and establishing of Project Quality Plan for construction projects as applicable. This course is designed to fulfill the requirements of quality control by selecting appropriate techniques for different construction activities to assure the construction quality at highest level.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Differentiate between quality assurance (QA), quality control (QC), and quality monitoring in the context of various construction activities.
2. Apply statistical quality control (SQC) and process monitoring techniques to evaluate construction quality.
3. Develop and implement quality inspection checklists and documentation for construction materials and processes in line with QA/QC practices.
4. Articulate quality standards and management systems, including ISO certifications, Indian Standards, and the National Building Code of India (2016).
5. Relate quality management tools to improve processes and analyze third-party audits, quality rating systems, and NCRs to enhance project outcomes.

Prerequisite: Possess basic knowledge of construction activities.

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Introduction to dimensions of quality, Maintaining quality and quality cycle, Quality manual contents and data required, Types of construction defects, Difference between quality assurance, quality monitoring and quality control.	05
02.	Statistical Quality Control & Monitoring: Statistical process control, Statistical quality control, Quality measurement attributes and variables, Statistical Process Control (SPC) methods, Control charts for attributes and variables, Acceptance sampling.	05



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Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

03.	Construction Quality Control Inspection : Quality management, Duties & responsibilities of QA/QC Managers, Checklists for Quality of Materials and construction processes, QA/QC documentation.	08
04.	Quality References: Quality standards for construction outputs, products and services, Indian Standard Code, Use of IS for quality references, National Building Code of India -2016 (NBC) methods of referring it & application.	05
05.	Quality Management Systems: Introduction, Benefits of ISO registration, ISO-9000 and ISO14000 certification procedures, ISO requirements, Implementation and its documentation, Quality manuals.	05
06.	Quality Management Tools for Construction Projects : Total Quality Management (TQM), Determining cost of poor quality including hidden cost, Quality functions deployment (QFD), just in Time (JIT), Importance of third party quality audits, CIDC- CQRA quality rating systems, Customers satisfaction surveys, Non Conformity reports (NCR), Remedial strategy for reducing NCR's.	08

References:

Text Books:

- A.K. Watal, Mahesh Sharma, "Quality Control in Civil Engineering", Standard Publishers Distributer.
- Manual on Quality Control, Gujarat Engineering Research Institute.
- Rajoria, KB, Narayan, Deepak, Gupta "ISO 9000 Practices In Construction", CBS Publishers & Distributors.
- G.Kanji, "Total Quality Management", Springer Science & Business Media.
- P.L.Jain, "Quality Control and Total Quality Management", Tata Mcgraw Hill Publ.

Reference Books:

- Amitva Mitra, "Fundamentals of Quality Control and Improvement", Wiley India Private Limited.
- Jude D'Silva, "Handbook on Quality Assurance & Quality Control in Construction", Publisher: BUUKS.
- Miller, Freund, "Probability and Statistics for Engineers", Hall, Prentice India Ltd.
- Mantri, "Handbook – A to Z of Construction", Mantri Publications
- El Reedy, "Concrete and Steel Construction: Quality Control and Assurance", Taylor and Francis.
- International Standards Organization – ISO 9000 and ISO 14000.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-II

Class: F. Y. M. Tech.	Semester: I
Course Code: CCM1116	Course Name: Risk Management in Construction

L	T	P	Credits
3	-	-	3

Course Description:

This course covers risk identification, analysis, and mitigation in construction projects, which includes types of risk, RAMP, NPV under uncertainty, decision-making tools, insurance schemes, and internal control systems. It emphasizes practical techniques like sensitivity and scenario analysis, decision trees, and real-world case studies to manage risks in project environments.

Course Learning Outcomes:

After completion of the course, the student will be able to,

1. Identify various types of risks in construction projects and its potential impacts on project.
2. Apply risk analysis methods to assess and manage risk effectively in construction projects for better decision making.
3. Implement effective risk mitigation strategies, standards, and decision-making tools to evaluate and manage project risks.
4. Develop internal audit functions and evaluate the effectiveness of risk management practices through case studies.

Prerequisite: Basic knowledge of Engineering Economics, Construction Management.

Course Content

Unit No.	Description	Hrs.
01.	Introduction to Risk Management: Importance of risk, development of risk management system, Identifying risk events, cost of risk, types of risk and classification, Benefits of risk management, responsibilities of those involved in risk management, Risk management standards, decision making strategies, effects of tax laws, government rulings, conflict resolution. Money, time and technical risks, Risks in the context of global project teams, Problems related to natural disasters or unusual events like earthquakes, fires, accidents.	08
02.	Risk Analysis and Management for Projects (RAMP): Probability distribution, Stages in Investment life-cycle, Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and	04



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

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03.	Risk Analysis Techniques: Sensitivity analysis, Uncertainty, cost factors and benefit factors, Scenario analysis, scenario analysis simulation, Decision tree analysis, risk profile method, certainly equivalent method, risk adjusted discount rate method, certainty index method, 3 point estimated method, Use of risk prompts, use of risk assessment tables, details of RAMP process, utility of grading of construction entities for reliable risk assessment, Entrepreneurial risks, pure risks, Contract review and legal conflicts.	08
04.	Risk Mitigation: By elimination, reducing, transferring, avoiding, absorbing or pooling Residual risk, mitigation of unqualified risk, Coverage of risk through CIDC's and Actuarial Society of India programs: through risk premium such as (BIP) – Bidding Indemnity Policy, (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP) - Loss of profit policy, (TI) - Transit Insurance policy, (LOPCE) - Loss of performance of construction equipment policy.	09
05.	Risk management and Internal Control: Internal audit works, control systems, Auditing risk management –setting up internal audit function.	04
06.	Case Study: Case study of construction projects based on risk analysis and mitigation.	03

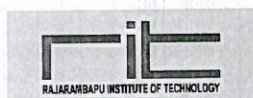
References:

Text Books:

- Sadgrove, K. (2005). The Complete Guide to Business Risk Management. Gower Publishing Ltd.
- Gahlot, P. S., & Dhir, B. M. (2009). Construction Planning and Management. New Age International Publishers.
- Chandra, P. (2014). Projects: Planning, Analysis, Selection, Implementation and Review. Tata McGraw-Hill.
- Marrison, C. (2002). The Fundamentals of Risk Measurement. Tata McGraw-Hill.
- Seetharaman. (2010) Construction Engineering and Management. Umesh Publications.

Reference Books:

- Chitkara, K. K. (2013). Construction Project Management: Planning, Scheduling and Controlling. Tata McGraw-Hill Education.
- Punmia, B. C., & Khandelwal, K. K. (2002). Project Planning and Control with PERT and CPM. Laxmi Publications.
- Peurifoy, R. L., & Oberlender, S. C. (2015). Construction Planning, Equipment and Methods, McGraw-Hill Education (India).



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-II

Class: - F. Y. M. Tech.	Semester-I	L	T	P	Credits
Course Code : CCM1196	Course Name : Pre-engineered Structures	3	---	--	3

Course Description:

Prefabrication involves the assembly of structural components in a factory or manufacturing facility, which are then transported as complete units to the construction site for final assembly. A prefabricated building is a fully constructed and erected structure, made up of individual prefabricated units or assemblies, using either standard or specialized materials. This approach to construction is a modern technique, particularly suitable for large-scale housing projects.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Describe the principles of pre-engineered structures, including their advantages, components, and applications in various construction projects.
2. Differentiate between conventional and pre-engineered buildings.
3. Identify and choose appropriate materials (steel, fasteners, etc.) used in the construction of pre-engineered buildings.
4. Recognize the steps involved in the fabrication of PEB components in a factory setting.
5. Perform basic cost estimation for pre-engineered buildings, considering materials, labour and fabrication costs.

Prerequisite: Possess basic knowledge of different components and elements of structures.

Course Content		
Unit No.	Description	Hrs.
01.	Types of RC Prefabricated Structures: Types of RC Precast Structures: Long wall and cross wall large panel buildings- One way and two way precast slabs - Framed buildings with partial and curtain walls, single storey industrial buildings with trusses and shells - Crane – Gantry systems.	06
02.	Functional Design Principles: Functional Design Principles: Modular coordination – Standardization - Disuniting, Diversity Of prefabricates – Production – Transportation – Erection - Stages of loading and codal provisions- Safety factors - Material properties - Deflection control - Lateral load resistance - Location and types of shear walls.	06
03.	Floors, Stairs and Roofs: Floors, Stairs and Roofs: Types of floor slabs – Methods of Analysis and design example of cored and panel types and two-way systems - Staircase slab design - Types of roof slabs and insulation requirements - Description of joints, behavior and requirements - Deflection	06



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M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	control for short term and long term loads - Ultimate strength calculations in shear and flexure	
04.	Walls: Walls: Types of wall panels - Blocks of large panels – Curtain partition and load bearing walls Load transfer from floor to wall panels – Vertical loads Eccentricity and stability of wall panels –Use of Design curves -Types of wall joints, their behavior and design – Leak prevention, Joint sealants, sandwich wall panels	06
05.	Industrial Buildings: Industrial Buildings: Components of single storey industrial sheds with crane gantry systems - Design aspects of R.C. Roof Trusses - Roof panels R.C. Crane - Gantry Girders - Corbels and columns and Wind bracing	06
06.	Case Study: Tata Bluescope (Road panel, folded plate const., Industrial structure case study)	06

References:

Text Books:

- Marashev, V.I.Sigalov, E.Y.Baikov, U.N., “Design of RC Structures”, Mir Publishers, Moscow.
- “SERC, Design & Construction of Prefabricated Residential & Industrial Buildings”, Organized by SERC, Chennai.
- B.Leweicki, “Building with Large Prefabrication”, Elsevier Publishing Co.
- IS 15917, (2010) “Building Design & Erection Using Prefabricated Concrete”.
- “Architectural Precast Concrete”, by Pre stressed Concrete Institute.

Reference Books:

- Bruggeling A. S. G and G.F Huyghe, “Prefabrication with Concrete”, CRC Press,
- Gilbert R. L and N.C Mickeborough, “ Design of Prestressed Concrete”, Taylor & Francis



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-II

Class: F. Y. M. Tech.	Semester: I	L	T	P	Credits
Course Code : CCM1211	Course Name: Advanced Concrete Technology	3	-	-	3

Course Description:

This course is intended to support the students to design high performance concrete mixes by means by correct material selection, mix design, and construction practices mixture. Course contents also involves studies of topics regarding fresh and hardened concrete behavior also with long term performance concerns, associated with creep, shrinkage and durability aspects of concrete.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Select binders, SCMs and admixtures to design strong, durable and sustainable concretes.
2. Analyze the factors affecting properties of fresh concrete.
3. Develop quality control plan for a concrete construction.
4. Design special purpose concrete mixes using mix design procedures recommended by pertinent codes of practices and handbooks.

Prerequisite: Possess basic knowledge of concrete technology.

Course Content

Unit No.	Description	Hrs.
01.	Binders: Working Mechanisms and types, Covering pulverized fuel ash, Ground granulated blast furnace slag and silica fume; Chemical composition; Physical characteristics; Chemical and physical interaction with processes of hydration; Effects on properties of concretes, Mortars and grouts; Methods of testing; Applications; Blended cements. Introduction to ternary cement mixes.	06
02.	Admixtures: Working Mechanisms and classification; Chemical composition; Origin and manufacture; Actions and interactions; Application; Effects on properties of concretes, red mud, Mortars and grouts; Methods of testing; Applications.	06
03.	Fresh concrete:	04



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Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Different models of elastic behavior of concrete, Concrete rheological models of concentrated suspensions, Pastes, Mortars and concretes; Viscoelasticity in concrete.	
04.	Properties of hardened concrete : Durability test Early Age Cracking and its mechanism in Concrete, Plastic settlement and plastic shrinkage, Methods for predicting creep and shrinkage.	04
05.	Onsite Quality Control: Quality assessment and control measures during the concreting process, Quality control charts, Placing and pumping of concrete, Compaction of concrete Advances in curing, Curing chemicals.	08
06.	Mix design: Review of methods and philosophies; Mix design of special purpose concretes (High Performance Concrete), Hands on concrete casting and testing.	08

References:

Text Books:

- Santhakumar, A.R., "Concrete Technology", Oxford University Press, New Delhi.
- Gambhir, M.L., "Concrete Technology", Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

Reference Books:

- Mehta, P. K. and Monteiro, P.J. M., "Concrete Microstructure, Properties and Materials", Mc Graw Hill Publications, NY.
- Shetty, M.S., "Concrete Technology", S. Chand & Company Ltd., New Delhi.
- Kett Irving, "Engineered Concrete Mix Design and Test Methods", CRC Press Taylor & Francis Group, Florida, USA.

Codes of Practice:

- Bureau of Indian Standards IS: 10262-2019. Indian standard code of practice for recommended Guidelines of Concrete Mix Design plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 456: 2000. Indian standard code of practice for plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 1199: 1959. Indian standard code of methods of sampling and analysis of concrete. New Delhi, BIS.
- ACI 211.1-91.
- Handbook on Concrete Mixes SP 23: 1982, 2001.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1256	Course Name: Microsoft Project (MSP) Laboratory

L	T	P	Credits
-	-	4	2

Course Description:

Computer based project management is vital in construction industry. Microsoft project software is used for analyses complex projects. Microsoft project software offers planning, scheduling and controlling of civil engineering projects. Course is designed to make graduates familiar with the current planning software used in industry; in this course students will acquire knowledge and expertise/hands-on in Micro soft project software.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Develop Work Breakdown Structure for project.
2. Prepare project schedule using Microsoft project.
3. Modify construction schedule based on site progress.
4. Extract and present various types of reports.

Prerequisite: Engineering / Construction Management

Course Content		
Experiment No.	Description	Hrs.
01.	Acquiring expertise in Microsoft Project.	16
02.	Solve 4 assignments on Construction planning and control.	16
03.	Plan two projects using Microsoft Project.	16





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: I
Course Code : CCM1276	Course Name : Geographic Information System Laboratory

L	T	P	Credits
-	-	4	2

Course Description:

This laboratory course is designed to make graduates familiar with advanced surveying equipment and Geographic information system software and its application in civil engineering.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Perform data collection using tools.
2. Analyze data using GIS software.
3. Prepare and present maps in GIS.

Prerequisite: Basics of Engineering Geology/Geography.

Course Content		
Experiment No.	Description	Hrs.
01.	Learning use of instrument/software.	16
02.	Application of instrument/software to complete a given task.	12
03.	Apply knowledge of software to a given project.	20





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: I
Course Code: SHP5513	Course Name: Technical Communication

L	T	P	Credits
02	--	--	01

Course Description:

This course is designed to help students in improving skills that will enable them to produce well designed technical documents and to deliver impressive oral presentations. The course focuses on principles of effective writing and on types of documents common in technical fields. While the emphasis will be on writing, oral communication of technical information will form an important component of the course, as well. The course assists students in preparing them for oral presentations in various professional contexts.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Construct grammatically correct sentences in different types of technical writing, such as reports and proposals.
2. Apply technical writing skills to improve readability of documents.
3. Demonstrate professional skills required in job interviews and at workplace.

Prerequisite: Students who enroll themselves to this course should have adequate LSRW abilities of English language.

Course Contents		
Unit No.	Description	Hrs.
01	Planning and Preparation: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	04
02	Paraphrasing and Plagiarism: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism.	03
03	Sections of Research Paper: Sections of a Paper, Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, and The Final Check.	03
04	Sections of Research Paper: Key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction, skills needed when writing a Review of the Literature.	04
05	Sections of Research Paper:	04



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M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions, useful phrases, how to ensure good quality of the paper at the time of submission.	
06	Professional skills: Resume Writing, e-Mails, Interview skills, Dos and Don'ts while Answering, FAQs, GROUP DISCUSSION: Structured and Unstructured GD, Opening and Closure, Showing Agreement and Disagreement.	06

References:

Text Books:

- Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London.

Reference Books:

- Day R, How to Write and Publish a Scientific Paper, Cambridge University Press,
- Goldbort R, Writing for Science, Yale University Press (available on Google Books).
- Jeff Butterfield, Soft Skills for Everyone, Cengage Learning India Private Limited.
- John Seely, Oxford Guide to Effective Writing and Speaking; Oxford University Press.
- Thomas N. Huckin and Leslie A. Olsen, Technical Writing and Professional.
- Communication for Nonnative Speakers of English; Tata McGraw Hills, International Edition.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II	L	T	P	Credits
Course Code: CCM1021	Course Name : Project Economics & Financial Management	3	---	--	3

Course Description:

This course introduces the fundamental principles of engineering economy, focusing on the economic analysis and evaluation of engineering projects. Students will learn essential concepts such as the time value of money, cash flow analysis, and methods of comparing investment alternatives using present worth, annual worth, future worth, and rate-of-return techniques. The course also explores the impact of depreciation, taxation, and inflation on engineering decisions. Emphasis is placed on benefit-cost analysis, replacement decisions, and project selection under uncertainty. Through practical examples and case studies, students will develop the skills needed to make informed, economically sound decisions in engineering and construction projects.

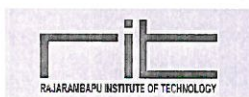
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Describe the foundational concepts of engineering economy, including interest rates, cash flow analysis, and factors affecting financial decision-making.
2. Apply various engineering project analysis techniques to evaluate project viability.
3. Evaluate engineering projects using benefit-cost analysis, sensitivity analysis, and decision-making tools such as payback and breakeven analysis.
4. Discuss different sources of finance, and understand their application in long-term and short-term financing, particularly in construction projects.
5. Discuss accounting principles to prepare, analyze, and manage financial statements and site-specific accounts for effective budgeting and cost control in construction projects.

Prerequisite: Basics of engineering economics

Course Content		
Unit No	Description	Hrs.
01.	Foundation of Engineering Economy: Concept of Engineering economy, Interest rate- Simple and compound, Cash flow, Factors-Single payment Factors, Uniform series factors, gradient factors, Nominal and effective interest rate.	06
02.	Analysis of Engineering Projects: Present worth analysis, capitalized cost analysis, Annual worth analysis, Rate of return analysis, Future worth analysis.	06
03.	Evaluation of Engineering project: Benefit cost analysis, Breakeven, Sensitivity and payback analysis, Replacement and retention decisions, Inflation and its effects.	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

04.	Capital Structure: Sources of finance (long term and short term sources), Sources of long term finance – Securities (Ordinary shares, Preference shares, Debentures or bonds), Loan capital. Short term Sources of finance- Trade Credit, Accruals, Commercial Paper, Bank credit, Public Deposit, Inter-Corporate Deposits, Private Institutions, Factoring, Working capital management, Importance of Working capital management in construction projects.	06
05.	Financial Statement Analysis: Financial Statements (Trading & Profit & Loss A/c, Balance Sheet etc.) and its uses, Techniques of financial statement analysis- comparative financial statement, common size statement, ratio analysis, Ratio Analysis-computation of liquidity ratios, leverage ratios, activity ratios & profitability ratios.	06
06.	Practical Accounting: Book Keeping & Accountancy, Preparation of different Site accounts for receiving materials, allocation of materials for various activities, stock records (Fixed and consumable), day to day expenditures etc. Preparation of reports, budgets and budgetary control system in construction firms	06

References:

Text Books:

- Managerial Economics by D. M. Mithani, Himalaya publication.
- Financial Management by Prasanna Chandra, Tata McGraw Hill, New Delhi.
- Financial Management by Khan and Jain, Tata McGraw Hill, New Delhi.
- Financial Management by I. M. Pande, Vikas House Publication.

Reference Books:

- Basics of Engineering Economy- by Leland Blank and Anthony Tarquin, Tata McGraw Hill, New Delhi
- Projects planning, Analysis Selection, Implementation and Review by Prasanna Chandra, Tata McGraw Hill, New Delhi.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II	L	T	P	Credits
Course Code : CCM1041	Course Name: Legal Aspects in Construction	3	-	-	3

Course Description:

This course will cover the entire process of construction contracts, starting from tender notice to arbitration.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Select appropriate type of contract for construction projects.
2. Develop tender document for construction project.
3. Perform comparative analysis of types of contract.
4. Analyze arbitration documents for construction project.

Prerequisite: Should know the basics of Estimating Costing

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Offer, Proposal, Void, Voidable & Valid contract, Essential of valid contract, Types of Contract, All in contract, Lump sum contract, Cost plus contract, Item rate contract, Labour contract non-conventional (PPP), BOT, BOOT, DBT contract.	06
02.	Tender: Tender documents, Invitation of tenders, Pre-qualification of contractor, Tender Notice, Preparation of tender document, Submission of Tender (One packet and Two Packet), Opening of Tender, Acceptance/ Rejection of tender.	06
03.	Contract Documents: Role of an Engineer, Contractor & Owner, Conditions of contract (general and special conditions), Performance security, Security deposit, Suspension of work, Time limit for completion, Liquidated damage, Measurement & Payment, Additions, Alterations or variation & deviations, Force majeure, Defects, Maintenance & Improper work, Subletting, Breach of contract, Variations and Claims, Settlement of account and closure of project.	06
04.	Payment and bills: Mobilisation advances, secured advances, interim payment, first and final bill (F&F), RA bill, repayment of security deposit and retention of money. Measurement & Payment, Additions, Alterations or variation & deviations, Defects, Maintenance & Improper work, Subletting, Breach of contract,	06



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(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Settlement of account of final payment, Claims.	
05.	Contract of Indemnity & Guarantee: Indemnity and Guarantee- Difference between the two contracts, consideration for guarantee, surety' s liability, discharge of surety. Bailment- Nature of transactions, delivery of bailee, Bailee' s responsibility, Termination, Bailment of pledges.	06
06.	Arbitration: Meaning of arbitration, Advantages of arbitration, Types of arbitration, Distinction between arbitration & expert determination, Arbitrator, Valuer, Engineer, Architect, Referee, Conciliator, Mediator, Arbitral award, arbitral tribunal, Partnering, mediation, counselling, litigation Arbitration and counselling act (1996).	06

References:

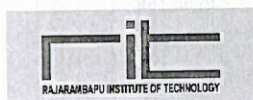
Text Books:

- Patil B. S., "Contracts & Estimates", CRC Press.
- B. P. Saraf, "Law of Arbitration and Conciliation", Snow white publications.

Reference Books:

- Namarari Roshan H., "Professional practice with Elements of Estimating Valuation Contract and the arbitration Act", Lakhani Book Depot.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II
Course Code: CCM1226	Course Name: Research Methodology & IPR

L	T	P	Credits
2	1	-	3

Course Description:

This course is designed to make graduates aware of various steps involved in Research Process. Also report and research proposal writing is incorporated in the syllabus. This course also deals with IPR; its process and developments.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Formulate a research problem.
2. Analyze research related information
3. Prepare and present research proposal/paper by following research ethics
4. Make effective use of computers and computing tools to search information, analyze information and prepare report.
5. Describe nature and processes involved in development of intellectual property rights

Prerequisite: Nil

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Meaning of research problem, Sources of research problem, Criteria and Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.	06
02.	Literature Study: Effective literature studies approaches, Plagiarism, Research ethics, Approaches of investigation of solutions for research problem, Data collection, Data analysis with software, Interpretation, Necessary instrumentations	06
03.	Technical Writing: Effective technical writing, How to write technical report and paper, Developing a Research Proposal, Format of research proposal, Presentation and assessment by a review committee.	06
04.	Nature of Intellectual Property: Patents, Designs, Trade and Copyright, Process of Patenting and Development: technological research, Innovation, Patenting development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT.	06
05.	Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications.	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

06.	New Developments in IPR: Administration of Patent System, New developments in IPR; IPR of Biological Systems, Computer Software etc., Traditional knowledge Case Studies, IPR and IITs.	06
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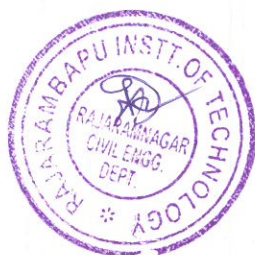
References:

Text Books:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students", Juta & Co Ltd.
- Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners", SAGE Publication.
- Asimov, "Introduction to Design", Prentice Hall.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", Wolters Kluwar.
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand Publ.

Reference Books:

- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction", Juta Academic.
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd.
- Mayall, "Industrial Design", McGraw Hill Publication.
- Niebel, "Product Design", McGraw Hill Publication.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-III

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1061	Course Name: Project Formulation and Appraisal

L	T	P	Credits
3	-	-	3

Course Description:

This course has been introduced as an elective course to train students in identification, evaluation, structuring and appraisal of various construction, building, infrastructure and engineering projects.

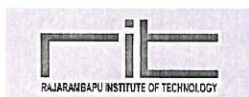
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Identify project needs to perform comparative evaluation of alternatives for effective project selection.
2. Conduct a comprehensive technical analysis and the suitability of technology for project implementation.
3. Analyze investment needs, cash flows, profitability indicators, and financial appraisal methods to assess the financial feasibility of a project.
4. Evaluate social cost-benefit aspects of projects by identifying direct, indirect, tangible, and intangible impacts.
5. Select feasible project considering appraisal criteria under capital and social constraints.
6. Prepare and present a comprehensive project report based on established norms of project administration.

Prerequisite: Should have basic knowledge of project management

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Identification of needs, present availability, additional requirements, alternatives and their comparative study, project identification.	06
02.	Technical Feasibility: Technical analysis market and demand analysis, project location resource requirement and their fulfillment technology, know how requirements technical study of alternatives and their suitability.	06
03.	Financial Feasibility: Investment and capital outlay cash flow of the project and its significance profit, Probability and break even analysis,	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	internal rate of return, of shadow pricing benefit cost ratio	
04.	Cost-Benefit Analysis: Social cost benefit analysis, objectives, direct – indirect costs and benefits – tangibles, intangibles and their conversion, levy subsidy concepts	06
05.	Project Appraisal: Criteria and selection from alternatives, discounting non discounting criteria selection under capital restriction, social restriction and other restriction risk analysis	06
06.	Project Administration: Project administration organization and control during execution period maintenance and care taker operational set up, project management after completion. Preparation of project report and norms and its presentation.	06

References:

Text Books:

- Prasanna Chandra, “Project Preparation, Appraisal, Budgeting and implementation”
- E. J. Mishan, “Cost Benefit Analysis”
- Chandra P. “Projects, planning, analysis, financing, implementation and review”, Tata Mc-Graw-hill New Delhi

Reference Books:

- Tiffin R., “Practical techniques of effective project investment appraisal”, Viva Books, New Delhi
- Khatua S., “Project Management and Appraisal”, Oxford University Press, New Delhi





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-III

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1080	Course Name: Advanced Construction Techniques

L	T	P	Credits
3	-	-	3

Course Description:

To study and understand the latest construction techniques applied to engineering Construction of infrastructures like high rise structures, metros, bridges etc.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Use modern construction techniques in the high rise structures.
2. Identify the suitable formwork technique used to construct a structure.
3. Justify the concepts used in the construction of special structures.

Prerequisite: Student needs basic knowledge construction techniques.

Course Content

Unit No.	Description	Hrs.
01.	High rise buildings: Construction methods and techniques using in-situ concrete, Precast Concrete & Structural Steel, finished concrete, tunnel form, fire Fighting ,Safety, Innovative Concrete formwork technology	6
02.	Innovative methods of construction: Jump-form technology, Slip form technology, Dry wall technology, Plastering Machines.	6
03.	Construction of Metro Railway: Underground and over ground structures, underwater structures, different methods and techniques of construction.	6
04.	Bridges: Introduction, Construction of special type of bridges such as cable stayed bridge, suspension and Pre-stressed bridge, construction of foundation and Super structure(Incremental, end and segmental)	6
05.	Off shore structure Construction: Beacons, Oil drilling Platforms. Dredging equipment and techniques for construction of Channels and Islands, Breakwater and Jetties construction.	6
06.	Piling: Single pile and a group piles (Bored and Driven) during Construction Methods of pile driving by Vibration and Construction of micro piles, Diaphragm Walls, Details of precast piles, pre stressed piles, steel piles and friction piles.	6



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

References:

Text Books:

- Bryan, "Construction Technology: Analysis, and Choice", 2ed. Wiley India.
- Rajiv Gupta, "Construction Planning and Technology", 2 ed, CBS publisher, New Delhi.
- Sanjay Gupta, "Construction technology & Management", Vayu Education of India.
- S.P Bindra, "Principles and Practices of Bridge Engineering", Dhanpat Rai Publication.

Reference Books:

- Roy Chudley and Roger Greeno, "Construction Technology", Prentice Hall.
- Peurifoy, "Construction Planning, Equipment and methods", Tata McGraw Hill Publication.
- Journals such as CE & CR. Construction world, International Construction.
- Brochures Published by various agencies associated with construction.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-III

Class: F. Y. M. Tech.	Semester:
Course Code: CCM1120	Course Name: Quantitative Techniques for civil Engineers

L	T	P	Credits
3	-	-	3

Course Description:

This course introduces the students to a range of mathematical and statistical methods that aid in making informed and optimal decisions throughout the lifecycle of a construction project. This course will cover various quantitative techniques, including optimization, probability, regression analysis, and statistical inference, with a strong focus on their application in civil engineering problems. Students will learn how to apply these techniques to solve real-world challenges in areas such as resource allocation, project scheduling, risk management, and cost estimation, ensuring the best outcomes for projects.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Apply quantitative techniques to solve civil engineering problems.
2. Formulate and solve linear programming models for civil engineering applications.
3. Analyze decision-making scenarios and select appropriate strategies under uncertainty.
4. Evaluate transportation and assignment problems in civil engineering projects.
5. Apply game theory concepts to civil engineering decision-making.

Prerequisite: Calculus, Matrix Algebra

Course Content		
Unit No.	Description	Hrs.
01.	Introduction to Operations Research: History, nature, and scope of OR, Applications of OR in civil engineering and managerial decision-making, Introduction to optimization techniques and their application in engineering planning, design, and construction.	06
02.	Linear Programming: Formulation of linear optimization models, Civil engineering applications of LP, Simplex method (core method without special cases), Method of Big M and duality.	06
03.	Transportation and Assignment Models: Transportation model: Formulation, methods, and applications in civil engineering. Assignment model: Formulation and the Hungarian method.	06



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M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

04.	Decision Strategies: Decision-making under certainty, risk, and uncertainty. Decision criteria: Maximax, Maximin, and Minimax regret.	06
05.	Game Theory: Classification of games: Two-person, zero-sum games, Formulation of payoff matrix and saddle points, Games with pure strategies, Solution to 2×2 matrix payoff matrices using pure strategies, Applications of game theory in bidding and contracts.	06
06.	Advanced Topics and Applications: Queuing theory and waiting time analysis: Applications in construction and service industries, Introduction to dynamic programming, Monte Carlo simulation: Concepts and applications in risk analysis.	06

References:

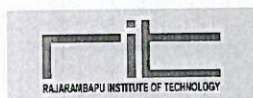
Text Books:

- Singiresu S. Rao, "Engineering Optimization", New Age International Publishers
- Taha, H. A., "Operations Research - An Introduction", Prentice Hall.

Reference Books:

- J. K. Sharma, "Quantitative Techniques-for managerial decisions", Macmillan Business books.
- Er. Prem Kumar Gupta, Dr. D. S. Hira, "Operations Research" S. Chand publications.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-III

Class: F. Y. M. Tech.	Semester: II	L	T	P	Credits
Course Code : CCM1106	Course Name: Health and Safety Management	3	-	-	3

Course Description:

Major accidents in industries across the world during the last two or three decades have led to generation of enormous interest in Occupational Safety and Health, as well as in the environment. On any project there is always the possibility of an accident or damage to someone's health. The work exposes people to hazards, be they: loads which have to be manually handled; dangerous machinery; toxic substances; electricity; working with display screen equipment or even psychological hazards such as stress. The course addresses the codal provisions and regulations to be followed on site.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Classify hazards to employees on construction site.
2. Determine safe practices necessary for a project site.
3. Identify the causes of accidents and suggest preventive measures to avoid accident.
4. Prepare safety management plan.

Prerequisite: Basic knowledge of Safety Engineering

Course Content		
Unit No	Description	Hrs.
01.	Introduction: Hazards and causes of accidents, Impact of accidents on site safety, safety measures.	06
02.	Labour Laws: Workman compensation act, labour welfare act Safety legislation and standards for construction industry	06
03.	Safety in Construction during substructure work: Safety precautions and practices in various construction activities like excavation, concreting	06
04.	Safety in Construction during superstructure work: scaffold erection and dismantle, concreting, steel erection and demolition of structures	06
05.	Accident Management: Management of accidents, Organization for ensuring safety, Frequency of accidents, Legal aspects of handling accidents.	06
06.	Construction Site Safety: Occupational hazards and personal protective equipment, site management, safety manual and check lists safety officer, safety committee, safety training, safety audit	06



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M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

References:

Text Books:

- NSC, Accident Prevention Manual for Industrial Operations.
- Fulman, J.B., "Construction Safety, Security, and Loss Prevention", John Wiley and Sons.
- ILO, Safety and Health in Construction.

Reference Books:

- Hudson R and R W King, "Construction hazard & Safety handbook", Butterworths.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-IV

Class: F. Y. M. Tech.	Semester: II	L	T	P	Credits
Course Code : CCM1148	Course Name: Construction Resource management	3	-	-	3

Course Description:

Resources contribute 90% of the project cost; of the five major resources this course covers two, Material and Human. Projects cannot be completed without handling these resources, this course deals with proper handling and development of resources in order to help managers to control and successfully complete the project.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the basics and importance of material management and inventory control.
2. Apply purchasing and vendor evaluation techniques to improve supply chain efficiency.
3. Analyze inventory management methods to optimize costs and resources.
4. Demonstrate HRM functions like recruitment, training, and manpower planning.
5. Evaluate the impact of welfare measures and performance appraisal on productivity.

Prerequisite: Basics of Project management

Course Content		
Unit No.	Description	Hrs.
01.	Basics of Material Management: Importance of materials management, functions, objectives and organizations for materials management, codification and standardization: process and advantages, stores management: layout, material handling.	06
02.	Purchasing and vendor development: Functions, steps, purchasing cycle. Procedure, Relevance of Good Supplier – Need for Vendor Evaluation-Goals of Vendor Rating-Advantages of Vendor Rating – Cost-ratio Method –Forced Decision Matrix,	06
03.	Inventory Management: ABC analysis- advantages, mechanism, purpose, objectives Importance & Scope of Inventory Control, Types of Inventories, Costs Associated with Inventory, Inventory Control, Selective Inventory Control, Economic Order Quantity, Safety Stocks	06
04.	HRM Basics: Manpower Planning, functions of HRM, Development and	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Operation of human resources - Managerial Staffing – Recruitment – Selection - Placement, Training and Development.	
05.	Welfare Measures: Compensation – Safety and health, Wages and Salary, GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures. Employee Benefits, employee appraisal and assessment	06
06.	Performance Appraisal: Performance appraisal - Employee handbook and personnel manual - Job descriptions and organization structure and human relations – Productivity of Human resources. Special Human resource problems.	06

References:

Text Books:

- Gopalkrishna & Sudarsan, “Materials Management, An Integrated approach”, PHI.
- A.K. Dutta, “Materials Management-Procedures, Texts & Cases”, Pearson.
- Memoria, C. B, “Personnel Management”, Himalaya Publishing Co.

Reference Books:

- Josy. J. Familaro, “Handbook of Human Resources Administration”, McGraw-Hill International Edition.
- Dwivedi R. S, Macmillian, “Human Relations and Organizational Behavior”, India Ltd.
- Gopal Krishnan, “Handbook of Materials Management”, PHI.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-IV

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1150	Course Name: Repair and Rehabilitation of Structures

L	T	P	Credits
3	-	-	3

Course Description:

An elective course which is very much needed for all civil engineers, every structure built needs maintenance and repairs. This course will help students to learn how building or structures can be repaired or rehabilitated.

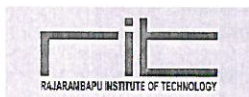
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Perform Assessment of buildings.
2. Recognize damages in the structure.
3. Select proper repair materials.
4. Suggest repair or rehabilitation method for particular damage.

Prerequisite: Possess basic knowledge of construction activities.

Course Content		
Unit No.	Description	Hrs.
01.	Introduction: Maintenance, strengthening, repair, rehabilitation and retrofit, need for rehabilitation of structures, Importance of maintenance, routine and preventive maintenance.	06
02.	Damages to Buildings: Various damages to masonry structures and causes, Various cracks in R.C. buildings, causes and effects.	06
03.	Repair materials: Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials, Special mortars and concretes, Grouting materials, Bonding agents, Protective coatings and FRP sheets.	06
04.	Damage diagnosis and assessment: Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Ground Penetrating Radar (GPR), Innovative Nondestructive testing (Case Study).	06
05.	Corrosion and Repairs: Corrosion of embedded steel in concrete, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns), Bio-repairing concrete.	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing.	
06.	Rehabilitation: Jacketing and Strengthening: Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing. Strengthening, Beam shear strengthening, Flexural strengthens.	06

References:

Text Books:

- S.Champion , “Failures and repair of concrete structures”, John Wiley and Sons.
- R.N.Raikar, “Diagnosis and treatment of structures in distress”,Published by R & D Centre of Structural Designers and Consultants Pvt.Ltd, Mumbai.
- “Handbook on repair and rehabilitation of RCC buildings”, CPWD, Government of India.
- A. Chakrabarti ,“Handbook on seismic retrofit of buildings”, Narosa Publishing House.

Reference Books:

- Noel P.Mailvaganam , “Repair and protection of concrete structures”, CRC Press.
- Peter.H.Emmons, Galgotia, “Concrete repair and maintenance”, Galgotia publications Pvt. Ltd.
- Pankaj Agarwal, Manish Shrikande, “Earthquake resistant design of structures”, PHI.Pvt. Ltd.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-IV

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1201	Course Name: International Contracting

L	T	P	Credits
3	-	-	3

Course Description:

For infrastructure development of various construction projects are required to be taken. These projects are executed by taking actual participation in contracting procedures. So in this course students will have different types of international terms and conditions which are useful for contracting.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Prepare tender documents as per international contracting procedures.
2. Apply of various conditions of international contract under the FIDIC document.
3. Understand the labour laws.
4. Act as arbitrator for dispute resolving.

Prerequisite: Basic knowledge of tendering and estimation and contracts.

Course Content

Unit No.	Description	Hrs.
01.	Contract Procedure and basic terminology: Types of engineering contracts, Drafting a tender notice, Tender document, procedure of submission and award of tender, Mode of payments and necessity.	06
02.	International contracting: meaning, scope, nature, presents status of the International construction market, role of Asia- Pacific region countries in the present construction development. Impact of WTO/GATS on the Indian Construction Sector as regards domestic market and export sector. Selection of personnel to suit socio-economic-environmental culture in other countries, suitable organizational structure.	06
03.	Study and application of various conditions of contract: under the FIDIC document. Development of regulatory framework. Project exports from India. International financing, Various institutions such as WB, IMF, ADB. African bank etc. and their role, rules – regulations in funding various projects, forming alliance, bilateral and multilateral funding, trade practices etc.	06
04.	International Projects: Types of BOT systems such as BOT, BOOT, BOO, DBO, BOR, BLT, BRT, BTO & DBFOT, MOOT, ROO, ROT, BOLT – Contractual procedures, special features, methods of handling.	06
05.	Documentation and Risk Identification: Familiarization with	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	construction documents, Certainty, Risk and Uncertainty, Risk Management, Identification and Nature of Construction Risks, Contractual allocations of Risk, Types of risks.	
06.	Disputes Resolution: International Courts, formation of DRB's (Dispute resolving boards) functioning and experiences in India and abroad, Advantages of DRB's UNICTRAL Proceedings for International Arbitration. Institutionalized Arbitration, CIDC – SIAC Arbitration. CASE studies of any major project executed/functioning under International contracting.	06

References:

Text Books:

- FIDIC Documents-International federation of consulting Engineers.
- Simon M.S., "Construction Contracts & Claims", McGraw Hill, New York.
- Unified Contract Documents by Ministry of Statistics and program implementation, Government of India.
- Robert Matyas and Mathews, "Dispute Review Board Manual".

Reference Books:

- Karla C. Shippe, "A Short Course in International Contracts: Drafting the International Sales", World trade press.
- K. N. Vaid, "International Construction Contracting", NICMAR Publication





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Program Elective-IV

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1236	Course Name: Construction Waste Management

L	T	P	Credits
3	-	-	3

Course Description:

Waste management is the need of the hour, construction waste generated is in huge amount and needs to be planned for its reuse, recycle before sending for land filling. This course is designed to cover government policies and other techniques of waste minimization.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Develop strategies for construction and demolition waste management and resource efficiency.
2. Examine the environmental impact of building materials.
3. Design site waste management plans.
4. Justify the application of waste minimization techniques on construction site.

Prerequisite: Basic knowledge of Environmental Engineering

Course Content		
Unit No.	Description	Hrs.
01.	Environmental impact: Environmental Impact of Building Materials Embodied energy of materials; impact on the local environment; toxicity of the material, EIA methods and tools.	06
02.	Waste Assessment: Life cycle assessment. Nature and Source, Direct and indirect waste; site types and origins; composition; quantity; current recycling/reuse potential of building materials, carbon footprint.	06
03.	Construction and Demolition Waste: Construction and Demolition Waste Management Plans International good practice; planning requirements; demolition plans; Site implementation; supplier agreements; sub-contractor management.	06
04.	Roles and Responsibility: Role of waste management contractor; training; auditing; skip management; current markets; current disposal options; health and safety; reporting to local authorities. Treatment of Construction and Demolition Waste, waste permits; waste licenses; waste transfer facilities; landfills; treatment technologies; hazardous waste facilities; reporting to EPA.	06
05.	Waste minimization: Designing for Waste Prevention and Minimization Waste prevention and minimization; client, contractor and designer	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	attitudes; proper maintenance of existing buildings; reuse of existing building structure; design flexibility; design for reuse and recycling; dimensional Co-ordination and standardization; modular design; material selection and control.	
06.	Waste forecasting: Waste Forecasting Tools Application of WRAP's designing out waste tool for buildings and civil engineering; WRAP net waste tool; BRE SMART Waste; WRAP Site Waste Management Plan Tracker.	06

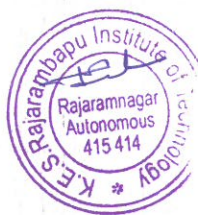
References:

Text Books:

- Greg Winkler, "Recycling Construction and Demolition waste: A LEED-Based Toolkit (Green Source) (Google ebook), Mc Graw Hill Professional.
- V M Tam, Chi Ming Tam, "Reuse of Construction and Demolition Waste in Housing Development", Nova Science Publishers.

Reference Books:

- Richard Ian Stessel "Recycling and Resource Recovery Engineering", Springer-Verlag Berlin Heidelberg.





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M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1246	Course Name : Fundamentals of BIM Laboratory

L	T	P	Credits
-	-	4	2

Course Description:

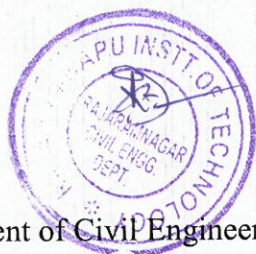
Upcoming and most related software for construction project management is evolved as Building Information Modeling (BIM), This course will help students to learn “Revit” and apply other futures to manage the project.

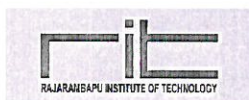
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Develop drawings as per software requirement.
2. Compute quantities of building items.
3. Develop project schedule using “Revit” application.

Course Content		
Experiment No.	Description	Hrs.
01.	Learning Revit software.	16
02.	Learning 3D in Revit.	08
03.	Develop models using Revit.	08
04.	Take of quantities using Revit.	08
05.	Monitor project with virtual models.	08





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1266	Course Name : Primavera Laboratory

L	T	P	Credits
-	-	4	2

Course Description:

Primavera software has the capacity to help plan, organize, and manage resource tools and develop resource estimates. Depending on the sophistication of the software, it can manage estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, decision-making, quality management and documentation or administration systems. Primavera is one of the computer based PM software used worldwide to handle construction projects. By this software complex civil engineering problems are handled. Primavera laboratory is designed to make students familiar with the current planning software used in industry; in this course students will acquire knowledge and expertise/hands-on in Primavera software.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Develop and organize project activities using Work Breakdown Structure (WBS), relationships, and calendars in Primavera.
2. Carry out resource allocation, cost estimation, and baseline creation for project planning using Primavera.
3. Apply project tracking techniques, update schedules, and generate performance reports to facilitate project monitoring and control.

Prerequisite: Project Planning, Scheduling Techniques, Estimating & Costing.

Course Content		
Expt. No.	Description	Hrs.
01.	Introduction to Primavera: Installation, User Interface, and Navigation	04
02.	Creating a New Project: Setting Calendars, Project Start/End Dates	04
03.	Developing Work Breakdown Structure (WBS), Defining Activities and Milestones	08
04.	Activity Sequencing: Creating Relationships and Network Diagrams, Assigning and Managing Project Calendars, Resource Management: Defining and Assigning Resources	08
05.	Cost Estimation: Assigning Unit and Lump-sum Costs, Creating and Managing Project Baselines, Generating Project Reports: Resource, Cost, and Schedule Reports	08
06.	Mini Project using Primavera (Individual/Group)	16



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: F. Y. M. Tech.	Semester: II
Course Code : CCM1286	Course Name: Mini project

L	T	P	Credits
-	-	2	1

Course Description:

Mini project shall be delivered on one of the advanced topics chosen in consultation with the supervisor, based on dissertation work/societal problem/special structure. Here parametric study is not expected. Some lifelong learning abilities should be developed. A hard copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing single side printed, preferably in TRM format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the seminar. A copy of the report in soft form must be submitted to the supervisor, along with other details, if any.

Prerequisite: Basics of Research Methodology.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Select mini project problem.
2. Prepare and present statement of purpose.
3. Develop solution to the selected problem.
4. Prepare and present report related to project undertaken.

Course Content	
Description	Hrs.
The topic for the Mini projects may be related to Civil Construction Management area and interdisciplinary area related to Civil Engineering or an innovative idea; Student should perform analysis/design work. Student should prepare model of their work. Evaluation of Mini projects report will be done by the DPGC Committee at the end of semester II.	48



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Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech	Semester- III
Course Code: MOE2012	Course Name: Artificial Intelligence - Machine Learning

L	T	P	Credits
03	--	--	03

Course Description:

Machine learning is a part of Artificial Intelligence. It uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can sift through large volumes of data at high speed to make predictions or decisions without human intervention. Machine learning as a field is now incredibly pervasive, with applications spanning from business intelligence to homeland security, from analyzing biochemical interactions to structural monitoring of aging bridges, and from emissions to astrophysics, etc. This class will familiarize students with a broad cross-section of models and algorithms for machine learning and prepare students for research or industry application of machine learning techniques.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Describe central machine learning methods and techniques and how they relate to artificial intelligence.
2. Differentiate between supervised and unsupervised learning techniques.
3. Apply the ML algorithms to a real-world problem.
4. Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
5. Evaluate a given problem and apply appropriate machine learning technique.

Prerequisite: Statistics, Linear Algebra, Optimization Techniques, Programming Language

Course Content		
Unit No	Description	Hrs.
01	Introduction to Artificial Intelligence and Machine Learning Introduction: What Is AI and ML? Examples of AI and ML, Applications, Supervised Learning, Un-Supervised Learning and Reinforcement Learning, Important Elements of Machine Learning- Data formats, Learnability, Statistical learning approaches, Elements of information theory.	06
02	Feature Selection Scikit- Learn Dataset, creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principle Component Analysis(PCA)- non-negative	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	matrix factorization, Sparse PCA, Kernel PCA. Atom Extraction and Dictionary Learning.	
03	Regression Linear regression- Linear models, A bi-dimensional example, Linear Regression and higher dimensionality, Polynomial regression, Logistic regression-Linear classification, Logistic regression, Implementation and Optimizations, Stochastic gradient descent algorithms.	06
04	Naïve Bayes and Support Vector Machine Bayes Theorem, Naïve Bayes Classifiers, Naïve Bayes in Scikit- learn- Bernoulli Naïve Bayes, Multinomial Naïve Bayes, and Gaussian Naïve Bayes. Support Vector Machine(SVM) Linear Support Vector Machines, Scikit- learn implementation, Linear Classification, Kernel based classification, Non- linear Examples. Controlled Support Vector Machines, Support Vector Regression.	06
05	Decision Trees and Ensemble Learning Decision Trees- Impurity measures, Feature Importance. Decision Tree Classification with Scikit learn, Ensemble Learning-Random Forest, AdaBoost, Gradient Tree Boosting, Voting Classifier. Clustering Fundamentals- Basics, K-means: Finding optimal number of clusters, DBSCAN, Spectral Clustering. Evaluation methods based on Ground Truth- Homogeneity, Completeness, Adjusted Rand Index.	04
06	Clustering Techniques Hierarchical Clustering, Expectation maximization clustering, Agglomerative Clustering Dendrograms, Agglomerative clustering in Scikit- learn, Connectivity Constraints. Introduction to Recommendation Systems Naïve User based systems, Content based Systems, Model free collaborative filtering-singular value decomposition, alternating least squares.	08

References:

Text Books:

- Giuseppe Bonaccorso, Machine Learning Algorithms, Packt Publishing Limited.
- Josh Patterson, Adam Gibson, Deep Learning: A Practitioners Approach, O REILLY, SPD.

Reference Books:

- Ethem Alpaydin, Introduction to Machine Learning, PHI.
- Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.





K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech	Semester: III
Course Code: MOE2022	Course Name: Creative Thinking: Techniques & Tools

L	T	P	Credits
03	--	--	03

Course Description:

In today's ever-growing and changing world, being able to think creatively and innovatively are essential skills. It can sometimes be challenging to step back and reflect in an environment which is fast paced or when students required to assimilate large amounts of information. Making sense of or communicating new ideas in an innovative and engaging way, approaching problems from fresh angles, and producing novel solutions are all traits which are highly sought after by employers. This course will equip with a 'tool-box', introducing to a selection of behaviors and techniques that will augment innate creativity. Some of the tools are suited to use on own and others work well for a group, enabling you to leverage the power of several minds. People can pick and choose which of these tools or techniques suit needs and interests, focusing on some or all of the selected approaches and in the order that fits best.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios.
2. Apply different brainstorming techniques in group activities.
3. Be proficient in the application of the 6 thinking hats tool in different life scenarios.
4. Develop a systematic approach to idea generation through the use of morphological analysis.
5. Innovate on an existing product, service or situation applying the SCAMPER method.
6. Get confident with the theory of inventive problem solving, called TRIZ.

Prerequisite: There are no prerequisites to this course.

Course Content		
Unit No	Description	Hrs.
01	Introduction to the Principles of Creativity Basic principles of creativity and highlight its importance in tackling global challenges. Creativity is explored and applied at two different levels, lower and higher-level creativity.	06
02	Creativity Tools	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Augment our creativity using different methods of Brainstorming, a creativity approach that aids the generation of ideas in solving a stated problem. Particularly focus on the application of brainstorming tools in group activities, with the aim of enabling to understand, evaluate and apply different types of brainstorming techniques in own context.	
03	Six Thinking Hats Principles as well as application of the 6 Hats thinking tool both at an individual level and in a group, under various professional and personal situations, allowing students to develop competency and accelerate proficiency on the use of technique.	06
04	Clarifying the Problem Organizing a process, turning problems into opportunities, facts, feelings & hunches, problem as question.	06
05	Generating Ideas Brainstorming, scamper, forced connections, portable think tank, case studies on generating ideas.	06
06	Developing Ideas and Planning for Action Organizing ideas, ideas to solutions, implementing solutions, case studies of development of ideas and plan of action.	06

References -

Text Books:

- Michael Michalko, Thinkertoys: A Handbook of Creative-Thinking Techniques, second edition, Ten Speed Press.
- Michael Michalko, Cracking Creativity: The Secrets of Creative Genius, revised edition, Ten Speed Press.
- Edward de Bono, Penguin, Lateral Thinking: A Textbook of Creativity.
- Edward de Bono, Penguin, Six Thinking Hats.

Reference Books:

- New World Library, Creative Thinkering: Putting Your Imagination to Work.
- Chris Griffiths, Kogan Page, The Creative Thinking Handbook: Your Step by Step Guide to Problem Solving in Business.



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech.	Semester: III
Course Code: MOE2032	Course Name: MOOC Course

L	T	P	Credits
03	--	--	03

Course Description:

Student can opt for online certification course and produce certificate.

- The students who are doing course on MOOC/NPTEL Course /Courses suggested by DPGC should select the course in consultation with supervisor and submit the details to Head of Program.
- The course should be minimum 25 hours duration and should have certification facility.
- Student should complete course and get certificate. The certificate copy should be submitted to head of program with supervisor signature.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Identify the real applications and practices of courses studied, at industry level
2. Recognize various modelling, analysis and validation techniques adopted at industries.
3. Demonstrate the issues at design, manufacturing and assembly levels.
4. Summarize and present technical data in report format.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech	Semester: III	L	T	P	Credits
Course Code: MOE2041	Course Name: Energy Audit and Management	03	--	--	03

Course Description:

This course provides basic understanding of energy audit and management. Essential theoretical and practical knowledge about the concept of energy conservation, energy management, and different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit and measuring instruments in commercial and industrial sector will be achieved through this course.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Identify the important of Energy Scenario.
2. Use energy audit knowledge to carry out energy audit of a given firm.
3. Examine different rolls in energy action planning
4. Apply project finance and management skills to carry out energy audit
5. Plan for energy monitoring and targeting.

Prerequisite: Electric Machines, Thermal Systems and Finance system

Course Content		
Unit No	Description	Hrs.
01	Energy Scenario Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy and Environment, Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.	06
02	Energy Management and Audit Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments	06
03	Energy Action Planning	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Key elements, Force field analysis, Energy policy purpose, perspective, Contents, Formulation, Ratification, Organizing –location of energy management, Top management support, Managerial function, Roles and responsibilities of energy manager, Accountability. Motivating-motivation of employees: Information system-designing barriers, Strategies; Marketing and communicating-training and planning.	
04	Financial Management Investment-need, Appraisal and criteria, Financial analysis techniques-Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis; Financing options, Energy performance contracts and role of ESCOs	06
05	Project Management Definition and scope of project, Technical design, Financing, Contracting, Implementation and performance monitoring. Implementation plan for top management, Planning Budget, Procurement Procedures, Construction, Measurement & Verification	06
06	Energy Monitoring and Targeting Defining monitoring & targeting, Elements of monitoring & targeting, Data and information-analysis, Techniques -energy consumption, Production, Cumulative sum of differences (CUSUM).	06

References:

Text Books:

- Amit Kumar Tyagi, Handbook on Energy Audits and Management, TERI Publication
- Wayne C. Turner, Energy Management Handbook, Wiley Inter Science Publication

Reference Books:

- P. O'Callaghan, Energy Management, McGraw - Hill Book Company
- Bureau of Energy Efficiency Study material for Energy Managers and Auditors Examination: Paper I





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech.	Semester: III
Course Code: MOE2062	Course Name: Augmented Reality and Virtual Reality

L	T	P	Credits
03	--	--	03

Course Description:

This course presents an introduction to virtual and augmented reality technologies, with an emphasis on designing and developing interactive virtual and augmented reality experiences. The course will cover the history of the area, fundamental theory, and interaction techniques. Students are provided with hands-on experience developing applications for modern virtual and augmented reality systems. In the course, students will also explore libraries and tools for creating AR/VR experiences such as Vuforia and UNITY.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Define the basic concepts of Virtual and Augmented Reality
2. Identify the differences in AR/VR concepts and technologies
3. Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
4. Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
5. Design and prototype effective AR/VR applications using UNITY platform for various application.

Prerequisites: Programming and Data Structures

Course Content		
Unit No	Description	Hrs.
01	Introduction to Augmented Reality Definition and Scope, Brief History of Augmented Reality, Displays (Multimodal Displays, Spatial Display Model, and Visual Displays), Strong vs Weak, AR Applications AR Challenges in AR.	06
02	Introduction to Virtual Reality Definition and Scope, Types of VR Characteristics, Basic VR environments, Limitations of VR environments, Immersion Vs Presence.	06
03	Interaction Design for AR/VR Environments Interaction design process Identifying user needs, AR/VR design considerations Typical AR/VR Interface Metaphors, User experience (UX) guidelines for AR/VR, UX challenges for AR/VR, Prototyping for AR/VR, Evaluation of the developed AR/VR prototype.	06



04	Introduction to UNITY Unity Overview: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects, Asset Store, Importing Plug-ins, Creating a Terrain, Materials, Colors, Transparency, Introduction to Mono behaviours: Awake, Start, Update.	06
05	Introduction to Vuforia and Physics in UNITY Vuforia Overview: Interface, Navigation, Terminology, Image Targeting, Custom Images, Overview of Physics in Unity, Introduction to Scripting: Terminology, Creating Objects, Accessing Components, Debugging, Lists, Loops.	06
06	Expanding on Scripting and Interaction Creating Trigger Events, Manipulating Components in Scripts, Programming Interactions between Objects and Tracked Images in AR, designing a simple User Interface in AR, Introduction to colliders and their use: On Collision Enter, On Collision Exit. On Collision Stay, On Trigger vs On Collision, Rigid bodies and how Colliders report to them.	06

References:

Text Books:

- Vince, Virtual Reality Systems, Pearson Education.
- Grigore Burdea, Philippe Coiffet, Virtual Reality Technology, Wiley.
- Schmalstieg, D., & Hollerer, T. Augmented reality: principles and practice. Addison-Wesley Professional.

Reference Books:

- Azuma, R.T. A survey of augmented reality. Presence: Teleoperators & Virtual Environments.
- Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., & MacIntyre, B. Recent advances in augmented reality. IEEE computer graphics and applications.
- Bhagat, K. K., Liou, W.-K., & Chang, C.-Y. A cost-effective interactive 3D virtual reality system applied to military live firing training. Virtual Reality.
- Carmigniani, J., Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., & Ivkovic, M. Augmented reality technologies, systems and applications. Multimedia tools and applications.
- Raisamo, R., Rakkolainen, I., Majaranta, P., Salminen, K., Rantala, J., & Farooq, A. Human augmentation: Past, present and future. International journal of human-computer studies.
- Schuemie, M. J., Van Der Straaten, P., Krijn, M., & Van Der Mast, C. A. Research on presence in virtual reality: A survey. Cyber Psychology & Behavior.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech	Semester: III
Course Code: MOE2072	Course Name: Industrial Instrumentation

L	T	P	Credits
03	--	--	03

Course Description:

This course is an overview of the principles, concepts, and applications of process transmitters found in an industrial plant. Continuous measurement and control of all the parameters will be emphasized. Also practical installation and calibration procedures of various types of sensors and transducers will be covered. Open and closed loop control systems will also be discussed, including such concepts as on/off control, set point, overshoot, undershoot, gain, feedback, PID loops, and reverse/direct acting systems.

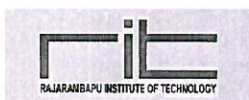
Course Outcomes:

After successful completion of the course, students will be able to,

- 1.Elaborate working principal of different transducers.
- 2.Select suitable transducer/sensor for specific application.
- 3.Justify the use of specific measurement technique for specific task.
- 4.Evaluate the Calibration and Interfacing of the transducers.

Prerequisite: Sensor And Measurement

Course Content		
Unit No	Description	Hrs.
01	Metrology Measurement of length – Gauge blocks – Plainness – Area using Simpson's rule, Plain meter – Diameter – Roughness – Angle using Bevel protractor, sine bars and Clinometer – Mechanical, Electrical, Optical and Pneumatic Comparators. Optical Methods for length and distance measurements using Optical flats and Michelson Interferometer.	06
02	Velocity and Acceleration Measurement Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers – Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers-different types, Gyroscopes-applications.	06
03	Force and Pressure Measurement Force measurement – Different methods –Gyroscopic Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement –	06



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Manometer types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement – McLeod Gauge, Knudsen Gauge, Momentum Transfer Gauge, Thermal Conductivity Gauge, Ionization Gauge, Dual Gauge Techniques, Deadweight Gauges, Hydrostatic Pressure Measurement.	
04	Flow Measurement and Level Measurement Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, mass flow meter, ultrasonic type, vortex shedding type, Hotwire anemometer type, Laser Doppler Velocity-meter. Basic Level measurements – Direct, Indirect, Pressure, Buoyancy, Weight, Capacitive Probe methods.	06
05	Density, Viscosity and Other Measurements Density measurements – Strain Gauge load cell method – Buoyancy method – Air pressure balance method – Gamma ray method – Vibrating probe method. Units of Viscosity, specific gravity scales used in Petroleum Industries, Different Methods of measuring consistency and Viscosity –Two float viscorator –Industrial consistency meter. Sound-Level Meters, Microphones, Humidity Measurement.	06
06	Calibration and Interfacing Calibration using Master Sensors, Interfacing of Force, Pressure, Velocity, Acceleration, Flow, Density and Viscosity Sensors, Variable Frequency Drive. Open and closed loop control system with on/off control, setpoint, overshoot, undershoot, gain, feedback, PID loops, and reverse/direct acting systems.	06

References:

Text Books:

- Doebelin E.O., Measurement Systems – Applications and Design, McGraw Hill International.
- Patranabis D, Principles of Industrial Instrumentation, Tata McGraw Hill.

Reference Books:

- Considine D. M., Process Instruments and Control Handbook, McGraw Hill International.
- Jain R.K., Mechanical and Industrial Measurements, Khanna Publications.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech.	Semester: III
Course Code: MOE2082	Course Name: Advanced Mechatronics Systems

L	T	P	Credits
03	--	--	03

Course Description:

The course will be helpful to provide overview of mechanical and electronic systems used in industrial atmosphere. This will be helpful for upcoming automation in industry. Mechatronics is a multidisciplinary field of science that includes a combination of Mechanical Engineering, Electronics, Computer Engineering, Telecommunications Engineering and Control Engineering. Mechatronics is a multi-disciplinary study dealing with the integration of mechanical devices, actuators, sensors, electronics, intelligent controllers and computers. Mechatronics generally involves

- (i) implementing electronics control in a mechanical system
- (ii) enhancing existing mechanical design with intelligent control and
- (iii) replacing mechanical component with an electronic solution.

This course will cover all aspects related with mechatronics such as sensors and transducers, actuators and mechanisms, signal conditioning, microprocessors and microcontrollers, modeling & system response and design of mechatronics systems.

Course Outcomes:

After successful completion of the course, students will be able to,

- 1. Explain Mechatronics System.
- 2. Analyze the Mechatronics Based System.
- 3. Model, simulate, and verify the mechatronics systems.
- 4. Identify Electrical, Hydraulic and Pneumatic Components.

Prerequisite: Basic knowledge of research related activities.

Course Content

Unit No.	Description	Hrs.
01	Introduction What is Mechatronics, Integrated Design Issues in mechatronics, Mechatronics Design Process, Mechatronics Key elements, applications in mechatronics.	06
02	Modelling and Analysis of Mechatronics Systems Block Diagram Modelling, Analogy approach, Impedance Diagrams, Electrical Systems, Mechanical systems and electromechanical systems.	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

	Mass-Spring-Oscillation and Damping system, Dynamic response of systems, Transfer function and frequency response. Labview, MATLAB, Scilab.	
03	Sensors and Actuators Performance terminology of sensors, Displacement, Position & Proximity Sensors, Displacement, Position sensors, Force, Fluid pressure, Liquid flow sensors, temperature, light sensor, Acceleration and Vibration measurement, Electrical and Mechanical Actuation Systems.	06
04	Signal Conditioning Introduction to signal processing, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Signal processing devices, relays, contactors and timers. Microcontrollers, PID controllers and PLCs.	06
05	Hydraulic System and Pneumatic System Flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps, Pneumatic system components and graphic representations, Advantages and limitations of pneumatic systems.	06
06	Case Study List of various mechatronics systems, Case study of pick and place mechanism of robotic arm using pneumatic power, Hydraulic circuit for CNC Lathe machine, 3D Printer, Auto-control system for Green House Temperature and Auto-focusing in Digital Cameras.	06

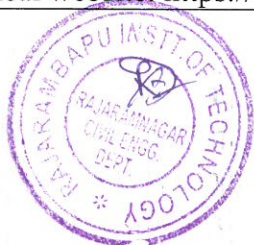
References:

Text Books:

- Bradley, D. Dawson, N. C. Burd and A.J. Loader, Mechatronics: Electronics in product and process, Chapman and Hall, London.
- Devadas Shetty, Richard A. Kolkm, Mechatronics system design, PWS publishing company.
- David G. Alciatore, Michael B. Histan, Introduction to mechatronics and measurement systems Mc Graw Hill Education.

References Books:

- Intelligent Mechatronic Systems: Modeling, Control and Diagnosis, R. Merzouki, A. K. Samantaray, P. M. Pathak, B. Ould Bouamama, Springer, London.
- Technical website: https://onlinecourses.nptel.ac.in/noc21_me27/course





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Open Elective

Class: S. Y. M. Tech	Semester: III
Course Code: MOE2091	Course Name: Disaster Management

L	T	P	Credits
03	--	--	03

Course Description:

This course provides a holistic understanding of disaster management, covering both natural and manmade disasters. Students will delve into the meaning, nature, and various types of disasters, exploring their effects on individuals, communities, and the environment. The course encompasses a global perspective while focusing on the disaster profile of India, considering regional and seasonal variations

Course Outcomes:

After successful completion of the course, students will be able to,

1. Outline disaster and disaster management cycle.
2. Summarize disaster preparedness and response activities for various types of disaster.
3. Apply various advanced techniques for disaster management.
4. Examine role of various agencies in disaster management.
5. Dissect the disaster management scenario in India.

Prerequisite: Environmental Science

Course Content		
Unit No.	Description	Hrs.
01	Natural Disaster Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic, eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.	06
02	Manmade Disasters Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents. Disasters -A Global View, Disaster Profile of India- Regional, and Seasonal.	06
03	Disaster Management Cycle Introduction to Disaster Management Cycle: Mitigation, Preparedness, Response and Recovery. Disaster Mitigation, Hazard identification and vulnerability analysis, Mitigation strategies or measures	06



M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

04	Disaster Preparedness, Response and Recovery Introduction to Disaster Preparedness, Disaster Risk Reduction (DRR), The Emergency Operation Plan (EOP). Introduction to Disaster Response, Aims of disaster response, Disaster Response Activities, Modern and traditional responses to disasters, Modern methods of disaster response, Disaster Recovery, The Recovery Plan, Disasters as opportunities for development initiatives.	06
05	Role of Technology in Disaster Management Geographic Information System (GIS) and Disaster Management. GIS applications. Global Positioning System (GPS) and Disaster Management, Applications of GPS to Disaster management. Remote Sensing and its significance in Disaster Management.	06
06	Role of Multiple Stakeholders In Disaster Management Role of NGO's, Community based organizations, media, Central, State, District and Local Administration, armed forces, Police and other organizations.	06

References:

Codes of Practice:

- National Disaster Management Authority (NDMA). National Disaster Management Plan 2019.
- National Disaster Management Authority (NDMA). National Disaster Management Act 2005.

Text Books:

- Coppola, D. P., Introduction to International Disaster Management, Elsevier USA.
- Singh R. B., Disaster Management, Rawat Publication.

Reference Books:

- Reiter L., Earthquake Hazard Analysis: Issues and Insight, Colombia University Press.
- Mileti D. S. Disaster by Design: A Reassessment of National Hazards in United States, The National Academic Press.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: S.Y. M. Tech.	Semester: III	L	T	P	Credits
Course Code : CCM2016	Course Name: Industry Internship	-	-	2	1

Course Description:

The course has been introduced so as to give exposure of industry culture and various tasks and departments in the industry. Students will be inducted through the training program and will be able to relate theory and its applications in the industry.

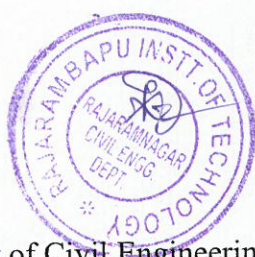
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Relate theory to practice.
2. Compile technical data of the project.
3. Prepare daily work reports of ongoing activities.
4. Prepare and present internship report.

In the industry training work, the student is expected to undergo training in industry, related to subject specialization for duration of 21 days (minimum) for at least 6 hrs. Per day. Student should write a report on the industry training and submit to department for ISE evaluation at the beginning of third semester. Student should include the certificate from company regarding satisfactory completion of the industry training.

90





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: S.Y. M. Tech.	Semester: III
Course Code : CCM2036	Course Name: Dissertation Phase-I

L	T	P	Credits
-	-	12	06

Course Description:

Synopsis approval presentation:

Under the guidance of faculty called as 'Supervisor', PG student from second year is required to do innovative and research oriented work related to various theory and laboratory courses he/she studied during previous semesters. Dissertation work should not be limited to analytical formulation, experimentation or software based project. Student can undertake an interdisciplinary type project with the prior permission of DPGC from both departments.

Synopsis:

Student need to carry out exhaustive literature survey with consultation of his/her supervisor for not less than 25 reputed national international journal and conference papers. Student should make the Synopsis Submission Presentation (SSP) with literature survey report to DPGC and justify about the innovativeness, applicability, relevance and significance of the work. At the time of presentation, student shall also prepare Synopsis of the work and submit to department for approval. Student shall submit synopsis of dissertation as per the prescribed format in 02 copies to department.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Select research problem through literature survey.
2. Develop research design for research problem.
3. Prepare and present synopsis report.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: S.Y. M. Tech.	Semester: III	L	T	P	Credits
Course Code : CCM2056	Course Name: Dissertation Phase-II	-	-	20	10

Course Description:

Phase II evaluation is based on End Semester Examination (ESE) which is based on the work during the semester. It is expected that student shall present preliminary results from his/her work during the semester with report as per prescribed format. DPGC including 1 external examiner as expert will approve the report and progress of student.

ISE will be evaluated by DPGC and ESE will be evaluated by DPGC and one external expert. Student will submit a report (soft bound before 1 week of date of presentation) as per prescribed format and present to DPGC for ISE and ESE. If student is not showing satisfactory performance, then he/she will be given grace period of two weeks. After two weeks' student will be again evaluated with grade penalty.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Perform data/experimental data collection for the project.
2. Analyze collected data using appropriate tools/techniques/ software.
3. Perform experimental/software analysis for validation of research work.
4. Prepare and present report.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: S.Y. M. Tech.	Semester: IV
Course Code : CCM2026	Course Name: Dissertation Phase-III

L	T	P	Credits
-	-	16	08

Course Description:

Student is required to give a presentation on the progress of his/her dissertation work in front of supervisor and DGPC. It is expected that up to this stage almost 90% of dissertation work is almost completed. Student will make the presentation and seek the suggestions from the supervisor and DPGC. Supervisor and DPGC will ensure that work carried out by the student till this stage is satisfactory and in compliance with synopsis of the dissertation submitted by student. This is In Semester Evaluation (ISE).

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Analyze collected data using appropriate tools/techniques/ software's.
2. Prepare and present/publish technical paper.
3. Prepare and present report.





M. Tech. Construction Management Syllabus
To be implemented for 2025-27 & 2026-28 Batch (NEP 2020)

Class: S.Y. M. Tech.	Semester: IV
Course Code : CCM2046	Course Name: Dissertation Phase IV

L	T	P	Credits
-	-	24	12

Course Description:

In Dissertation Phase-IV, it is expected that student should complete

1. 100% implementation of the proposed system.
2. Simulation/ experimentation work on the proposed system.
3. Performance evaluation of the proposed system.
4. Comparison of the proposed system with existing systems.
5. Writing of the conclusion.
6. Preparation of a draft-copy of the dissertation report with plagiarism report.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Compile the work done in appropriate sequence.
2. Derive conclusion of the work done of the project.
3. Analyze proposed system.
4. Perform plagiarism analysis of compiled report.
5. Prepare and present the final dissertation report in desired format.



