

Rayat Shikshan Sanstha's
**Karmaveer Bhaurao Patil,
College of Engineering, Satara.**

An Autonomous Institute & Affiliated to DBATU Lonere

Accredited by NAAC with "B++" Grade



**Two Years Master of Technology
in
Civil (Construction Engineering &
Management)
Structure & Curriculum**

(w.e.f. A.Y. 2026-27)

As Per NEP 2020

NCrF Level 7.0

**Recommended in BOS (Civil) Meeting Dated: 16th June 2026
&**

Approved in Academic Council Meeting Dated: 20th July 2026

**Mr. A. A. Mahadar
BOS Chairman (Civil)**

**Dr. S. J. Modi
Member Secretary
Academic Council**

**Dr. A. C. Attar
Principal**

Rayat Shikshan Sanstha's

**KARMAVEER BHAURAO PATIL
COLLEGE OF ENGINEERING, SATARA**

Accredited by NAAC with B++ Grade

(An Autonomous Institute and Affiliated to DBATU, Lonere)



DEPARTMENT OF CIVIL ENGINEERING

STRUCTURE AND CURRICULUM

For

Master of Technology

In

CONSTRUCTION ENGINEERING & MANAGEMENT

(w.e.f. Academic Year 2026 - 2027)





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M.Tech. in Construction Engineering & Management
Curriculum Structure & Evaluation Scheme
(With Effect From 2026-27)

Programme Educational Objectives (PEOs)

PEO1: Apply advanced knowledge of construction engineering, project management, and emerging technologies to plan, execute, and manage complex infrastructure projects effectively and sustainably.

PEO2: Demonstrate professional leadership, teamwork, ethical values, and entrepreneurial abilities while addressing industrial and societal challenges.

PEO3: Engage in research, innovation, and lifelong learning for continuous professional growth and development of sustainable construction practices.

Program Outcomes (POs)

The post-graduate students will demonstrate:

PO1: Analyze, evaluate, and develop innovative solutions for complex construction engineering and management problems using advanced engineering principles and modern tools.

PO2: Conduct research and apply sustainable, ethical, economic, and environmentally responsible practices in the planning and execution of construction projects.

PO3: Demonstrate effective leadership, communication, teamwork, entrepreneurship, and independent learning capabilities in multidisciplinary and global professional environments.

Correlation between the PEOs and the POs			
	P01	P02	P03
PEO1	3	2	1
PEO2	1	2	3
PEO3	2	3	3

Correlation Levels

- 3 – High Correlation
- 2 – Moderate Correlation
- 1 – Low Correlation





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Program Specific Outcomes (PSOs)

PSO1

Apply advanced project planning, scheduling, cost control, resource optimization, and risk management techniques for successful delivery of construction projects.

PSO2

Utilize Building Information Modelling (BIM), digital construction technologies, Lean Construction principles, and data-driven tools for improving project performance.

PSO3

Develop sustainable, safe, and innovative infrastructure solutions through research, consultancy, and industry-oriented practices.

Correlation between the PEOs and the PSOs			
	PSO1	PSO2	PSO3
PEO1	3	3	2
PEO2	2	2	3
PEO3	1	3	3

Correlation Levels

- 3 – High Correlation
- 2 – Moderate Correlation
- 1 – Low Correlation





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Programme Details

Particular	Details
Programme Name	MTech. in Construction Engineering and Management
Duration	2 Years
Number of Semesters	4
NCrF Level	Level 7
Total Credits	80 Credits
Curriculum Pattern	CBCS + OBE + NEP Framework
Mode	Full-Time
Structure	Theory + Practical + Seminar + Dissertation

Curriculum Framework

List of Abbreviations

Sr. No.	Abbreviation	Type of Course
1	PCC	Programme Core Course
2	PEC	Programme Elective Course
3	RM	Research Methodology
4	RS	Research Seminar
5	DP	Dissertation Phase
6	AEC	Ability Enhancement Course





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M.Tech. (Construction Engineering and Management)

(For Autonomous Engineering Institutes as per NEP 2020, UGC CCFPG, AICTE Model Curriculum and CBCS Framework)

The Curriculum and Credit Framework for the Postgraduate Programme shall consist of a two-year (four-semester) M.Tech. Programme with a total credit requirement of 80 credits.

Credit Distribution for M.Tech. Programme

Sr. No.	Curriculum Component	Category	Percentage	Credits
1	Programme Core Courses (PCC – Theory + Laboratory)	Course Work (60%)	40.00%	32
2	Programme Elective Courses (PEC)		17.50%	14
3	Research Methodology (RM)		2.50%	02
4	Dissertation Phase-I (DP)-I	Research (40%)	37.50%	30
5	Dissertation Phase-II (DP)-II			
6	Research Seminar (RS)		2.50%	02
Total Credits			100%	80

Semester-Wise Credit Structure

Semester	Components	Credits
Semester I	Core Courses + Labs	20
Semester II	Core Courses + Labs + Programme Electives	20
Semester III	Programme Elective + Dissertation Phase-I + Seminar	20
Semester IV	Dissertation Phase-II	20
	Total	80 Credits





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Credit Norms (as per UGC/AICTE Practices)

Activity	Credit Norm
1 Hour Theory / Week	1 Credit
2 Hours Laboratory / Week	1 Credit
1 Hour Tutorial / Week	1 Credit

UGC's revised PG curriculum framework under NEP 2020 recommends flexible and research- oriented postgraduate programmes and an approximate **80-credit structure for a 2-year PG degree.**

Evaluation Scheme

For Theory Courses

Component	Weightage
Continuous Assessment	10%
Mid Semester Examination	30%
End Semester Examination	60%

For Laboratory Courses

Component	Weightage
Continuous Assessment	60%
End Semester Examination	40%

Other Courses

Component	Weightage
Seminar / Presentation / Viva Voce	As per course structure
Dissertation Evaluation	Internal + External Assessment





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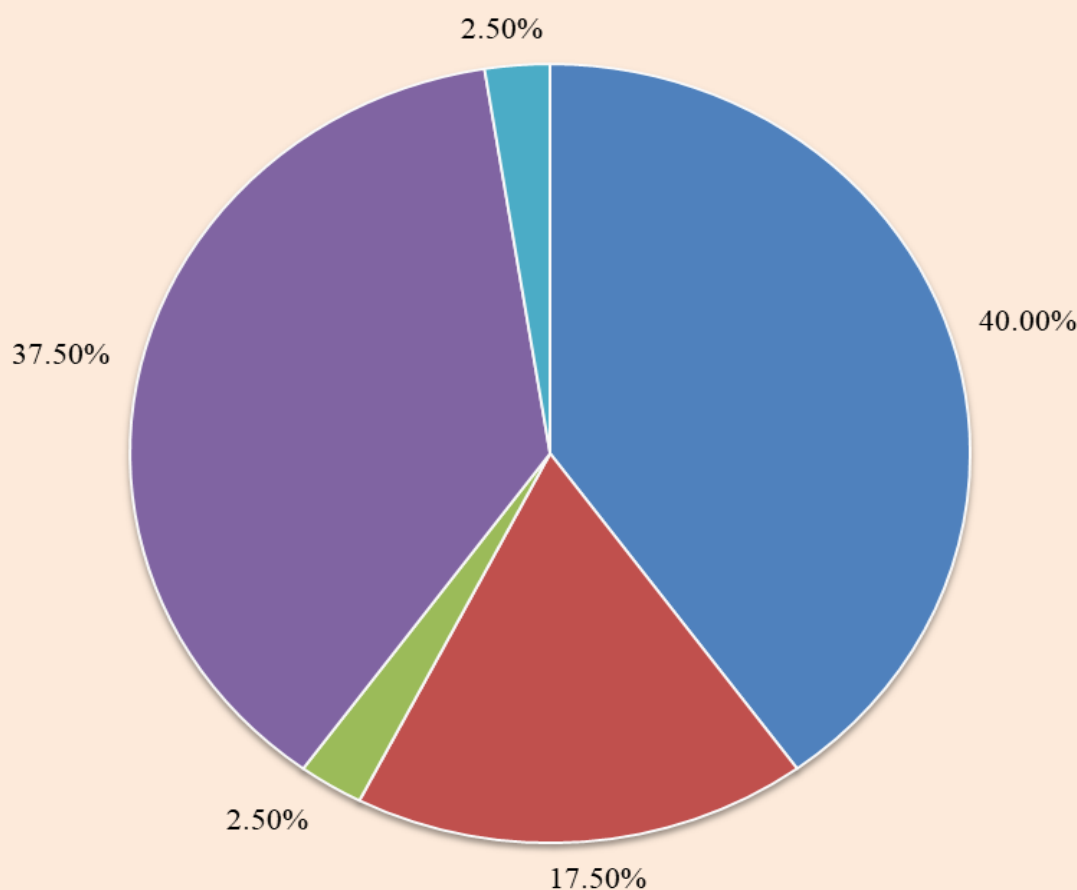
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M.Tech. in Construction Engineering & Management

Curriculum Structure & Evaluation Scheme

(With Effect From 2026-27)

Credit Distribution Chart



- Programme Core Courses (PCC – Theory + Laboratory)
- Programme Elective Courses (PEC)
- Research Methodology(RM)
- Dissertation Phase-I & II
- Research Seminar(RS)





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Semester-wise Basket Themes for Emerging Technology Specialization

Bucket	Courses	Suggested Theme Name
Bucket I	Construction Planning, Scheduling and Project Control	1. Advanced Construction Planning and Scheduling 2. Project Scheduling and Control 3. Construction Planning Software (Primavera) 4. Construction Planning Software (MS Project) 5. Operations Research 6. Optimization Methods for Civil Engineering 7. Engineering Econometrics
Bucket II	Construction Resources, Equipment and Technology	1. Construction Equipment and Machinery 2. Construction Materials and Material Management 3. Building Information Modelling (BIM) 4. Construction Management Information Systems 5. Pavement Construction Technology 6. Advanced Construction Technology 7. Building Materials and Composites
Bucket III	Project Management, Contracts and Professional Practice	1. Project Formulation and EPC Contract Management 2. Professional Practices in Construction 3. International Construction Contract Management 4. Project Cost Engineering and Finance 5. Risk Management 6. Project Management for Managers 7. Principles of Management
Bucket IV	Sustainable Construction, Quality and Research	1. Construction Quality and Safety Management 2. Sustainable Building Construction 3. Lean Construction 4. Research Methodology 5. Integrated Waste Management for a Smart City 6. Life Cycle Assessment (LCA) 7. Environmental Impact Assessment (EIA)





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Semester-I

Sr No	Course Category	Course Code	Name of Course	Weekly Teaching Scheme (Weekly Hour)				Cr	Evaluation Scheme (Weightage in Marks)			
				L	T	P	S		ISE	MSE	ESE/POE	Total
1	Programme Core Course (PCC)	26202PCC101	Construction Equipment and Machinery	3	-	-	1	3	10	30	60	100
2		26202PCC102	Advanced Construction Planning and Scheduling	3	-	-	1	3	10	30	60	100
3		26202PCC103	Construction Materials and Material Management	3	-	-	1	3	10	30	60	100
4		26202PCC104	Professional Practices in Construction	3	-	-	1	3	10	30	60	100
5		26202PCC105	Project Scheduling and Control	3	-	-	1	3	10	30	60	100
6		26202PCCL106	Construction Planning Software Laboratory (MSP)	-	-	4	-	2	60	-	40	100
7	Research Methodology (RM)	26202RM101	Research Methodology	3	-	-	1	3	10	30	60	100
Total				18	-	4	6	20	120	180	400	700

Legends: L-Lecture, T-Tutorial, P-Practical, Cr-Credits S-Self Study

- Total Contact Hours/Week: 22

- Cumulative Credits:20

- ISE: In Semester Evaluation

-ESE: End Semester Examination





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Semester-II

Sr No	Course Category	Course Code	Name of Course	Weekly Teaching Scheme				Cr	Evaluation Scheme			
				L	T	P	S		ISE	MSE	ESE	Total
1	Programme Core Course (PCC)	26202PCC201	Construction Quality and Safety Management	4	-	-	1	4	10	30	60	100
2		26202PCC202	Project Formulation and EPC Contract Management	3	-	-	1	3	10	30	60	100
3		26202PCC203	Operations Research	3	-	-	1	3	10	30	60	100
4		26202PCCL204	Building Information Management (Lab)	-	-	4	-	2	60	-	40	100
5		26202PCCL205	Construction Planning Software Laboratory (Primavera)	-	-	4	-	2	60	-	40	100
6	Programme Elective Course (PEC)	26202PEC201	Program Elective Course – I	3	-	-	1	3	10	30	60	100
7		26202PEC202	Program Elective Course – II	3			1	3	10	30	60	100
	Total			16	-	8	5	20	170	150	380	700

Legends: L-Lecture, T-Tutorial, P-Practical, Cr-Credits S-Self Study

- Total Contact Hours/Week: 24
- Cumulative Credits: 20+20=40
- ISE: In Semester Evaluation
- ESE: End Semester Examination



Programme Electives Bucket

Programme Elective Bucket-I			Programme Elective Bucket-II		
Sr. No	Course Code	Course Title	Sr. No	Course Code	Course Name
1	26202PEC201A	Sustainable Building Construction	1	26202PEC202A	International Construction Contract Management
2	26202PEC201B	Lean Construction	2	26202PEC202B	Risk Management
3	26202PEC201C	Construction Management Information Systems	3	26202PEC202C	Project Cost Engineering and Finance



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Semester-III

Sr No	Course Category	Course Code	Course Name	Teaching Scheme (Weekly Hour)				Cr	Evaluation Scheme (Weightage in Marks)			
				L	T	P	S		ISE	MSE	ESE /POE	Total
1	Programme Elective Course (PEC)**	26202PEC301	Massive Open Online Course-I	4	-	-	-	4	-	-	100	100
2		26202PEC302	Massive Open Online Course-II	4	-	-	-	4	-	-	100	100
3	Research	26202RS303	Research Seminar	-	-	4	-	2	60	-	40	100
4		26202DP304	Dissertation Phase-I	-	-	20	-	10	60	-	40	100
			Total	8	-	24	-	20	120	-	180	300

**** Note: 100% ESE of 3 hours or credit transfer**

Legends: L-Lecture, T-Tutorial, P-Practical, Cr-Credits S-Self Study

- | | |
|---|--|
| - Total Contact Hours/Week: 24+8 | - Cumulative Credits:40+20=60 |
| - ISE: In Semester Evaluation | - ESE: End Semester Examination |

Massive Open Online Course -I & II

Massive Open Online Course-I			NPTEL Course
Sr. No	Course Code	Course Title	
1	26202PEC301A	Project Management for Managers	https://nptel.ac.in/courses/110107081
2	26202PEC301B	Optimization Methods for Civil Engineering	https://nptel.ac.in/courses/105103210
3	26202PEC301C	Pavement Construction Technology	https://nptel.ac.in/courses/105103685

Massive Open Online Course-II			NPTEL Course
Sr. No	Course Code	Course Title	
1	26202PEC302A	Integrated Waste Management for a Smart City	https://nptel.ac.in/courses/105105160
2	26202PEC302B	Engineering Econometrics	https://nptel.ac.in/courses/110105093
3	26202PEC302C	Principles of Management	https://nptel.ac.in/courses/110105146





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****Note for Programme Elective Course**

The Programme Elective Course offered in Semester-III of the M.Tech. programme shall be mandatorily completed through the NPTEL platform. Every student shall enroll in and successfully complete an approved NPTEL course from the respective Programme Elective basket.

1. **Enrollment in an approved NPTEL course is mandatory for all students.** The selected course shall be from the respective **Programme Elective (PEC)** basket as notified by the Department.
2. Since **Massive Open Online Course-I & II** carries **04 credits**, the selected **NPTEL course must be of a minimum duration of 12 weeks only.**
3. **Submission and successful completion of all NPTEL assignments is mandatory** and shall be considered for the **Internal Semester Evaluation (ISE).**
4. **Students shall appear for the NPTEL proctored examination and submit the Course Completion Certificate/Grade Card** issued by NPTEL after successfully completing the course.
5. **Successful completion of the prescribed NPTEL course is mandatory** for fulfilling the Massive Online Courses (Program Electives) requirement and earning the associated academic credits.
6. **The Institute reserves the right to approve the list of eligible NPTEL courses** and issue detailed guidelines regarding **enrollment, assessment, and credit transfer** from time to time.





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Semester-IV

Sr No	Course Category	Course Code	Course Name	Teaching Scheme (Weekly Hour)				Cr	Evaluation Scheme (Weightage in Marks)			
				L	T	P	S		ISE	MSE	ESE /POE	Total
1	Research	26202DP401	Dissertation Phase-II ***	-	-	40	-	20	120		80	200
			Total	-	-	40		20	120		80	200

- | | |
|--|--|
| <ul style="list-style-type: none">- Total Contact Hours/Week: 40- ISE: In Semester Evaluation | <ul style="list-style-type: none">- CumulativeCredits:80- ESE: End Semester Examination |
|--|--|

*****Research Publication / Intellectual Property Requirement**

As a part of the **M.Tech. (Construction Engineering and Management)** programme, every student shall **mandatorily fulfill any one of Clauses 1 to 3**, based on the research work carried out under the guidance of the Research Guide.

Fulfill any one of the following:

- 1) Publish One research papers** in blind peer-reviewed journals approved by the Research Guide.
OR
- 2) Publish One research paper** in reputed conference proceedings or publications of **IEEE / Springer / CRC Press / Science Direct (Elsevier) / ASCE / ASME**.
OR
- 3) Publish and Grant one patent** based on the research work carried out during the programme.

Note: Award of the M.Tech. degree shall be subject to the successful fulfillment of any one of the mandatory publication requirements specified in **Clauses 1 to 3**.





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Curriculum Structure
of
First Year M.Tech. in Construction
Engineering and Management
SEM I





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCC101	Course Name: Construction Equipment and Machinery	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Evaluate equipment selection, fleet sizing, and equipment replacement strategies using economic and operational performance indicators.
C02	Analyze productivity, cycle-time characteristics, and optimization of earthmoving and excavation equipment for large-scale infrastructure projects.
C03	Assess the performance, stability, and operational efficiency of hauling and hoisting systems under varying site and loading conditions.
C04	Design and optimize concreting and asphalt production systems to improve productivity, quality, and sustainability in construction operations.
C05	Evaluate advanced piling, tunneling, and underground construction machinery for complex geotechnical and infrastructure projects.
C06	Develop data-driven maintenance, fleet management, and safety strategies using modern digital technologies such as IoT, telemetry, and predictive analytics.

Prerequisites: Construction Equipment and Methods

Unit No.	Description	Hrs.
1	Equipment Economics and Planning Equipment sizing, selection criteria, matching equipment to operations. Depreciation methods, ownership and operating costs (O&O costs), economic life of equipment, replacement analysis.	6
2	Earthmoving and Excavating Equipment Productivity and cycle time analysis of Bulldozers, Scrapers, Excavators, Backhoes, and Draglines. Soil compaction physics and compaction equipment selection.	6
3	Hauling and Hoisting Equipment Dump trucks and haulers: rolling resistance, grade resistance, rimpull, and drawbar pull. Hoisting equipment: Derrick cranes, Mobile cranes, Tower cranes (types, capacity charts, and stability analysis).	6
4	Concreting and Asphalt Plants Aggregate crushing plants, concrete batching plants, transit mixers, concrete pumps, and placers. Asphalt mixing plants, asphalt pavers, and bituminous road construction train.	7
5	Piling and Tunneling Machinery Piling rigs, diesel/hydraulic hammers, sheet piling vibrators. Tunnel Boring Machines (TBM): types, mechanics, muck disposal systems. Diaphragm wall equipment.	7





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6	Maintenance and Safety Management Logistics and preventative, predictive, and breakdown maintenance. Logbooks, telemetry, and IoT integration in fleet management. Safety codes for heavy machinery operations.	7
Text Book: 1. S. C. Sharma, Construction Equipment and Management, Khanna Publishers. 2. Peurifoy, Schexnayder, Schmitt, Shapira & Cohen, Construction Planning, Equipment and Methods, McGraw Hill. 3. Gransberg, Popescu & Ryan, Construction Equipment Management for Engineers, Estimators and Owners, CRC Press. Reference Books: 1. Schaufelberger & Migliaccio, Construction Equipment Management, Routledge. 2. Nunnally, Construction Methods and Management, Pearson. 3. Gahlot & Dhir, Construction Planning and Management, New Age International. 4. Chudley & Greeno, Construction Technology, Pearson. 5. Tomlinson & Woodward, Pile Design and Construction Practice, CRC Press. 6. Kuesel, King & Bickel, Tunnel Engineering Handbook, Springer. 7. Chitkara, Construction Project Management, Tata McGraw-Hill. 8. Hinze, Construction Planning and Scheduling, Pearson.		

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	PO1	PO2	PO3	PSO1	PSO2	PSO3
C01	3	2	1	3	1	1
C02	3	2	1	3	1	1
C03	3	1	2	3	1	1
C04	3	2	1	2	2	1
C05	3	2	1	2	2	3
C06	2	3	3	2	3	3





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCC102	Course Name: Advanced Construction Planning and Scheduling	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Develop and analyze advanced construction schedules using Precedence Diagramming Method (PDM), including logic relationships, lead-lag constraints, critical path identification, and float analysis.
C02	Apply Line of Balance (LOB) and Repetitive Scheduling Methods (RSM) to plan and control repetitive construction projects such as high-rise buildings, highways, and infrastructure works.
C03	Evaluate resource requirements and implement resource allocation, leveling, and smoothing techniques under constrained and unconstrained project environments.
C04	Perform schedule compression through time-cost trade-off analysis and network crashing techniques while managing multiple critical paths and project constraints.
C05	Assess project schedule uncertainty using PERT, probabilistic scheduling approaches, and Monte Carlo simulation for schedule risk analysis and decision-making.
C06	Develop, monitor, and control project schedules using industry-standard software tools such as Primavera P6 and MS Project, including WBS, EPS, activity coding, constraints, and baseline management.

Prerequisites: Construction Planning and Control

Unit No.	Description	Hrs.
1	Advanced Network Techniques Precedence Diagramming Method (PDM): logic relationships, lead/lag constraints, anomalies. Network calculations, critical path determination, and float analysis (total, free, interfering, independent float).	6
2	Linear and Repetitive Scheduling Line of Balance (LOB) technique: concepts, rate of production, graphical scheduling for high-rise buildings and highways. Repetitive Scheduling Method (RSM) and time-space diagrams.	6
3	Resource Allocation and Levelling Resource profiles, resource constraints (Limited/Unlimited). Heuristic approaches to resource leveling and smoothing. Mathematical programming formulations for resource allocation.	6
4	Schedule Compression and Crashing Time-cost trade-off analysis. Direct vs. indirect costs. Analytical and heuristic methods for network crashing. Multi-critical path management during compression.	7





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5	Uncertainty in Scheduling PERT networks: three-time estimates, probability of completion, slack analysis. Advanced Risk-based scheduling, Monte Carlo Simulation applications in schedule risk assessment.	7
6	Software Applications in Scheduling Hands-on scheduling logic using Primavera P6 and MS Project: Enterprise Project Structure (EPS), Work Breakdown Structure (WBS), activity codes, constraints, and baseline management.	7

Text Book:

1. Peurifoy, R.L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw-Hill Education.
2. Chitkara, K.K., Construction Project Management: Planning, Scheduling and Controlling, Tata McGraw-Hill.
3. Popescu, C.M. and Kasipong, C., Project Planning, Scheduling and Control in Construction, Wiley.
4. Newitt, J.S., Construction Scheduling: Principles and Practices, Pearson Education.
5. O'Brien, J.J. and Plotnick, F.L., Project Management with CPM, PERT and Precedence Diagramming, McGraw-Hill.
6. Halpin, D.W. and Senior, B.A., Fundamentals of Construction Management, Wiley India.

Reference Books:

1. Mubarak, S.A., Construction Project Scheduling and Control, Wiley.
2. Baldwin, A. and Bordoli, D., Scheduling Construction Projects: Principles and Practices, Routledge.
3. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling and Controlling, Wiley.
4. Harris, P.E., Planning and Control Using Primavera P6, Eastwood Harris Pty Ltd.
5. Harris, P.E., Project Planning and Control Using Microsoft Project, Eastwood Harris Pty Ltd.
6. Seetharaman, S., Construction Management and Design of Civil Engineering Projects, Umesh Publications.
7. Frederick E. Gould and Joyce, N.E., Construction Project Management, Pearson Education.
8. Siegel, N.G., Engineering Project Management, Wiley.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PSO1	PSO2	PSO3
C01	3	1	1	3	2	1
C02	3	2	1	3	2	1
C03	3	2	2	3	1	1
C04	3	2	1	3	1	1
C05	3	3	1	3	2	3
C06	3	1	2	2	3	1





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCC103	Course Name: Construction Materials and Material Management	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Evaluate the engineering properties and applications of advanced construction materials including high-performance concrete, smart materials, and advanced composites.
C02	Apply material management principles for effective procurement, vendor selection, and supply chain coordination in construction projects.
C03	Analyze and implement inventory control techniques for optimizing material availability and minimizing inventory costs.
C04	Plan and manage construction material logistics, transportation, storage, and handling systems for improved project efficiency.
C05	Assess material wastage, perform material reconciliation, and recommend strategies for waste reduction and traceability.
C06	Conduct material quality assurance procedures, interpret testing documentation, and utilize digital tools for material tracking and inventory management.

Prerequisites: Construction Materials and Building Technology

Unit No.	Description	Hrs.
1	Advanced Structural Materials High-performance concrete, Self-compacting concrete, Fiber-reinforced concrete. Smart materials: self-healing concrete, shape memory alloys. Advanced structural steels and polymers.	6
2	Integrated Material Management Framework Scope and objectives of material management in construction. Material procurement cycle: vendor evaluation, vendor rating, purchase purchase procedures, and global sourcing.	6
3	Inventory Control and Planning Material coding and classification systems. Inventory models: Economic Order Quantity (EOQ) with stock-outs and discounts. ABC analysis, VED analysis, FSN analysis.	6
4	Material Logistics and Supply Chain Logistics planning, multi-modal transport systems, supply chain integration in construction. On-site material handling, storage requirements, layout planning to minimize double handling..	7
5	Material Wastage and Mitigation Wastage analysis on site: allowance vs. actual waste. Reconciliation of key materials (cement, steel, aggregates). Traceability systems, RFID, and barcode integration in stores.	7
6	Field Testing, QA and Documentation Sampling plans and non-destructive testing (NDT) of incoming materials. Mill test certificates, material inspection report (MIR) workflows, and digital inventory tracking.	7





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Text Book:

1. S. K. Sharma, Construction Materials, Oxford University Press, New Delhi.
2. P. C. Varghese, Building Materials, PHI Learning Pvt. Ltd., New Delhi.
3. R. Chudley and R. Greeno, Building Construction Handbook, Routledge Publications.
4. J. R. Illingworth, Construction Methods and Planning, CRC Press/Taylor & Francis.
5. Gopalakrishnan P. and Sundaresan M., Materials Management: An Integrated Approach, Prentice Hall of India.
6. K. K. Ahuja, Construction Management and Planning, CBS Publishers & Distributors.

Reference Books:

1. M. L. Gambhir, Concrete Technology: Theory and Practice, McGraw Hill Education.
2. Neville A. M., Properties of Concrete, Pearson Education.
3. Mehta P. K. and Monteiro P. J. M., Concrete: Microstructure, Properties and Materials, McGraw Hill Education.
4. R. S. Means, Means Construction Cost Data and Materials Management, RSMeans Publications.
5. Donald Waters, Supply Chain Risk Management and Logistics, Kogan Page Publications.
6. Sunil Chopra and Peter Meindl, Supply Chain Management: Strategy, Planning and Operation, Pearson Education.
7. L. C. Jhamb, Materials Management, Everest Publishing House.
8. P. Gopalakrishnan and M. Sundaresan, Inventory Management: Principles and Practices, PHI Learning.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	1	2	3
C02	3	2	2	3	2	1
C03	3	2	1	3	2	1
C04	3	2	2	3	2	1
C05	2	3	1	2	1	3
C06	3	2	2	2	3	2





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCC104	Course Name: Professional Practices in Construction	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Analyze professional ethics, responsibilities, and codes of conduct applicable to construction professionals.
C02	Evaluate various construction procurement systems, contract administration procedures, and regulatory requirements.
C03	Apply legal principles, labor laws, and statutory provisions governing construction projects.
C04	Assess claims, disputes, and alternative dispute resolution (ADR) mechanisms in construction projects.
C05	Develop strategies for stakeholder management, professional communication, leadership, and organizational governance.
C06	Integrate sustainability, digital technologies, risk management, and corporate social responsibility into professional construction practice.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Professional Ethics and Governance Professional roles and responsibilities in construction, Engineering ethics, professional conduct, and accountability, Professional negligence and liability, Corporate governance and organizational ethics, Role of professional institutions and regulatory bodies.	6
2	Construction Laws and Regulatory Framework Legal aspects of construction projects, Construction contracts and statutory provisions, Labor laws, safety regulations, and environmental compliance, Building regulations, permits, and approvals, Professional indemnity and insurance.	6
3	Procurement and Contract Administration Construction procurement systems, Traditional, Design-Build, EPC, and PPP contracts, Tendering procedures and bid evaluation, Contract documentation and administration, Performance guarantees and contract monitoring..	6
4	Claims and Dispute Resolution Types and causes of construction claims, Delay, disruption, and cost claims, Extension of time and claim documentation, Negotiation, mediation, and arbitration, Litigation and dispute management practices.	7
5	Leadership and Stakeholder Management Leadership and team management in construction, Professional communication and reporting, Stakeholder identification and	7





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	engagement, Conflict management and negotiation skills, Organizational behavior and decision-making.	
6	Sustainable and Emerging Professional Practices Sustainable construction and ESG principles, Corporate social responsibility in construction, BIM and digital project management, Artificial intelligence and emerging technologies, Risk management and future professional competencies.	7

Text Book:

1. Richard H. Clough, Glenn A. Sears & S. K. Sears, Construction Contracting, Wiley.
2. Edward R. Fisk & Wayne D. Reynolds, Construction Project Administration, Pearson.
3. Donald S. Barrie & Boyd C. Paulson, Professional Construction Management, McGraw-Hill.
4. Daniel W. Halpin & Bolivar A. Senior, Construction Management, Wiley.
5. Chris Hendrickson, Project Management for Construction, Carnegie Mellon University.

Reference Books:

1. Julian Bailey, Construction Law, Informa Law.
2. Paul Levin, Construction Contract Claims, Changes and Dispute Resolution, ASCE Press.
3. Justin Sweet & Marc Schneier, Legal Aspects of Architecture, Engineering and the Construction Process, Cengage Learning.
4. FIDIC, FIDIC Contracts Guide, International Federation of Consulting Engineers.
5. Steve Rowlinson, Construction Safety Management Systems, Routledge.
6. Jerald L. Rounds & Robert O. Segner, Construction Supervision, Wiley.
7. Charles Patrick, Construction Project Planning and Scheduling, Pearson.
8. Robert L. Peurifoy et al., Construction Planning, Equipment and Methods, McGraw-Hill.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	1	3	3	1	1	3
C02	3	2	2	3	1	2
C03	2	3	1	2	1	3
C04	3	2	2	3	1	2
C05	1	2	3	2	1	3
C06	2	3	2	2	3	3





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCC105	Course Name: Project Scheduling and Control	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Design project performance baselines and progress measurement systems.
C02	Analyze project performance using Earned Value Management (EVM) techniques.
C03	Evaluate schedule and cost control systems for effective project monitoring.
C04	Assess construction delays using forensic delay analysis methods.
C05	Evaluate the impact of quality and productivity on project performance.
C06	Develop digital project monitoring and reporting solutions using PMIS and advanced technologies.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Baseline and Progress Measurement Establishing performance measurement baselines. Methods of measuring work progress: units completed, incremental milestones, weight start/finish, cost ratio.	6
2	Earned Value Management (EVM) EVM metrics: PV, EV, AC, CV, SV, CPI, SPI. Forecasting metrics: Estimate at Completion (EAC), Estimate to Complete (ETC), To-Complete Performance Index (TCPI).	6
3	Schedule and Cost Control Systems Variance analysis, trend analysis, S-curves for time and cost. Integrated project control systems. Change order management and its impact on control systems.	6
4	Forensic Delay Analysis Types of delays: excusable vs. non-excusable, compensable vs. non-compensable, concurrent delays. Delay analysis methodologies: As-Planned vs. As-Built, Impacted As-Planned, Time Impact Analysis (TIA).	7
5	Quality and Schedule Integration Impact of rework on schedule and cost performance. Quantifying productivity losses due to disruptions (manpower levels, weather, acceleration).	7
6	Digital Dashboarding and Reporting Project management information systems (PMIS), executive dashboards, KPI tracking, automated progress capture via drones and laser scanning integration.	7





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Text Book:

1. Fleming, Q. W. and Koppelman, J. M., Earned Value Project Management, 5th Edition, Project Management Institute (PMI), 2016.
2. Kerzner, H., Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 13th Edition, Wiley, 2022.
3. Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7th Edition, PMI, 2021.
4. Mubarak, S. A., Construction Project Scheduling and Control, 4th Edition, Wiley, 2023.
5. Jha, K. N., Construction Project Management: Theory and Practice, 2nd Edition, Pearson India, 2015.

Reference Books:

1. Harris, R. B. and Ioannou, P. G., Project Planning and Control Using Primavera P6, Eastwood Harris Pty Ltd., Latest Edition.
2. Wickwire, J. M., Driscoll, T. J., Hurlbut, S. D., and Hillman, M. T., Construction Scheduling: Preparation, Liability, and Claims, 3rd Edition, John Wiley & Sons, 2010.
3. Pickavance, K., Delay and Disruption in Construction Contracts, 5th Edition, Routledge, 2016.
4. Society of Construction Law (SCL), Delay and Disruption Protocol, 2nd Edition, 2017.
5. East, E. W., Construction Project Management Information Systems (PMIS): Best Practices, McGraw-Hill, Latest Edition.
6. Gould, F. E. and Joyce, N. E., Construction Project Management, 5th Edition, Pearson, 2020.
7. Hendrickson, C. and Au, T., Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall (also available as an open educational resource).
8. Trauner, T. J., Manginelli, W., Lowe, J. S., and Nagata, B. A., Construction Delays: Understanding Them Clearly, Analyzing Them Correctly, 3rd Edition, Elsevier, 2018..

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	3	2	1
C02	3	2	1	3	2	1
C03	3	2	2	3	2	2
C04	3	3	2	3	2	3
C05	3	3	2	2	2	3
C06	3	2	3	2	3	2





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202PCCL106	Course Name: Construction Planning Software Laboratory	-	-	4	-	2

Course Outcomes: At the end of the course student will be able to

C01	Develop construction project schedules using Microsoft Project by applying work breakdown structures, activity sequencing, duration estimation, and network scheduling techniques.
C02	Perform resource allocation, resource leveling, cost planning, and project tracking using project management software tools.
C03	Analyze project performance through schedule monitoring, earned value analysis, reporting, and project control techniques for effective decision-making.

Prerequisites: Microsoft Project, Microsoft Excel

Unit No.	Description
1	Introduction to Microsoft Project (MSP): Familiarization with MSP interface, project settings, calendars, working days, holidays, and project start dates.
2	Development of Work Breakdown Structure (WBS): Creation of task hierarchies, summary and sub-tasks, and organization of project activities.
3	Activity Definition and Duration Estimation: Entry of project activities, assignment of durations and milestones, and establishment of activity relationships.
4	Network Scheduling: Application of FS, SS, FF, and SF relationships, lead-lag analysis, and Critical Path Method (CPM) scheduling.
5	Gantt Chart Development: Preparation and customization of Gantt charts, schedule visualization, and baseline schedule creation.
6	Resource Planning and Allocation: Creation of resource sheets, assignment of labor, material, and equipment resources, and resource utilization analysis.
7	Resource Leveling and Optimization: Identification of resource over-allocation, application of resource leveling techniques, and analysis of scheduling impacts.
8	Cost Planning and Budgeting: Assignment of resource costs, preparation of project budgets, and generation of cost and cash flow reports.
9	Baseline Setting and Progress Tracking: Saving project baselines, updating project progress, and variance analysis between planned and actual schedules.
10	Earned Value Management (EVM): Computation and analysis of SPI, CPI, and project completion forecasting.
11	Project Monitoring and Control: Tracking Gantt analysis, delay identification, corrective actions, and schedule compression techniques.
12	Report Generation and Dashboard Preparation: Preparation of schedule, resource, and cost reports along with project performance dashboards.
13	Construction Project Case Study: Development of a complete schedule for a residential/commercial construction project including resource loading, cost planning, monitoring, and reporting.
14	Mini Project: Preparation of an integrated construction project schedule using MSP including baseline creation, resource allocation, project tracking, performance analysis, and project presentation.





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CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	1	1	3	3	1
C02	3	2	2	3	3	1
C03	3	2	2	3	2	2





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Course: F. Y. M. Tech	Semester: I	L	T	P	S	Credits
Course Code: 26202RM101	Course Name: Research Methodology	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Explain research principles, methodologies and scientific approaches for engineering research.
C02	Conduct systematic literature review and formulate research problems with appropriate objectives and hypotheses.
C03	Design suitable research methodology and apply appropriate data collection techniques.
C04	Analyze research data using statistical techniques and software tools for informed decision making.
C05	Apply research ethics, plagiarism prevention and intellectual property practices in academic research.
C06	Prepare quality research proposals, technical papers and dissertations following standard academic practices.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Introduction to Research Methodology Meaning, objectives and significance of research, Types of research: Basic, Applied, Experimental, Descriptive and Analytical, Research process and scientific method, Identification of research problems, Research questions, objectives and hypotheses, Scope and limitations of research, Research opportunities in Construction Engineering and Management	6
2	Literature Review and Research Design Sources of literature, Systematic literature review (SLR), Bibliometric analysis, Identifying research gaps, Research design and methodology selection, Variables and measurement scales, Sampling techniques, Preparation of research proposal	6
3	Data Collection Methods Primary and secondary data, Questionnaire design, Interview techniques, Surveys and field investigations, Case study research, Experimental research, Observation methods, Data quality, reliability and validity	6
4	Data Analysis and Statistical Tools Descriptive statistics, Probability distributions, Hypothesis testing, Correlation and regression analysis, ANOVA, Non-parametric tests, Introduction to SPSS, Excel, R and Python for research, Interpretation of statistical results	7





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5	Research Ethics and Intellectual Property Ethics in research, Research misconduct, Plagiarism and plagiarism detection tools, Citation styles (APA, IEEE, ASCE), Reference management using Mendeley and Zotero, Intellectual Property Rights (IPR), Patents, Copyrights and Technology Transfer	7
6	Technical Writing and Research Dissemination Technical paper writing, Thesis and dissertation writing, Research proposal preparation, Conference presentations, Journal publication process, Peer review process, Impact factor, Scopus, SCI, Web of Science AI tools in research and responsible use	7
Text Book: 1. Kothari, C.R. and Garg, G., Research Methodology: Methods and Techniques, New Age International Publishers. 2. Kumar, R., Research Methodology: A Step-by-Step Guide for Beginners, Sage Publications. 3. Creswell, J.W. and Creswell, J.D., Research Design: Qualitative, Quantitative and Mixed Methods Approaches, Sage Publications. Reference Books: 1. Montgomery, D.C., Runger, G.C., Applied Statistics and Probability for Engineers, Wiley. 2. Alley, M., The Craft of Scientific Writing, Springer. 3. Day, R.A. and Gastel, B., How to Write and Publish a Scientific Paper, Cambridge University Press. 4. Gupta, C.B., Intellectual Property Rights, Sultan Chand & Sons.		

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	1	1	2
C02	3	3	1	2	2	3
C03	3	2	2	2	2	2
C04	3	2	1	3	3	2
C05	2	3	2	1	1	3
C06	2	3	3	2	2	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PCC201	Course Name: Construction Quality and Safety Management	4	-	-	1	4

Course Outcomes: At the end of the course student will be able to

C01	Explain the principles of quality management, cost of quality, TQM philosophy, Six Sigma concepts, and PDCA cycle applications in construction projects.
C02	Apply Quality Assurance and Quality Control (QA/QC) procedures, ISO 9001:2015 requirements, quality control tools, and Statistical Quality Control techniques for construction materials and processes.
C03	Interpret safety standards, statutory regulations, and legal requirements related to construction safety, including OSHA, ISO 45001:2018, and BOCW Act provisions.
C04	Perform Hazard Identification and Risk Assessment (HIRA) and Job Safety Analysis (JSA) for various construction activities and evaluate associated risks.
C05	Develop and implement construction safety programs, safety culture initiatives, PPE management systems, safety audits, and accident investigation procedures.
C06	Assess occupational health hazards, ergonomic risks, and welfare requirements and recommend suitable health and safety management measures for construction projects.

Prerequisites: Construction Safety Principles

Unit No.	Description	Hrs.
1	Quality Management Principles Quality definitions, Cost of Quality (Prevention, Appraisal, Failure costs). Total Quality Management (TQM) philosophy, Six Sigma application in construction, PDCA cycle.	8
2	Quality Assurance and Control (QA/QC) ISO 9001:2015 standards and documentation. Quality control tools: Pareto charts, Fishbone diagrams, Control charts. Statistical Quality Control (SQC) for concrete and materials.	8
3	Safety Standards and Legislation OSHA regulations, international safety standards (ISO 45001:2018). Building and Other Construction Workers (BOCW) Act. Statutory safety obligations of employers and contractors.	9
4	Hazard Identification and Risk Assessment (HIRA) Job Safety Analysis (JSA), HIRA methodologies. Identification of construction hazards: falls from height, excavation collapses, electrical mishaps, scaffolding failures.	9
5	Safety Programs and Culture Safety training, Toolbox talks, Personal Protective Equipment (PPE) management. Behavioral-Based Safety (BBS). Safety audits, accident investigation, and reporting protocols.	9





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6	Occupational Health and Ergonomics Health hazards in construction: silica dust, asbestos, noise-induced hearing loss, ergonomic stressors. Welfare facilities on site. Safety and health management in deep excavations and high-rises.	9
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Text Book:

1. Construction Safety Management and Engineering, Darshan Singh, Construction Safety Management and Engineering, Cengage Learning India.
2. Construction Project Management, Kumar Neeraj Jha, Construction Project Management: Theory and Practice, Pearson Education India.
3. Total Quality Management, Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield and Mary Besterfield-Sacre, Total Quality Management, Pearson Education.
4. Quality Planning and Analysis, J. M. Juran and Frank M. Gryna, Quality Planning and Analysis, McGraw-Hill.
5. Construction Planning, Equipment and Methods, Robert L. Peurifoy, Clifford J. Schexnayder and Aviad Shapira, Construction Planning, Equipment and Methods, McGraw-Hill Education.

Reference Books:

1. Safety and Health for Engineers, Roger L. Brauer, Safety and Health for Engineers, Wiley India.
2. Construction Safety Handbook, Mohammed A. El-Reedy, Construction Safety Handbook, Butterworth-Heinemann (Elsevier).
3. Project Quality Management, Kenneth H. Rose, Project Quality Management: Why, What and How, J. Ross Publishing.
4. Quality Management for Construction Projects, Abdul Razzak Rumane, Quality Management in Construction Projects, CRC Press.
5. Occupational Safety and Health Simplified for the Construction Industry, Frank R. Spellman, Occupational Safety and Health Simplified for the Construction Industry, Bernan Press.
6. Principles of Occupational Health and Hygiene, Sue Reed and David Pisaniello, Principles of Occupational Health and Hygiene, Allen & Unwin.
7. Bureau of Indian Standards, National Building Code (NBC) of India – Part 7: Construction Management, Practices and Safety, BIS Publications.
8. International Organization for Standardization, ISO 9001:2015 – Quality Management Systems Requirements and ISO 45001:2018 – Occupational Health and Safety Management Systems.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	2	3	1	2	1	3
C02	3	3	1	2	1	3
C03	2	3	2	1	1	3
C04	3	3	1	3	1	3
C05	2	3	3	2	2	3
C06	2	3	2	1	1	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PCC202	Course Name: Project Formulation and EPC Contract Management	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Explain the principles of project formulation, feasibility studies, Detailed Project Consultancy (DPC)/Detailed Project Report (DPR), and Engineering, Procurement, and Construction (EPC) project delivery
C02	Analyze technical, financial, economic, environmental, legal, and risk aspects involved in project formulation and preparation of Detailed Project Consultancy (DPC)/DPR for infrastructure projects.
C03	Apply project planning, scheduling, procurement strategies, resource optimization, and EPC contract provisions for effective execution and administration of construction projects.
C04	Evaluate EPC contract management practices, including contract documentation, claims management, dispute resolution, quality assurance, safety management, and project performance monitoring.
C05	Assess the application of Building Information Modelling (BIM), digital construction technologies, Lean principles, and data-driven tools for enhancing project delivery and contract management.
C06	Develop integrated project formulation, DPC/DPR preparation, and EPC contract management strategies incorporating sustainability, innovation, risk mitigation, and professional ethics for successful infrastructure project delivery.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Project Formulation and Feasibility Studies Project concept, identification, selection, and prioritization, Project life cycle and project development process, Project formulation methodology, Technical, market, financial, economic, environmental, and social feasibility studies, Stakeholder identification and analysis, Project risk identification, Introduction to Detailed Project Consultancy (DPC) and Detailed Project Report (DPR), Components of DPR for infrastructure projects	6
2	Detailed Project Consultancy (DPC) and Project Appraisal Preparation of Detailed Project Consultancy (DPC), Detailed Project Report (DPR): structure and documentation, Site investigations and data collection, Survey, design basis, and technical specifications, Quantity estimation and cost estimation Financial appraisal (NPV, IRR, BCR, Payback Period), Economic appraisal, Value Engineering and Life Cycle Cost Analysis, Risk	6





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	assessment and sensitivity analysis	
3	EPC Project Planning, Procurement and Scheduling Engineering, Procurement and Construction (EPC) project delivery system, Project planning and scheduling, Work Breakdown Structure (WBS), Procurement planning and vendor management, Tendering procedures and bid evaluation, Resource planning and optimization, Primavera P6/MS Project applications Quality planning and project monitoring	6
4	EPC Contract Administration and Claims Management Types of construction contracts, EPC contract structure and documentation, FIDIC Conditions of Contract (Silver Book), General and Special Conditions of Contract, Contract administration, Performance securities and guarantees, Variations and change orders, Claims management, Dispute resolution: Negotiation, Mediation, Arbitration, Adjudication, Contract close-out procedures	7
5	Digital Technologies in Project Delivery Building Information Modelling (BIM) in project formulation and EPC, Common Data Environment (CDE), Digital Project Management, Industry 4.0 in construction, Artificial Intelligence applications, Internet of Things (IoT), GIS, Remote Sensing, UAVs/Drones, Digital Twins, Project dashboards and data analytics, Lean principles in EPC project delivery	7
6	Sustainable Project Delivery, Case Studies and Emerging Trends Sustainable infrastructure planning, ESG principles in infrastructure projects, Green procurement, Safety and quality management in EPC projects, Performance measurement using KPIs, Public-Private Partnership (PPP) and Hybrid Annuity Model (HAM), International and Indian case studies on EPC projects Emerging trends in EPC and consultancy practices, Consultancy ethics and professional responsibilities, Mini project: Preparation of a DPC/DPR and EPC execution strategy for a real infrastructure project	7

Text Book:

1. Chitkara, K. K., Construction Project Management: Planning, Scheduling and Controlling, Tata McGraw-Hill Education.
2. Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7th Edition, Project Management Institute.
3. FIDIC, Conditions of Contract for EPC/Turnkey Projects (Silver Book), International Federation of Consulting Engineers (Latest Edition).
4. Gould, F. E. and Joyce, N. E., Construction Project Management, 5th Edition, Pearson Education.
5. Eastman, C., Teicholz, P., Sacks, R. and Liston, K., BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers, 3rd Edition, Wiley.

Reference Books:

1. Kerzner, H., Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 13th Edition, Wiley.





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2. Merrow, E. W., Industrial Megaprojects: Concepts, Strategies, and Practices for Success, Wiley.
3. Yescombe, E. R., Public-Private Partnerships in Infrastructure: Principles of Policy and Finance, 2nd Edition, Butterworth-Heinemann.
4. Smith, N. J., Merna, T. and Jobling, P., Managing Risk in Construction Projects, 3rd Edition, Wiley-Blackwell.
5. Flanagan, R. and Norman, G., Risk Management and Construction, Wiley-Blackwell.
6. Forbes, L. H. and Ahmed, S. M., Modern Construction: Lean Project Delivery and Integrated Practices, CRC Press.
7. Central Public Works Department (CPWD), CPWD Works Manual, Latest Edition, Government of India.
8. Ministry of Road Transport and Highways (MoRTH), Standard Specifications for Road and Bridge Works, Latest Edition, Government of India.
9. National Highways Authority of India (NHAI), Model EPC Agreement for National Highway Projects, Latest Edition.
10. International Federation of Consulting Engineers (FIDIC), FIDIC Contracts Guide, Latest Edition.
11. Bureau of Indian Standards (BIS), National Building Code of India (NBC) 2016 – Part 7: Construction Management, Practices and Safety, BIS Publications.
12. Bureau of Indian Standards (BIS), Relevant Indian Standards (IS Codes) for estimation, contracts, quality assurance, and project management, Latest Editions.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	2	1	2
C02	3	3	1	3	1	3
C03	3	2	2	3	2	2
C04	3	3	2	3	2	3
C05	3	2	2	2	3	2
C06	3	3	3	3	3	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PCC203	Course Name: Operation Research	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Apply Operations Research techniques to construction management problems.
C02	Analyze project schedules using network planning techniques.
C03	Evaluate optimization models for construction resource management.
C04	Assess project risks using decision analysis techniques.
C05	Evaluate construction operations using inventory and queuing models.
C06	Develop decision-support solutions using digital tools and optimization software.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Introduction to Operations Research Introduction, scope and applications of Operations Research in construction. Decision-making process, model formulation, Linear Programming Problems (LPP), graphical method, simplex method, and applications in resource allocation.	6
2	Project Scheduling and Network Analysis Network techniques, CPM and PERT, critical path, float calculations, project crashing, time-cost trade-off, resource allocation, resource leveling and smoothing.	6
3	Optimization Techniques Transportation problem, assignment problem, integer programming, goal programming, and applications in material, equipment, and manpower optimization.	6
4	Decision Analysis and Risk Decision-making under certainty, risk and uncertainty, decision trees, expected monetary value (EMV), sensitivity analysis, introduction to simulation, and construction risk assessment.	7
5	Construction Operations Management Queuing theory and its applications at construction sites, inventory control (EOQ), equipment replacement decisions, maintenance planning, and productivity improvement.	7
6	Digital Tools for Decision Support Applications of Operations Research using Excel Solver and other optimization software, Project Management Information Systems (PMIS), BIM-based decision support, dashboards, and AI applications in construction management.	7





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Text Book:

1. Taha, H. A., Operations Research: An Introduction, 10th Edition, Pearson Education, 2017.
2. Hillier, F. S. and Lieberman, G. J., Introduction to Operations Research, 11th Edition, McGraw-Hill Education, 2021.
3. Sharma, J. K., Operations Research: Theory and Applications, 6th Edition, Macmillan Education India, 2017.
4. Panneerselvam, R., Operations Research, 3rd Edition, PHI Learning, 2012.
5. Jha, K. N., Construction Project Management: Theory and Practice, 2nd Edition, Pearson India, 2015.

Reference Books:

1. Winston, W. L., Operations Research: Applications and Algorithms, 4th Edition, Cengage Learning, 2004.
2. Ravindran, A., Phillips, D. T., and Solberg, J. J., Operations Research: Principles and Practice, 2nd Edition, Wiley India.
3. Bazaraa, M. S., Jarvis, J. J., and Sherali, H. D., Linear Programming and Network Flows, 4th Edition, Wiley, 2010.
4. Hamdy A. Taha, Operations Research with Excel Solver, Pearson Education (Latest Edition).
5. Kerzner, H., Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 13th Edition, Wiley, 2022.
6. Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7th Edition, PMI, 2021.
7. Moder, J. J., Phillips, C. R., and Davis, E. W., Project Management with CPM, PERT and Precedence Diagramming, 3rd Edition, Van Nostrand Reinhold.
8. Ravindran, A., Operations Research and Management Science Handbook, CRC Press.

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Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	3	2	1
C02	3	2	2	3	2	1
C03	3	2	1	3	2	2
C04	3	3	2	3	2	3
C05	3	2	1	3	1	2
C06	3	2	3	2	3	2





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PCCL204	Course Name: Building Information Modelling Laboratory	-	-	4	-	2

Course Outcomes: At the end of the course student will be able to

C01	To develop proficiency in BIM-based modeling and project documentation.
C02	To apply BIM tools for quantity estimation, scheduling, and project coordination.
C03	To understand collaborative BIM workflows for construction project management.

Prerequisites: Microsoft Project, Microsoft Excel

Unit No.	Description
1	Introduction to BIM concepts, BIM maturity levels, and BIM project environment.
2	Creation of architectural BIM models: walls, floors, roofs, doors, windows, and openings.
3	Development of structural BIM models: columns, beams, slabs, and foundations.
4	Creation of MEP (Mechanical, Electrical, and Plumbing) components and systems.
5	Preparation of BIM families, templates, and parametric objects.
6	Generation of construction drawings, schedules, and project documentation from BIM models.
7	Quantity take-off and material estimation using BIM tools.
8	Clash detection and model coordination among architectural, structural, and MEP models.
9	4D BIM modeling by integrating project schedules with BIM models.
10	Visualization, rendering, and walkthrough generation for construction projects.
11	Collaborative BIM workflows using common data environments (CDE).
12	Mini-project: Development of an integrated BIM model for a building project incorporating quantity estimation and construction scheduling.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	1	1	1	3	1
C02	3	2	2	3	3	1
C03	2	2	3	2	3	2





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PCCL205	Course Name: Construction Planning Software Laboratory (Primavera)	-	-	4	-	2

Course Outcomes: At the end of the course student will be able to

C01	Develop construction project schedules using Primavera P6 by creating WBS, activities, calendars, network logic, and critical path analysis.
C02	Apply resource planning, resource leveling, cost loading, budgeting, and cash flow analysis for effective project management.
C03	Monitor and control construction projects through baseline management, progress tracking, earned value analysis, and project reporting.

Prerequisites: Microsoft Project, Microsoft Excel

Unit No.	Description
1	Introduction to BIM concepts, BIM maturity levels, and BIM project environment.
2	Creation of architectural BIM models: walls, floors, roofs, doors, windows, and openings.
3	Development of structural BIM models: columns, beams, slabs, and foundations.
4	Creation of MEP (Mechanical, Electrical, and Plumbing) components and systems.
5	Preparation of BIM families, templates, and parametric objects.
6	Generation of construction drawings, schedules, and project documentation from BIM models.
7	Quantity take-off and material estimation using BIM tools.
8	Clash detection and model coordination among architectural, structural, and MEP models.
9	4D BIM modeling by integrating project schedules with BIM models.
10	Visualization, rendering, and walkthrough generation for construction projects.
11	Collaborative BIM workflows using common data environments (CDE).
12	Mini-project: Development of an integrated BIM model for a building project incorporating quantity estimation and construction scheduling.
13	Introduction to Primavera P6 interface, project creation, and navigation.
14	Creation of Enterprise Project Structure (EPS) and Organizational Breakdown Structure (OBS).
15	Development and customization of project, resource, and global calendars.





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CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	1	1	3	3	1
C02	3	2	2	3	3	1
C03	3	2	2	3	2	2





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC201A	Course Name: Sustainable Building Construction	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Analyze the principles of sustainable development, green building concepts, site planning strategies, and evaluate green building rating systems such as GRIHA, IGBC, and LEED for sustainable construction projects.
C02	Design and assess water conservation measures including rainwater harvesting, efficient plumbing systems, wastewater treatment, recycling, reuse systems, and water management strategies in buildings.
C03	Evaluate indoor environmental quality parameters and recommend appropriate measures for daylighting, ventilation, acoustics, and selection of low-emission materials to enhance occupant comfort and health.
C04	Analyze building energy performance and propose energy-efficient solutions through renewable energy integration, life cycle energy assessment, net-zero building concepts, and climate-responsive building orientation.
C05	Select and evaluate sustainable construction materials and resource management practices by incorporating local, renewable, recycled, and salvaged materials along with circular economy principles and construction waste management techniques.
C06	Assess the role of MEP systems, building automation, facility management, and advanced monitoring technologies in improving the operational efficiency and sustainability of green buildings.

Prerequisites: Construction Accounting Principles

Unit No.	Description	Hrs.
1	Introduction to Green Buildings Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems. Green and Lean construction- Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc.	6
2	Water conservation and efficiency Rainwater harvesting methods for roof & non-roof, reducing landscape-water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.	6
3	Indoor Environmental Quality	6





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	Day lighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics.	
4	Energy Efficiency Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings. Orientation of building according to sun diagram to reduce energy requirements	7
5	Materials & Resources local building materials, natural and renewable materials, materials with recycled content, waste and salvaged materials, waste management, Circular economy	7
6	MEP Systems MEP systems such as ventilation, air conditioning, heating, electrical lighting and building control systems Facility management; Advance monitoring methods; Modern gadgets; Plumbing and electrical inputs	7
Reference Books: 1. LEED Reference Guide – Green Building Design and Construction – 2009 edition Available from US Green Building Council 2. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian GreenBuilding Council Publishers. 3. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.		

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	2	3	1	1	1	3
C02	3	3	1	1	1	3
C03	3	3	1	1	1	3
C04	3	3	1	2	2	3
C05	2	3	1	1	1	3
C06	3	3	2	2	3	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC201B	Course Name: Lean Construction	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Explain the philosophy, principles, terminology, and evolution of Lean Construction and distinguish it from conventional construction management practices.
C02	Analyze construction processes using Lean tools and techniques such as Value Stream Mapping (VSM), 5S, Kaizen, Kanban, Visual Management, and Poka-Yoke to identify waste and improve productivity.
C03	Apply Lean planning and production control techniques including Last Planner System (LPS), Pull Planning, Look-Ahead Planning, Target Value Delivery (TVD), and Integrated Project Delivery (IPD) for effective project execution.
C04	Evaluate the role of Building Information Modelling (BIM), Industry 4.0, IoT, Artificial Intelligence, Digital Twins, and other digital technologies in supporting Lean Construction practices.
C05	Assess Lean quality, safety, sustainability, supply chain management, and performance measurement techniques for improving construction project outcomes.
C06	Develop comprehensive Lean implementation strategies for construction projects by integrating Lean principles, digital technologies, innovation, and sustainable practices to enhance project performance.

Prerequisites: Construction Principles

Unit No.	Description	Hrs.
1	Introduction to Lean Construction Evolution of Lean Manufacturing and Toyota Production System (TPS), Lean Thinking and Lean Philosophy, Principles of Lean Construction, Traditional vs Lean Construction, Customer Value and Value Generation, Types of Waste (TIMWOODS), Continuous Improvement (Kaizen), Lean Culture and Organizational Change	6
2	Lean Tools and Waste Elimination Value Stream Mapping (VSM), Process Mapping, 5S Methodology, Visual Management, Kanban Standard Work, Poka-Yoke, Root Cause Analysis, PDCA Cycle, A3 Problem Solving Productivity Improvement Techniques	6
3	Lean Planning and Production Control Last Planner System (LPS), Pull Planning, Master Planning, Phase Planning, Look-Ahead Planning, Weekly Work Planning, Constraint Analysis, Percent Plan Complete (PPC), Workflow Reliability, Target	6





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	Value Delivery (TVD), Integrated Project Delivery (IPD)	
4	Lean Construction and Digital Technologies BIM and Lean Integration, Common Data Environment (CDE), Digital Construction, Industry 4.0, Internet of Things (IoT), Artificial Intelligence, RFID, Drones, Digital Twins, Data Analytics for Lean Projects	7
5	Lean Quality, Safety and Sustainable Construction Lean Quality Management, Total Quality Management (TQM), Six Sigma Concepts, Lean Safety Management, Lean Supply Chain Management, Green Lean Construction, Circular Economy Sustainable Construction Practices, Performance Measurement and KPIs	7
6	Lean Implementation and Case Studies Lean Implementation Framework, Organizational Transformation, Challenges in Lean Adoption, Lean Contracting, Collaborative Project Delivery, International and Indian Case Studies, Emerging Trends in Lean Construction, AI-enabled Lean Construction, Smart Construction Sites, Mini Project on Lean Implementation	7

Text Books:

1. Forbes, L. H. and Ahmed, S. M., Modern Construction: Lean Project Delivery and Integrated Practices, CRC Press.
2. Womack, J. P. and Jones, D. T., Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Simon & Schuster.
3. Sacks, R., Eastman, C., Lee, G. and Teicholz, P., BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers, 3rd Edition, Wiley.
4. Salem, O., Lean Construction: From Theory to Implementation, ICE Publishing.

Reference Books:

1. LEED Reference Guide – Green Building Design and Construction – 2009 edition
2. Available from US Green Building Council
3. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian
4. Green Building Council Publishers.
5. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PSO1	PSO2	PSO3
C01	3	1	1	2	2	1
C02	3	2	2	3	3	2
C03	3	2	2	3	3	2
C04	3	3	2	2	3	3
C05	3	3	2	3	2	3
C06	3	3	3	3	3	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC201C	Course Name: Construction Management Information Systems	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Explain the concepts, architecture, and applications of Construction Management Information Systems.
C02	Analyze information flow and data management requirements in construction projects.
C03	Apply BIM, database systems, and PMIS tools for project planning and control.
C04	Evaluate ERP, decision support systems, and business intelligence tools for construction organizations.
C05	Assess information security, system implementation, and auditing requirements in CMIS.
C06	Develop integrated digital solutions using BIM, IoT, AI, and emerging technologies for construction management.

Prerequisites: Construction Management Principles

Unit No.	Description	Hrs.
1	Introduction to Construction Management Information Systems Information systems: Concepts, objectives, and classifications, Management Information Systems (MIS), Construction Management Information Systems (CMIS), Information requirements at strategic, tactical, and operational levels, Information flow in construction projects Role of CMIS in planning, monitoring, and decision making, Challenges and opportunities in digital construction management	6
2	Data Management and Database Systems Data, information, and knowledge concepts, Construction data lifecycle Database concepts and Database Management Systems (DBMS), Relational databases and SQL basics, Data warehousing and data integration, Common Data Environment (CDE), Cloud computing and document management systems, Information standards and interoperability	6
3	Building Information Modeling (BIM) and Digital Construction BIM concepts and maturity levels, BIM dimensions: 3D, 4D, 5D, and 6D BIM execution planning, BIM for scheduling, quantity take-off, and cost control, BIM collaboration and coordination, Integration of BIM with GIS and project management tools, Digital twins in construction management	6
4	Project Management Information Systems and ERP Project Management Information Systems (PMIS), Functional requirements of PMIS, Enterprise Resource Planning (ERP) for construction enterprises, Procurement, inventory, equipment, finance, and HR modules, E-tendering	7





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	and e-procurement systems, Integration of Primavera/MS Project with ERP and BIM, Project dashboards and performance reporting	
5	Decision Support Systems and Construction Analytics Decision Support Systems (DSS), Executive Information Systems (EIS) Knowledge Management Systems (KMS), Business Intelligence (BI) tools, Data analytics and visualization, Key Performance Indicators (KPIs), Artificial Intelligence and Machine Learning applications in construction, IoT-enabled monitoring systems and smart construction	7
6	Information Security, System Implementation and Emerging Technologies System Development Life Cycle (SDLC), System analysis and design, Information system implementation strategies, Change management and user adoption, Information security and cyber security, Data privacy and access control, Information system audit and evaluation, Blockchain applications in construction, Future trends in CMIS and digital transformation	7

Text Books:

1. Kenneth C. Laudon and Jane P. Laudon, Management Information Systems: Managing the Digital Firm, Pearson Education.
2. James A. O'Brien and George M. Marakas, Management Information Systems, McGraw-Hill Education.
3. Ralph M. Stair and George W. Reynolds, Principles of Information Systems, Cengage Learning.
4. Barbara Haley Wixom, Alan Dennis and Roberta Roth, Systems Analysis and Design, Wiley.

Reference Books

1. Daniel Minoli and Emma Minoli, Building the Agile Enterprise with SOA, BPM and MBM, CRC Press.
2. Jason Underwood and Umit Isikdag, Handbook of Research on Building Information Modeling and Construction Informatics, IGI Global.
3. Sidney M. Levy, Project Management in Construction, McGraw-Hill.
4. Paul Teicholz, Construction Management Fundamentals, McGraw-Hill.
5. Hossein Arayici et al., BIM and Integrated Design, Routledge.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	2	1	1	1	3	1
C02	3	2	1	2	3	1
C03	3	2	2	3	3	1
C04	3	2	2	2	3	2
C05	2	3	1	1	2	2
C06	3	3	2	2	3	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC202A	Course Name: Contract Management	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Interpret legal principles governing construction contracts and procurement processes.
C02	Analyze tendering procedures, bid evaluation methods, and contract award processes.
C03	Prepare and administer construction contract documents and manage contractual obligations.
C04	Evaluate claims, variations, delays, and risk allocation mechanisms in construction projects.
C05	Apply contract management practices using standard forms of contracts such as FIDIC, CPWD, EPC, and PPP contracts.
C06	Recommend appropriate dispute resolution techniques including negotiation, mediation, conciliation, arbitration, and litigation.

Prerequisites: Construction Contracts Principles

Unit No.	Description	Hrs.
1	Fundamentals of Construction Contracts Principles of contract law and Indian Contract Act, 1872, Essential elements of a valid contract, Types of construction contracts: Lump Sum Contracts, Item Rate Contracts, Cost Plus Contracts, EPC/Turnkey Contracts, Design-Build Contracts, PPP/BOT Contracts, Contractual relationships among owner, consultant, contractor, subcontractor and suppliers, Contract documents and hierarchy of contract documents, Standard forms of contracts (CPWD, FIDIC, NEC, JCT)	6
2	Tendering and Procurement Management Procurement systems in construction, Prequalification of contractors, Notice Inviting Tender (NIT), Preparation of tender documents, Bid securities and performance securities, E-procurement and digital tendering, Bid opening and evaluation procedures, Contract award and Letter of Acceptance, Ethical issues in procurement and tendering practices	6
3	Contract Administration and Performance Management Contract execution process, Roles, duties and responsibilities of contracting parties, Performance monitoring and reporting, Contract communication and documentation, Progress payments and certification Retention money and performance guarantees, Time management and milestones, Quality assurance requirements, Contract closure procedures and final accounts	6





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4	Risk Allocation, Variations and Claims Management Risk allocation in construction contracts, Contractual risk identification and mitigation, Change orders and variation management, Extension of Time (EOT), Delay analysis techniques, Cost escalation provisions, Liquidated damages and penalties, Construction claims: Time-related claims, Cost-related claims, Disruption and acceleration claims, Claim documentation and evaluation methods	7
5	International Contracts and Advanced Contracting Strategies FIDIC Contract Conditions (Red, Yellow and Silver Books), EPC and Design-Build contracts, Joint Ventures and Consortium Agreements, Public Private Partnership (PPP) contracts, Concession Agreements, International contracting issues: Insurance, Force Majeure, Currency fluctuations, Cultural and legal considerations, Sustainable and collaborative contracting approaches	7
6	Dispute Resolution and Arbitration Nature and causes of construction disputes, Negotiation and dispute avoidance techniques, Mediation and Conciliation, Dispute Review Boards (DRB), Arbitration and Conciliation Act, 1996 and amendments Arbitration procedures and arbitral awards, Litigation in construction disputes, Enforcement of awards, Case studies on major construction disputes and lessons learned	7

Text Books:

1. Hughes, W., Champion, R. and Murdoch, J., Construction Contracts: Law and Management, Routledge.
2. B.S. Ramaswamy, Contracts and Their Management, LexisNexis.
3. Fisk, E.R. and Reynolds, W.D., Construction Project Administration, Wiley.
4. Patil, B.S., Legal Aspects of Building and Engineering Contracts, University Press.

Reference Books

1. Murdoch, J. and Hughes, W., Construction Contracts: Law and Management, Routledge.
2. Rashid Hussain, Contract Management: A Life Cycle Approach, 3C Corporate Consulting.
3. John Mullen and Peter Davison, Evaluating Contract Claims, Wiley-Blackwell.
4. FIDIC, Conditions of Contract for Construction (Red Book).
5. FIDIC, Conditions of Contract for Plant and Design-Build (Yellow Book).

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	2	3	1	2	1	3
C02	3	2	2	3	1	2
C03	3	2	2	3	1	2
C04	3	2	2	3	1	2
C05	3	2	1	3	1	2
C06	2	2	3	2	1	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC202A	Course Name: Risk Management	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Identify and classify various risks associated with construction projects throughout their life cycle.
C02	Apply qualitative and quantitative risk assessment techniques for evaluating project uncertainties.
C03	Analyze financial, contractual, safety, environmental, and operational risks using appropriate tools and methodologies.
C04	Develop risk mitigation, allocation, and response strategies for effective project execution.
C05	Evaluate the impact of risk on project cost, schedule, quality, and stakeholder performance.
C06	Prepare and implement integrated risk management plans for construction and infrastructure projects.

Prerequisites: Construction Contracts Principles

Unit No.	Description	Hrs.
1	Fundamentals of Risk Management Concept of risk, hazard, uncertainty, and opportunity, Need and importance of risk management in construction, Types and classification of risks : Technical risks, Financial risks, Contractual risks, Environmental risks, Political and regulatory risks, Safety risks, Risk management frameworks and standards, Project life-cycle approach to risk management, Enterprise Risk Management (ERM) concepts	6
2	Risk Identification and Assessment Risk identification process, Risk Breakdown Structure (RBS), Sources of project risks, Stakeholder-based risk identification, Brainstorming, Delphi technique, interviews, checklists, Risk registers and documentation, Probability and impact assessment, Risk ranking and prioritization, Risk matrices and risk scoring models	6
3	Quantitative and Qualitative Risk Analysis Qualitative risk analysis techniques, Sensitivity analysis, Scenario analysis, Expected Monetary Value (EMV), Decision tree analysis, Probability distributions, Monte Carlo simulation concepts, Risk profile method, Certainty equivalent and risk-adjusted discount rate methods, NPV under uncertainty	6
4	Risk Response and Mitigation Strategies Risk response planning, Risk avoidance, Risk reduction and mitigation, Risk transfer and sharing, Risk retention and acceptance, Contingency planning, Insurance and bonding in construction, Risk allocation in contracts, Risk	7





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	communication and stakeholder engagement, Developing risk response plans	
5	Construction Safety, Environmental and Contractual Risks Occupational health and safety risks, Hazard Identification and Risk Assessment (HIRA), Accident causation theories, Safety management systems, Environmental risks and sustainability concerns, Environmental Impact Assessment (EIA) related risks, Contractual claims and disputes Force majeure and delay risks, Legal liabilities and regulatory compliance	7
6	Integrated Risk Management for Construction Projects Risk Management and Internal Control Systems, Risk monitoring and review, Key Risk Indicators (KRIs), Risk reporting and dashboards, Digital tools for risk management, BIM-based risk management, Case studies of infrastructure projects, Preparation of Project Risk Management Plan, Emerging risks in smart and sustainable construction	7

Text Books:

1. Smith, N. J., Merna, T., and Jobling, P., Managing Risk in Construction Projects, Wiley-Blackwell.
2. Chapman, C. and Ward, S., Project Risk Management: Processes, Techniques and Insights, John Wiley & Sons.
3. Melvin W. Lifson and Edward F. Shaifer, Decision and Risk Analysis for Construction Management, John Wiley & Sons.
4. K.K. Chitkara, Construction Project Management: Planning, Scheduling and Controlling, Tata McGraw-Hill.

Reference Books

1. Institution of Civil Engineers (ICE), Risk Analysis and Management for Projects (RAMP).
2. Chris Marrison, Fundamentals of Risk Measurement, Tata McGraw-Hill.
3. Ian Cameron and Raghu Raman, Process Systems Risk Management, Elsevier.
4. Flanagan, R. and Norman, G., Risk Management and Construction, Wiley-Blackwell.
5. PMI, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Risk Management Knowledge Area.
6. *ISO 31000: Risk Management – Principles and Guidelines.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	2	2	1	3	1	2
C02	3	2	1	3	1	2
C03	3	3	1	3	1	3
C04	3	2	2	3	1	2
C05	3	2	2	3	1	2
C06	3	3	2	3	2	3





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Course: F. Y. M. Tech	Semester: II	L	T	P	S	Credits
Course Code: 26202PEC202C	Course Name: Project Cost Engineering and Finance	3	-	-	1	3

Course Outcomes: At the end of the course student will be able to

C01	Apply principles of time value of money and perform economic evaluation of construction investments using PW, FW, AW, IRR, and B/C ratio methods.
C02	Prepare and interpret construction accounting records and financial statements using standard accounting practices and contract accounting methods.
C03	Analyze the financial performance and creditworthiness of construction organizations using financial ratio analysis.
C04	Evaluate working capital requirements and develop cash flow management strategies for construction projects.
C05	Assess various sources of project finance and financing models including PPP, BOT, and concession-based infrastructure projects.
C06	Examine the effects of inflation, depreciation, and taxation on project profitability and financial decision-making.

Prerequisites: Construction Accounting Principles

Unit No.	Description	Hrs.
1	Time Value of Money & Capital Budgeting Simple and compound interest, cash flow diagrams, nominal and effective interest rates. Equivalence analysis: Present Worth (PW), Future Worth (FW), Annual Worth (AW), Internal Rate of Return (IRR), Benefit-Cost (B/C) ratio.	6
2	Construction Accounting & Financial Statements Double-entry bookkeeping, journal and ledger systems. Construction accounting methods: Percentage-of-Completion method, Completed-Contract method. Balance sheets, Income statements	6
3	Financial Ratio Analysis Liquidity ratios, leverage ratios, profitability ratios, activity ratios. Interpreting financial health and creditworthiness of contractors and construction firms.	6
4	Working Capital Management Cash flow forecasting for construction projects. Working capital cycle: billing cycles, retention money, mobilization advances, managing accounts receivable and payable. Over-trading risks.	7
5	Capital Budgeting & Source of Funds Long-term financing options: equity, debt, debentures, bank loans, venture capital. Public-Private Partnerships (PPP), Build-Operate-Transfer (BOT) financing schemes, Concession agreements.	7





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6	Inflation, Depreciation, and Taxation Impact of inflation on financial viability. Corporate taxation, GST structure in construction contracts, tax deductions, depreciation methods (straight-line, declining balance) and tax shields.	7
Text Book: - Blank, L. T., & Tarquin, A. J. – Engineering Economy, McGraw-Hill Education. - Peurifoy, R. L., Schexnayder, C. J., Shapira, A., & Schmitt, R. – Construction Planning, Equipment and Methods, McGraw-Hill Education. - Seetharaman, A. – Construction Accounting and Financial Management, New Age International Publishers. - Pandey, I. M. – Financial Management, Vikas Publishing House Pvt. Ltd. - Chandra, P. – Financial Management: Theory and Practice, McGraw-Hill Education India. - Rao, P. C. K. – Financial Management and Policy, Himalaya Publishing House. Reference Books: - Sullivan, W. G., Wicks, E. M., & Koelling, C. P. – Engineering Economy, Pearson Education. - Peterson, S. J., & Fabozzi, F. J. – Capital Budgeting: Theory and Practice, Wiley India. - Maheshwari, S. N., Maheshwari, S. K., & Maheshwari, S. K. – Financial Accounting, Vikas Publishing House. - Jain, S. P., & Narang, K. L. – Advanced Accountancy, Kalyani Publishers. - Prasanna Chandra – Projects: Planning, Analysis, Financing, Implementation and Review, McGraw-Hill Education. - Brealey, R. A., Myers, S. C., & Allen, F. – Principles of Corporate Finance, McGraw-Hill Education. - Horne, J. C. Van, & Wachowicz, J. M. – Fundamentals of Financial Management, Pearson Education. - Sharma, J. K. – Business Statistics and Financial Analysis, Pearson Education.		

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	3	1	2
C02	3	2	1	3	1	1
C03	3	2	1	3	1	1
C04	3	2	2	3	1	2
C05	3	3	2	2	1	3
C06	3	2	1	3	1	2





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Course: S. Y. M. Tech	Semester: III	L	T	P	S	Credits
Course Code: 26202RS303	Course Name: Research Seminar	-	-	4	-	2

Course Outcomes: At the end of the course student will be able to

C01	Review and analyze contemporary topics, research papers, and industry practices in Construction Engineering and Management.
C02	Prepare technical reports and presentations through systematic literature review and critical evaluation of selected topics.
C03	Demonstrate effective communication, presentation, and professional discussion skills through seminar delivery and viva-voce.

Contents

Unit I: Selection of seminar topic, literature survey, problem identification, objectives and scope.

Unit II: Review of recent developments in BIM, Lean Construction, Project Management, Sustainability, Safety, Quality, Digital Construction and Smart Infrastructure.

Unit III: Technical paper analysis, research gap identification, report writing, referencing and plagiarism awareness.

Unit IV: Seminar presentation, discussion, peer review, viva-voce and final report submission.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	2	1	2	2	3
C02	2	2	3	1	2	3
C03	1	1	3	1	1	2





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Course: S. Y. M. Tech	Semester: III	L	T	P	S	Credits
Course Code: 26202DP301A	Course Name: Dissertation Phase I	-	-	20	-	10

Course Outcomes: At the end of the course student will be able to

C01	Identify and formulate a research problem in Construction Engineering and Management through comprehensive literature review and gap analysis.
C02	Develop an appropriate research methodology, work plan, and experimental/analytical framework for investigating the selected research problem.
C03	Prepare and present a detailed dissertation proposal demonstrating technical competence, critical thinking, and effective research communication skills.

Guidelines:

The dissertation is a year-long project, conducted and evaluated in two phases. It can be carried out either in-house or within an industry as assigned by the department. The project topic and internal advisor (a faculty member from the department) are determined at the beginning of Phase I.

Students are expected to complete the following activities in Phase-I:

1. Literature survey
2. Problem Definition and Research Gap
3. Aim and Objectives
4. Preliminary design /Experimentation/ feasibility / modular approaches

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	PO1	PO2	PO3	PSO1	PSO2	PSO3
C01	3	2	1	2	2	3
C02	3	3	1	2	2	3
C03	2	2	3	1	1	3





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Course: S. Y. M. Tech	Semester: IV	L	T	P	S	Credits
Course Code: 26202DP401	Course Name: Dissertation Phase II	-	-	40	24	20

Course Outcomes: At the end of the course student will be able to

C01	Conduct research using appropriate experimental, analytical, computational, or field-based methods to address the identified problem in Construction Engineering and Management.
C02	Analyze, interpret, and evaluate research findings to develop technically sound conclusions and recommendations.
C03	Prepare, present, and defend a comprehensive dissertation demonstrating research competence, innovation, and professional communication skills.

Guidelines:

Students are expected to complete the following activities in Phase-II:

1. Implementation of the proposed approach in the first stage
2. Testing/ Data Collection, Analysis, and validation of the implemented solution
3. Writing of a report and presentation
4. Publish the work done at a suitable peer-reviewed conference/ journal.

CO-PO Mapping Matrix

Course Outcome	Programme Outcome (PO)/ Programme Specific Outcome (PSO)					
	P01	P02	P03	PS01	PS02	PS03
C01	3	3	1	2	2	3
C02	3	3	2	2	2	3
C03	2	2	3	1	2	3

