



Shri Balasaheb Mane Shikshan Prasarak Mandal's
ASHOKRAO MANE GROUP OF INSTITUTIONS

Vathar Tarf Vadgaon | Kolhapur | Maharashtra
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Curriculum Structure

and

Evaluation Scheme for

M. Tech.

in

Construction Management

Semester: I, II, III & IV

With Effect from Academic Year 2025-26

Dr. J. M. Shinde
Head of Department

Dr. (Mrs.) S. S. Patil
Dean Academics

Dr. (Mrs.) S. R. Chougule
Director

Prof. P. B. Ghewari
Campus Director



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ABBREVIATIONS

- **L:** Lecture
- **T:** Tutorial
- **P:** Practical
- **ISE-I:** In Semester Evaluation I
- **ISE-II:** In Semester Evaluation II
- **MSE:** Mid Semester Evaluation
- **ESE:** End Semester Evaluation
- **PCC:** Program Core Course
- **PEC:** Program Elective Course
- **OE:** Open Elective Course
- **AEC:** Ability Enhancement Courses
- **AC:** Audit Course
- **ELC:** Experiential Learning Course
- **MDM:** Multidisciplinary Minor Course



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PG Program: Construction Management
Semester: I

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
PCC	P25CM101	Planning, Scheduling & Controlling of Projects	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM102	Cost and Quality Assurance Systems	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM103	Financial Planning and Budgeting of Projects	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PEC	P25CM104	Program Elective-I	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
RM	P25CM105	Research Methodology and IPR	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
ELC	P25CM106	Seminar	-	-	2	1	ISE	50	20	40
							ESE (OE)	50		
PCC	P25CM107	PG Lab-I	-	-	4	2	ISE	50	20	40
							ESE (POE)	50		
AC	P25CM108	Yoga and Meditation	1	-	-	-	-	-	-	-
Total			15	03	06	20		700		
Total Contact Hours - 24						Total Credits - 20				



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PG Program: Construction Management
Semester: II

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
PCC	P25CM201	Construction Contracts Act & Laws	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM202	Resource Management Systems	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM203	Construction Safety	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PEC	P25CM204	Program Elective-II	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
OE	P25CM205	Open Elective-I	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
VEC	P25CM206	Technologies for Industrial Evolution	2	-	-	2	ISE-I	25	20	
							ISE-II	25		
ELC	P25CM207	Mini Project	-	-	2	1	ISE-I	25	20	40
							ISE-II	25		
							ESE (OE)	50		
PCC	P25CM208	PG Lab-II	-	-	4	2	ISE	50	20	40
							ESE (POE)	50		
ELC	P25CM209	Internship/Field Training [#]	-	-	-	-	Will be Evaluated in Sem.-III	-	-	-
Total			17	02	06	22		750		
Total Contact Hours - 25						Total Credits - 22				

It is required to do Four weeks domain specific industrial internship after completing first year of the program evaluated in Semester-III.



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PG Program: Construction Management
Semester: III

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
OE	P25CM301	Open Elective-II ^{\$}	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
MDM	P25CM302	Multi-Disciplinary Minor ^{\$}	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
ELC	P25CM303	Dissertation Phase- I*	-	-	20	10	ISE-I	25	20	40
							ISE-II	25		
							ESE (POE)	50		
ELC	P25CM209	Internship/Field Training [#]	-	-	-	2	ISE	50	20	
Total			06	00	20	18		350		
Total Contact Hours - 26						Total Credits - 18				

\$ It is mandatory to opt these courses certification from SWAYAM/NPTEL, MOOC platform.

** It is required to complete 30% work of Dissertation.*

It is required to do Four weeks domain specific industrial internship after completing first year of the program evaluated in Semester-III



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PG Program: Construction Management
Semester: IV

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
ELC	P25CM401	Dissertation Phase- II*	-	-	40	20	ISE-I	50	40	80
							ISE-II	50		
							ESE (POE)	100	40	
	Total		-	-	40	20		200		
Total Contact Hours - 40						Total Credits - 20				

**It is required to publish two papers out of which at least one paper should be in a SCI/ SCIE/ SCOPUS/ Web of Science/ Peer- Reviewed Journal before Thesis Submission.*

Exit Courses after Semester– II - P.G. Diploma

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
ELC	P25CM209	Internship/Field Training [#]	-	-	-	2	ISE-I	50	40	
							ISE-II	50		
AEC	P25CM210	Employability Skill Development*	4		-	4	ISE	50	40	
							ESE	50		
	Total		04	00	00	06		200		
Total Contact Hours - 04						Total Credits - 06				

**It is mandatory to opt this course certification from SWAYAM/NPTEL MOOC platform*

Four weeks domain specific industrial internship after successfully completing first year of the program.



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PROGRAM ELECTIVE

(Students have to select any one Program Elective course out of 03, for each applicable semester, of their interest, offered by the PG Program from the table below)

Program Elective – I			
Sr. No.	Course Code	Course Name	Semester
1	P25CM104A	Advanced Construction Equipments	I
2	P25CM104B	Value Engineering and Valuation	
3	P25CM104C	Risk Management	

Program Elective – II			
Sr. No.	Course Code	Course Name	Semester
1	P25CM204A	Disaster Management	II
2	P25CM204B	Operation Research	
3	P25CM204C	Building Systems and Services	

MULTIDISCIPLINARY MINOR (MDM)

(Students have to select any one course of their interest (other than a courses offered by their program) for the award of Minor Degree from the table below)

Sr. No.	Course Code	Course Name (MDM)	Semester	Offered by the Department
1	P25CM302	Principles of Construction Management	III	Civil Engineering
2	P25ET302	IoT and its Applications	III	Electronics & Telecommunication Engineering
3	P25CS302	Artificial Intelligence & Machine Learning	III	Computer Science and Engineering
4	P25MD302	Introduction to Industry 4.0 and Industrial Internet of Things	III	Mechanical Engineering
5	P25MP302	Product Life Cycle Management	III	Mechanical Engineering



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OPEN ELECTIVE COURSES

(Students have to select any one Open Elective course, for each applicable semester, of their interest from the basket below.)

Open Elective – I Semester II			Open Elective – II Semester III		
Sr. No.	Course Code	Course Name (OE)	Sr. No.	Course Code	Course Name (OE)
1	P25CM205A	Environment and Development	1	P25CM301A	Labour Welfare and Industrial Relations
2	P25CM205B	Engineering Economics	2	P25CM301B	Sustainable Technology
3	P25CM205C	Project Management	3	P25CM301C	Entrepreneurship Development
4	P25CM205D	Healthcare Engineering	4	P25CM301D	Industrial Automation



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Semester-I

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
PCC	P25CM101	Planning, Scheduling & Controlling of Projects	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM102	Cost and Quality Assurance Systems	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM103	Financial Planning and Budgeting of Projects	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PEC	P25CM104	Program Elective-I	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
RM	P25CM105	Research Methodology and IPR	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
ELC	P25CM106	Seminar	-	-	2	1	ISE	50	20	40
							ESE (OE)	50		
PCC	P25CM107	PG Lab-I	-	-	4	2	ISE	50	20	40
							ESE (POE)	50		
AC	P25CM108	Yoga and Meditation	1	-	-	-	-	-	-	-
Total			15	03	06	20		700		
Total Contact Hours - 24						Total Credits - 20				



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Course Name: Planning, Scheduling & Controlling of Projects Course Code: P25CM101	L	T	P	Credits
	3	1	--	4
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Project Management and Engineering Management

Course Objectives: The course aims,

- 1 To understand the foundational concepts and contributions of management in the context of civil engineering projects.
- 2 To apply project life cycle principles by considering time and cost factors to develop effective project schedules.
- 3 To analyze various techniques and methods for controlling, monitoring, and scheduling construction activities.
- 4 To create cost management strategies and job layout plans using appropriate software tools and staffing processes.

Course Outcomes: Students will be able to

CO1	Compare the contributions of Henry Fayol and Frederick Taylor, and interpret definitions, functions, and styles of management.
CO2	Analyze the project life cycle with respect to time and cost, and explain the roles and responsibilities in project execution.
CO3	Evaluate various controlling and scheduling techniques, apply cost optimization strategies, and manage project schedules effectively.
CO4	Design and implement efficient construction operations by utilizing human resources, site logistics, modern software tools, and communication strategies.

Course Contents

Unit No.	Contents	Hours
1	General Management: Comparison between traditional management and modern scientific management, Contribution of Taylor, Henry Fayol, Management functions, Management styles, Objectives of Management, Management techniques & use, organizations, forms of organizations.	7
2	Project Management: Project life cycle, concept of s-curve between time and cost of project, planning for achieving time, cost, quality, safety requirements of projects, role, and responsibilities of projects Manager, Role of Project Management Consultants on major projects.	7
3	Construction Scheduling & Controlling: Construction Scheduling, LOB technique, Mass haul diagrams. Precedence Network Analysis, Activity cost and time estimation in Bar Chart, CPM, PERT, RPM, Work break down structure, Applications for major construction projects, Monitoring and Control of construction project, Resource Levelling and Smoothing.	7



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4	Cost Analysis: Direct and Indirect cost, Cost analysis, cost curve, optimization and crashing of network for civil engineering projects, updating of network.	7
5	Construction Management: Job layout, Site mobilization – Demobilization, Mass housing, small scale industries, Co-ordinating, communicating & reporting techniques, Organizing and monitoring of the construction work with respect to cost-time schedules.	7
6	Staffing: Its Nature and purpose, selection, appraisal, organizational development. Software Application: Managing information software (MIS), Primavera, Web based project management to construction management, MSP managed service Providers.	7

Text Books:

- 1 T. R. Banga and S. C. Sharma, "*Industrial Engineering and Management including Production Management*", Khanna Publishers, 18th Edition, 2013.
- 2 O. P. Khanna, "*Industrial Engineering and Management*", Dhanpat Rai Publications, Revised Edition, 2010.
- 3 P. S. Gahlot and B. M. Dhir, "*Construction Planning & Management*", New Age International (P) Ltd., 2nd Edition, 2013.
- 4 K. Nagrajan, "*Project Management*", New Age International Ltd., 7th Edition, 2015.
- 5 D. S. Barrie and B. C. Paulson, "*Professional Construction Management*", McGraw Hill Education, 4th Edition, 2013.

Reference Books:

- 1 H. N. Ahuja, "*Project Management*", John Wiley & Sons, 3rd Edition, 1994.
- 2 B. Sengupta and H. Guha, "*Construction Management and Planning*", Tata McGraw-Hill Publishing Company, 2nd Edition, 2002.



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Course Name: Cost and Quality Assurance Systems Course Code: P25CM102	L	T	P	Credits
	3	1	--	4
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Project Management, Estimating, Costing & Quantity Surveying

Course Objectives: The course aims,

- 1 To explain the types and methods of costing, rate analysis, and processes for measuring works.
- 2 To analyze cash inflow and outflow, various payment methods, and billing records for effective financial management.
- 3 To apply quality improvement techniques and safety policies for controlling and monitoring construction activities.
- 4 To evaluate and interpret quality system standards such as ISO and QS to enhance project quality and compliance.

Course Outcomes: Students will be able to

CO1	Explain the types and methods of costing perform rate analysis, and summarize billing and payment processes.
CO2	Determine cash inflow and outflow, and analyze different modes of payment for efficient financial planning.
CO3	Identify and implement quality improvement techniques and safety policies for effective monitoring and control of works.
CO4	Interpret and evaluate quality system standards such as ISO and QS to ensure compliance and continual improvement in construction projects.

Course Contents

Unit No.	Contents	Hours
1	Construction Costing: Costing of construction Works, different methods of costing, types of costs, demand and supply, cost elements in a project, Analysis of rates, Non-scheduled items of work, Cost estimation for a small construction job, Purpose, methods and stages of cost control, cost monitoring, cost forecasting methods.	7
2	Cash Flow and Payment of Works: Determining the funds required for a construction job, preparing cash flow statements, Cash inflow and outflow during contract period, Project expectations and performance models. Precautions in custody of cash, Maintenance of temporary advance and advance account, different types of payment, first running advance and final payments.	7
3	Preparation of Bill and Report: Preparation of bills for payment, measurement book, mode of payment, running account bill, Ledger and Cash book details, Arbitration, Completion report of the project; Checking of Plan, Details of various works and issue of completion report of the	7



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	project.	
4	Quality: Necessity for improving Quality in the context of Global Challenges, Factors influencing construction quality, Concept of Quality Control,	7
5	Quality Assurance: Quality Management and Total Quality Management (TQM), Designing of quality manuals, checklists and inspection reports, installing the quality assurance system, monitoring and control. Quality Assurance Department and quality control responsibilities of the line organization, Quality in foundations and piling work, structural work, Concreting, electrical system building facilities, waste recycling and maintenance.	7
6	Quality Systems: Introduction, Quality system standard, ISO 9000, ISO 14000 and QS 9000 family of standards & requirements, Preparing Quality System Documents, Quality related training, Implementing a Quality system, Bench-marking quality, Design of Quality manuals, checklist and inspection reports, Nonlinear Analysis.	7

Text Books:

- 1 K. K. Chitkara, "*Construction Project Management*", Tata McGraw-Hill Publishing Company, 2nd Edition, 2011.
- 2 P. S. Gahlot and B. M. Dhir, "*Construction Planning and Management*", New Age International Publishers, 2nd Edition, 2007.
- 3 F. W. Mueller, "*Integrated Cost and Schedule Control for Construction Projects*", McGraw-Hill Book Company, 1st Edition, 1991.
- 4 P. Gopalakrishnan and M. Sundaresan, "*Materials Management – An Integrated Approach*", Prentice Hall of India, 1st Edition, 2002.
- 5 A. K. Datta, "*Materials Management: Procedures, Text and Cases*", Prentice Hall of India, 2nd Edition, 2006.

Reference Books:

- 1 Dobbler and Bart, Purchasing and supplies Management, Text and Cases, 6e.
- 2 ISO 9000, ISO 14000 and QS 9000 standards and certifications.
- 3 Schedule of rates, specification manuals etc. from PWD.



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Course Name: Financial Planning and Budgeting of Projects Course Code: P25CM103	L	T	P	Credits
	3	1	--	4
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Engineering Economics and Financial Management

Course Objectives: The course aims,

- 1 To understand the economic principles that influence business operations and financial decision-making in construction projects.
- 2 To explain the principles and practices of working capital management, cost implications, and accounting processes in construction and maintenance.
- 3 To analyze long-term financial planning strategies, various sources of finance, and the role of financial institutions in construction projects.
- 4 To evaluate corporate tax planning, public financial policies, and global financial markets to make informed financial decisions in construction management.

Course Outcomes: Students will be able to

CO1	Identify and analyze the economic environment of construction firms, including factors influencing their size, growth, and economic trends.
CO2	Estimate working capital needs, manage cash flows, supplier payments, and perform cost analysis for financial planning and control.
CO3	Evaluate financial feasibility, risk assessment techniques, financing mechanisms, and prepare master budgets with accurate cash flow forecasting.
CO4	Interpret financial statements, project contract accounts, and assess financial performance using ratio analysis and financial reporting methods.

Course Contents

Unit No.	Contents	Hours
1	Principles of Economics: Importance of the economic background to measurement, objectives of business firm, Factors bearing on size of firms, Motives to growth, Obstacles to growth of firms, Study of present economy.	7
2	Capital: Analysis of need working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Managing payments to suppliers and out standings.	7
3	Economic Analysis: Cost implication to different forms of construction and maintenance and replacement lives of material, Installation and running cost of services, Capital investment in project, Cost analysis by traders and by functional element, Cost planning techniques, Cost control during design and Construction, Depreciation, Various Appraisal Criteria Methods. Break-even analysis, Cash flow analysis, Risk Analysis and Management Practice, Role of Lender's Engineer.	7



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4	Financial Planning and Budgeting: Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves, Over and under capitalization. Budget: Budgetary control system. Types of budgets, Procedure for master budgets, Budget manual, Cash now forecast.	7
5	Corporate Finance: Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction, CIDC- grading of construction entities, Venture Capital Financing- Indian Venture Capital scenario, SEBI regulation, Problems of expansion and merger of companies.	7
6	Construction Accounts: Accounting process, preparation of profit and loss account and balance sheet as per the companies Act, 1956, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis, Escrow Account for PPP Project.	7

Text Books:

- 1 Prasanna Chandra, "*Projects: Planning, Analysis, Selection, Implementation and Review*", Tata McGraw-Hill, New Delhi, 7th Edition, 2009.
- 2 Lianabel Oliver, "*The Cost Management Toolbox: A Manager's Guide to Controlling Costs and Boosting Profits*", Tata McGraw-Hill, 1st Edition, 2000.
- 3 H. Singh, "*Construction Management and Accounts*", Tata McGraw-Hill, New Delhi, 1st Edition, 2006.
- 4 D. Cormican, "*Construction Management: Planning and Finance*", Construction Press, London, 1st Edition, 1991.
- 5 R. A. Brealey, "*Principles of Corporate Finance*", Tata McGraw-Hill, New Delhi, 10th Edition, 2012.

Reference Books:

- 1 Leland T. Blank, Anthony Tarquin, "*Engineering Economy*", McGraw Hill, 7th Edition, 2011.
- 2 David Bedworth, Sabah Randhawa, "*Engineering Economics*", McGraw Hill, 1st Edition, 1990.
- 3 Bruggeman, Fishr, "*Real Estate: Finance and Investment*", McGraw Hill, 13th Edition, 2018.
- 4 Block, Hirt, "*Foundations of Financial Management*", McGraw Hill, 16th Edition, 2017.
- 5 Burner, "*Case Studies in Finance*", McGraw Hill, 7th Edition, 2013.



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Program Elective – I

Sr. No.	Course Code	Course Name	Semester
1	P25CM104A	Advanced Construction Equipments	I
2	P25CM104B	Value Engineering and Valuation	
3	P25CM104C	Risk Management	

Program Elective - I	L	T	P	Credits
Course Name: Advanced Construction Equipments	3	--	--	3
Course Code: P25CM104A	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Construction Equipment

Course Objectives: The course aims,

- 1 To identify various constructions equipment used in building and infrastructure projects.
- 2 To describe the functions and working principles of pumps, excavators, compactors, cranes, and crushers used in construction.
- 3 To compare and analyze different types and methods of excavation, compaction, and material handling equipment based on site requirements.
- 4 To evaluate the suitability and performance of construction equipment for specific construction tasks to ensure efficiency and productivity.

Course Outcomes: Students will be able to	
CO1	Explain the functions of cranes and crushers used in the construction process.
CO2	Interpret the applications of various construction equipment including pumps and compactors.
CO3	Infer the suitable types and methods of excavating and compacting equipment based on site conditions.
CO4	Differentiate and assess the performance of construction equipment to optimize their use in various construction scenarios.

Course Contents

Unit No.	Contents	Hours
1	Introduction: Identification, Planning, Equipment management in projects, various costs associated with equipment's, Maintenance management, Replacement, Cost control of equipment, Depreciation Analysis, Fundamentals of earthwork operations-Earth moving operations, Types of Earthwork Equipment, Tractors, Motor Graders, Scrapers, Front end waders, Earth Movers Equipment for Dredging, Trenching, Tunnelling, Drilling, Blasting, Equipment for compaction-Erection.	8



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2	Pumps: Types of pumps used in construction, Equipment for Dewatering and Grouting, Foundation and Pile Driving Equipment, Forklifts and Related Equipment, Portable Material Bins, Conveyors.	7
3	Excavating Equipment: Power shovels; size, basic parts, selection, factors affecting output, Draglines: - types, size, basic parts, and effect of job and management conditions on the output of dragline. Shortcrete, grouting, grunting, under water concreting, hot and cold weather concrete, pumpabale concrete, special concreting methods.	8
4	Hauling & Compacting Equipment: Clamshells – clamshell buckets, Hoes- basic parts working ranges, Bulldozers-types, moving earth with bull dozers. Types of compacting equipment's, Such as tamping rollers, smooth wheel rollers, pneumatic tyred rollers, and Hoisting equipment's: Chain, hoist, fork trucks.	8
5	Cranes: Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane, Safety in crane operation, Use of cranes in steel construction, Use of cranes in concrete construction.	6
6	Crushers: Types, primary, secondary, tertiary crushers, jaw, gyratory, stone crushers, hammer mills, roll crushers, rod and ball mills screening aggregate, revolving, vibrating screens.	5

Text Books:

- 1 Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992.
- 2 Peter. H. Emmons, "Concrete repair and maintenance illustrated", Golgotha Publications Pvt. Ltd., 2001.Press, 2008.
- 3 Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995.
- 4 Sankar, S. K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.



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Program Elective-I	L	T	P	Credits
Course Name: Value Engineering and Valuation	3	--	--	3
Course Code: P25CM104B	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Professional Practices

Course Objectives: The course aims,

- 1 To describe the concept, importance, and key components of value engineering and valuation in construction projects.
- 2 To explain the phases of job planning, types of function analysis systems, and the principles of life cycle costing.
- 3 To apply value analysis techniques to assess benefits and applications in construction-related scenarios.
- 4 To evaluate construction projects using life cycle costing and valuation methods to enhance decision-making and project efficiency.

Course Outcomes: Students will be able to

CO1	Explain the concepts of value engineering, job planning phases, and life cycle costing in construction projects.
CO2	Interpret the significance, purpose, and methodologies related to valuation and value engineering processes.
CO3	Infer appropriate types of function analysis and value analysis methods applicable to construction scenarios.
CO4	Assess the benefits, applications, and cost-effectiveness of value analysis and life cycle costing in construction decision-making.

Course Contents

Unit No.	Contents	Hours
1	Value: Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic etc., Difference between value engineering, value analysis & value management, Habits, roadblocks, attitudes & their relevance in value engineering.	7
2	Job Plan: Definition & Terms related to Value Engineering Job Plan, Various versions of job plan, Phases involved in job plan.	7
3	Function Analysis: Function- Definition, Role of function in achieving value, Types of function, Function Analysis System Techniques (FAST), Graphical function Analysis	7
4	Value Analysis: Principles of value analysis, Benefits & applications of value analysis, Methods for improving the effectiveness of value analysis.	7
5	Life Cycle Costing: Life cycle costing, Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity	7



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	analysis, Different methods of performing value engineering.	
6	Valuation: Types of value, purposes of valuation factors affecting value, Different methods of valuation for different types of assets such as land and building, horticulture, historical places, Valuation Report: Valuation Report, contents, standard formats, Case study of any one report.	7

Text Books:

- 1 O. P. Khanna, "*Industrial Engineering and Management*", Dhanpat Rai Publications, Revised Edition, 2004.
- 2 T. R. Banga, S. C. Sharma, "*Industrial Organization and Engineering Economics*", Khanna Publications, 22nd Edition, 2010.
- 3 B. N. Dutta, "*Estimating and Costing in Civil Engineering: Theory and Practice*", S. Dutta & Company, Lucknow, 28th Edition, 2005.
- 4 M. Chakraborty, "*Estimating, Costing, Specifications and Valuation in Civil Engineering*", Published by the Author, 4th Edition, 2013.
- 5 G. S. Birdie, "*Estimating and Costing*", Dhanpat Rai Publishing Company, 1st Edition, 2009.

Reference Books:

- 1 Rangwala, "*Estimating and Costing*", Charotar Publishing House, Revised Edition, 2007.
- 2 P. T. Joglekar, "*Practical Information for Quantity Surveyors, Property Valuers, Architects, Engineers and Builders*", Pune Vidyarthi Griha Prakashan, 2008 Reprint.
- 3 Peter Gevorkian, "*Green Buildings: Project Planning and Cost Estimating*", McGraw-Hill, 2008.
- 4 **Lindsey Haselbach**, "*The Engineering Guide to LEED – New Construction: Sustainable Construction for Engineers*", McGraw-Hill, 2008.
- 5 Satish Chandra Agarwala, "*Architecture and Town Planning*", Dhanpat Rai & Co (P) Ltd., 3rd Edition, 2006.



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Program Elective-I	L	T	P	Credits
Course Name: Risk Management	3	--	--	3
Course Code: P25CM104C	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Project management, Engineering Economics and Legal Aspects in Engineering

Course Objectives: The course aims,

- 1 To understand the fundamentals of risk management including types of risk, benefits, and responsibilities.
- 2 To explain various risk analysis techniques such as sensitivity, scenario analysis, decision trees, and simulation methods.
- 3 To apply appropriate risk mitigation strategies and risk coverage mechanisms.
- 4 To evaluate the effectiveness of risk management practices by auditing internal controls

Course Outcomes: Students will be able to

CO1	Understand the importance of energy and the role of energy conservation in effective facility design.
CO2	Outline the principles and objectives of energy management and auditing in building systems.
CO3	Describe relevant technologies, codes, and policies that promote energy conservation in buildings.
CO4	Design energy-efficient and environmentally sustainable buildings using appropriate methods and standards.

Course Contents

Unit No.	Contents	Hours
1	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.	7
2	Risk Analysis: Probability distribution, Stages in Investment life cycle, Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and uncorrelated cash.	7
3	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.	7
4	Risk Mitigation: By elimination, reducing, transferring, avoiding, absorbing or pooling, Residual risk, mitigation of unqualified risk, Coverage of risk through CIDC's .	7
5	Risk Mitigation Policies: Actuarial Society of India programs: through risk premium such as (BIP), Bidding Indemnity Policy (DIMO), Delay in meeting obligation by client policy, (SOC),	7



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	Settlement of claims policy (LOP), Loss of profit policy (TI), Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy.	
6	Risk Management and Internal Control: Internal audit works, control systems, Auditing risk management, setting up internal audit function.	7

Text Books:

- 1 Chris Chapman and Stephen Ward, *"Project Risk Management: Processes, Techniques and Insights"*, Wiley Publications, 2nd edition, 2003.
- 2 Paul Hopkin, *"Fundamentals of Risk Management: Understanding, Evaluating and Implementing Effective Risk Management"*, Kogan Page Publishers, 6th edition, 2022.
- 3 Raghavan Iyengar, *"Risk Management in Projects"*, McGraw Hill Education India, 1st edition, 2015.
- 4 P. K. Gupta, *"Insurance and Risk Management"*, Himalaya Publishing House, 2nd edition, 2018.
- 5 M. R. Raghav achari, *"Risk Management"*, Margham Publications, Revised edition, 2013.

Reference Books:

- 1 Michel Crouhy, Dan Galai, and Robert Mark, *"The Essentials of Risk Management"*, McGraw Hill Professional, 2nd edition, 2014.
- 2 Nigel J. Smith, Tony Merna, and Paul Jobling, *"Managing Risk in Construction Projects"*, Wiley-Blackwell, 3rd edition, 2014.
- 3 Scott E. Harrington and Gregory R. Niehaus, *"Risk Management and Insurance"*, McGraw Hill Education, 2nd edition, 2004.



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Course Name: Research Methodology and IPR Course Code: P25CM105	L	T	P	Credits
	2	--	--	2
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basic knowledge of research methodology

Course Objectives: The course aims,

- 1 To understand the fundamental principles of research methodology.
- 2 To explain the concepts of research design, formulation of research problems and setting research objectives.
- 3 To apply appropriate methods for analyzing research data and structuring effective research studies.
- 4 To analyze the role and importance of Intellectual Property Rights (IPR).

Course Outcomes: Students will be able to

CO1	Understand the basic concepts, types of research, and the importance of research ethics and publication standards.
CO2	Identify suitable research problems and formulate structured research proposals aligned with academic and industry needs.
CO3	Explain the types and significance of Intellectual Property Rights (IPR), and apply the procedures for patent filing and protection.
CO4	Demonstrate the impact of IPR on fostering innovation and evaluate its role in promoting economic and technological growth.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Research Methodology: Meaning, Objectives, Motivation, Types of Research, Research Approaches, Research Process, Criteria of Good Research	5
2	Research Problem and Design: Identifying Research Problem, Literature Survey, Research Objectives, Research Design Concepts, Features of Good Design	5
3	Data Collection and Analysis: Sources of Data, Sampling Methods, Data Processing, Statistical Techniques, Hypothesis Testing, Report Writing.	5
4	Ethics in Research: Ethical Principles, Plagiarism, Impact of Misconduct, Ethical Committees, Publishing Ethics	5
5	Introduction to IPR: Overview of Intellectual Property, Importance of IPR, Types: Patents, Trademarks, Copyrights, Industrial Designs	4
6	IPR Procedures and Case Studies: Patent Filing Procedure, Patentable and Non-patentable Items, Patent Search, Licensing, Case Studies on IPR Disputes	4



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Text Books:

- 1 C. R. Kothari, "*Research Methodology: Methods and Techniques*", New Age International Publishers, 2nd Edition, 2004.
- 2 P. Pandey & S. Pandey, "*Research Methodology: Tools and Techniques*", Bridge Center, 1st Edition, 2015.
- 3 Neeraj Pandey & Khushdeep Dharni, "*Intellectual Property Rights*", PHI Learning Pvt. Ltd., 1st Edition, 2014.
- 4 T. Ramappa, "*Intellectual Property Rights under WTO: Tasks Before India*", S. Chand Publishing, 2nd Edition, 2008.

Reference Books:

- 1 Ranjit Kumar – “Research Methodology: A Step-by-Step Guide”, Sage Publications.
- 2 T. Ramakrishna – “Basic Principles and Acquisition of Intellectual Property Rights”, CIPRA, NLSIU.
- 3 V. Scaria – “Intellectual Property Rights in the Global Era”, LexisNexis.



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Experiential Learning Course

	L	T	P	Credits
Course Name: Seminar	--	--	2	1
Course Code: P25CM106	ISE-I	MSE	ISE-II	ESE (OE)
	25	--	25	50

Pre-Requisite: Core Subject Knowledge, Technical Writing Skill and Presentation Skill

Course Objectives: The course aims,

- 1 To encourage students to explore, analyze, and present emerging research trends in Electronics and Telecommunication.
- 2 To develop the ability to conduct in-depth technical literature reviews using scholarly and scientific sources.
- 3 To improve technical writing and documentation skills through structured report writing.
- 4 To build confidence in delivering academic and professional presentations.
- 5 To strengthen communication, critical thinking, and professional ethics in the context of Construction Management innovations.

Course Outcomes: Students will be able to

CO1	Identify advanced and emerging topics relevant to the E&TC field.
CO2	Perform critical literature reviews using peer-reviewed journals and industry sources.
CO3	Write a well-structured technical report using proper formatting, citation, and referencing styles.
CO4	Deliver a formal seminar presentation with clarity, coherence, and confidence.
CO5	Effectively respond to technical queries and participate in academic discussions.
CO6	Demonstrate academic integrity, professional ethics, and independent learning

Course Contents

Sr. No.	Guidelines
1	Topic Selection: <ul style="list-style-type: none"> • The topic should be recent, innovative, and relevant to the Construction Management domain (e.g., risk analysis, management techniques etc.). • Finalize in consultation with a Guide.
2	Literature Survey: <ul style="list-style-type: none"> • Use IEEE Xplore, Springer, Elsevier, Science Direct, ACM, Wiley etc. • Minimum 15–20 references from recent publications (preferably last 5 years). • Maintain a citation style (IEEE preferred in Construction Management).
3	Report Writing: <ul style="list-style-type: none"> • Cover Page with title, student name, guide name, institution.



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	<ul style="list-style-type: none">• Abstract (150–250 words).• Introduction.• Literature Review.• Technical Discussion / Methodology.• Challenges and Research Gaps.• Conclusion and Future Scope.• References (IEEE format).
4	Presentation: <ul style="list-style-type: none">• Duration: 12–15 minutes + 5 minutes Q&A.• Use professional PowerPoint Slides:<ul style="list-style-type: none">○ 12–20 slides covering title, abstract, objectives, literature review, analysis, conclusion.• Include diagrams, block diagrams, or simulation results if applicable.
5	Submission Requirements: <ul style="list-style-type: none">• Final seminar report (spiral bound and PDF).• Presentation files (PPT/PDF).



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	L	T	P	Credits
Course Name: PG Laboratory-I	--	--	4	2
Course Code: P25CM107	ISE-I	MSE	ISE-II	ESE (POE)
	25	--	25	50

Pre-Requisite: Project Management

Course Objectives: The course aims,

- 1 To develop an understanding of project management fundamentals.
- 2 To analyze scheduling techniques such as CPM, PERT, and PDM along with network diagrams.
- 3 To apply project management software tools for resource assignment.
- 4 To evaluate project performance through tracking progress, baseline comparison, resolving resource over-allocations.

Course Outcomes: Students will be able to	
CO1	Understand project management fundamentals.
CO2	Analyze task dependencies, network diagrams, calendars, critical paths, float values, and resource allocation.
CO3	Apply project management software tools to create WBS, assign resources, and define milestones.
CO4	Evaluate project performance through progress tracking, baseline setting, and resource leveling.

Course Contents

Experiment No.	Contents
1	Introduction to Project Management, Project Definition, Characteristics, Phases, Start with Planning & WBS
2	Activity Relationship (FS, SS, FF & SF), Network Diagram (CPM, PERT & PDM), Finding Project Duration & Critical Path, Float or Slack Value, Using Lead & Lag
3	User Interface, Calendar Definition & Types (Standard, Night Shift & 24 hrs.), Assigning Project & Task Calendar
4	Project & Task Information, Draw Network Diagram by Task Relationship, Critical Task & Project Summary Task
5	WBS Creation, Mile Stone, Defining Code & Outlining, Time Scale Settings, Bar Style & Grid Lines
6	Resource Sheet Preparation, Resource Assigning, Resource Information, Cost Rate Table & Assignment Information
7	Finding Resource Over allocation, Resource Usage sheet Preparation (Manually), Resource Levelling Methods (Theory), Levelling Options,



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8	Resource Graph Tracking Progress, Tracking Types, Steps of Tracking, Baseline Creation & Status Date
9	Table, View, Filter & Group Customization, Constraints, Recurring Task & Custom Fields

Note: The students are expected to perform minimum 05 experiments from the above list.

Audit Course



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Course Name: Yoga and Meditation Course Code: P25CM108 / P25CS108 / P25ET108 / P25MD108 / P25MP108	L	T	P	Credits
	1	--	--	--
	ISE-I	MSE	ISE-II	ESE
	--	--	--	--

Pre-Requisite: Basic understanding of human anatomy and interest in physical and mental well-being

- Course Objectives: The course aims,**
- 1 To explore the philosophical and psychological foundations of Yoga and Meditation.
 - 2 To introduce and practice the Eight Limbs of Yoga (*Ashtanga Yoga*) for holistic self-regulation.
 - 3 To train students in meditation, breathing, and ethical practices for enhancing clarity, focus, and emotional balance.
 - 4 To help students integrate yogic wisdom and mindfulness

Course Outcomes: Students will be able to

CO1	Comprehend the core teachings of <i>Yoga Sutras</i> .
CO2	Practice foundational yogic techniques.
CO3	Apply principles of <i>Yama</i> and <i>Niyama</i> for improved discipline, ethics, and self-awareness.
CO4	Develop concentration and mindfulness for stress reduction and productivity.

Course Contents

Unit No.	Contents	Hours
1	Foundations of Yoga Philosophy: Origin and evolution of Yoga; Introduction to Yoga Sutras. Definition of Yoga – " <i>Yogas Chitta Vritti Nirodha</i> ". The five <i>Vrittis</i> (mental fluctuations) and their control.	3
2	Ethical and Personal Discipline (Yama & Niyama): The five Yamas – Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha. The five Niyamas – Shaucha, Santosha, Tapas, Svadhyaya, Ishwar Pranidhana. Relevance of Yama-Niyama in academic and professional life.	3
3	Physical & Mental Purification (Asana, Pranayama, Pratyahara): <i>Asana</i> – Role of posture; stability and comfort in the body, <i>Pranayama</i> – Breath control techniques; calming the nervous system, <i>Pratyahara</i> – Withdrawal of senses; mastering inner awareness	4
4	Concentration, Meditation, and Liberation (Dharana, Dhyana, Samadhi): <i>Dharana</i> – Developing concentration and focus, <i>Dhyana</i> – The process and practice of meditation, <i>Samadhi</i> – State of absorption; experiencing inner peace and unity.	4

Reference Books:

- 1 Swami Satchidananda, *The Yoga Sutras of Patanjali*, Integral Yoga Publications, Revised Edition, 2012.



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- 2 B.K.S. Iyengar, *Light on the Yoga Sutras of Patanjali*, HarperCollins Publishers India, 1st Edition, 1996.
 - 3 Swami Satyananda Saraswati, *Four Chapters on Freedom*, Bihar School of Yoga, 7th Edition, 2008.
 - 4 Swami Vivekananda, *Raja Yoga*, Advaita Ashrama, 13th Edition, 2010.



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Semester: II

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
PCC	P25CM201	Construction Contracts Act & Laws	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM202	Resource Management Systems	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PCC	P25CM203	Construction Safety	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
PEC	P25CM204	Program Elective-II	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
OE	P25CM205	Open Elective-I	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
VEC	P25CM206	Technologies for Industrial Evolution	2	-	-	2	ISE-I	25	20	
							ISE-II	25		
ELC	P25CM207	Mini Project	-	-	2	1	ISE-I	25	20	40
							ISE-II	25		
							ESE (OE)	50		
PCC	P25CM208	PG Lab-II	-	-	4	2	ISE	50	20	40
							ESE (POE)	50		
ELC	P25CM209	Internship/Field Training [#]	-	-	-	-	Will be Evaluated in Sem.-III		-	-
Total			17	02	06	22	750			
Total Contact Hours - 25						Total Credits - 22				

It is required to do Four weeks domain specific industrial internship after completing first year of the program evaluated in Semester-III.



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Course Name: Construction Contracts Act & Laws Course Code: P25CM201	L	T	P	Credits
	3	1	--	4
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Professional Practices

Course Objectives: The course aims,

- 1 To comprehend professional ethics and the legal aspects of construction contracts.
- 2 To introduce students to the fundamentals of contract law.
- 3 To understand construction claims, legal remedies, and special contract types.
- 4 To familiarize students with the principles and practices of dispute resolution in construction, focusing on the Indian Arbitration Act.

Course Outcomes: Students will be able to

CO1	Interpret and apply contract laws and ethical practices in construction, and manage stakeholder relationships.
CO2	Differentiate between valid, void, and voidable contracts, interpret essential contract clauses, and apply legal principles.
CO3	Identify and manage various types of construction claims, and handle legal processes.
CO4	Apply arbitration procedures, assess the role of stakeholders in dispute prevention, and utilize alternate dispute resolution (ADR) methods.

Course Contents

Unit No.	Contents	Hours
1	Contracts Administration: Professional ethics, standard forms of building contracts, conditions of contracts, Contract formation, contracts with various stakeholders on a major Construction projects, rights of owners, adjoining owners and third parties, project management consultants, contractor, contract performance, contract correspondence and contract closure, Global tenders and B.O.T. System.	10
2	Contract System and Acts: Various types, Importance & clauses of contract, The Indian Contract Act (1872): Objectives of the act, Definition of the contract, Valid, Voidable, and Void contracts, Sale of Goods Act.	7
3	Construction Claims, Injunctions and Bailment: Extra items and causes of claims, Types of construction claims, documentation, settlement of claims, and extension of time, Injunctions, Types:- temporary, perpetual, mandatory, Indemnity & Guarantee- difference between the two, Contracts of Guarantee & Indemnity, Consideration for Guarantee, Surety's liability, discharge of surety, Bailment- Nature of transaction, delivery of Bailee.	8
4	Arbitration Awards & Dispute Resolving Boards: Indian Arbitration Act, arbitration agreement, conduct of arbitration, power and duties of arbitrator, rules of evidence/preparation	8



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	and publication of awards, methods of enforcement, impeding and award, Limitations of arbitration in the Indian context (DRB s) Dispute resolving boards-necessity, formation, functioning advantages, Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation.	
5	Industrial Act and Labour Laws, Administration of Incentive Schemes: Industrial Dispute Acts, payment of wages act, Minimum Wages Act, Indian Trade Union Act, and Workmen's Compensation Act. Labour welfare fund act 1953, Necessity, Merit rating, job evaluation, installation, modification and maintaining and incentive scheme based on implementation experience.	9

Text Books:

- 1 B. N. Dutta, "*Estimating and Costing in Civil Engineering: Theory and Practice*", S. Dutta & Company, Lucknow, latest edition
- 2 B. S. Patil, "*Civil Engineering Contracts and Estimates*", Universities Press (India) Private Limited, latest edition
- 3 Joseph T. Bockrath, "*Contracts and the Legal Environment for Engineers and Architects*", McGraw Hill, 1st edition, 2000.
- 4 Kwaku A. Tenah, Jose M. Guevara, "*Fundamentals of Construction Management and Organisation*", Prentice Hall, 1st edition, 1985.
- 5 G. T. Gajaria, "*Laws Relating to Building and Engineering Contracts in India*", M.M. Tripathi Private Ltd., 1st edition, 1982.

Reference Books:

- 1 Jimmie Hinze, "*Construction Contracts*", McGraw Hill, 1st edition, 2001.
- 2 Jack Meredith & Samuel Mantel, "*Project Management: A Managerial Approach*", Wiley India, latest edition
- 3 Dennis Lock, "*Project Management*", Gower Publishing, England, latest edition
- 4 The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.



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Course Name: Resource Management Systems Course Code: P25CM202	L	T	P	Credits
	3	1	--	4
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Engineering Management

- Course Objectives: The course aims,**
- 1 To introduce students to the principles and practices of materials management in the construction industry.
 - 2 To gain the knowledge of systematic material management techniques.
 - 3 To learn of inventory control techniques and store management in construction.
 - 4 To estimate equipment requirements based on work cycles, time constraints, and project volume.

Course Outcomes: Students will be able to

CO1	Interpret the strategic role of materials management; perform key functions related to procurement and inventory control.
CO2	Apply inventory control methods, optimize material usage and storage, and prevent losses and wastage.
CO3	Calculate the number and cost of construction equipment needed for specific tasks and maintain equipment records.
CO4	Apply HRD and HRM principles, design training programs, and develop strategies for building skilled and competent human resources.

Course Contents

Unit No.	Contents	Hours
1	Materials Management: Importance of materials management and its role in construction industry-scope, objectives and functions, integrated approach to materials management, Role of materials manager.	7
2	Material Planning and Analysis: Classification and Codification of materials of construction, ABC analysis-Procedure and its use, Standardization in materials and their management, Procurement, identification of sources of procurement, vendor analysis, Vendor analysis concept of (MRKP) Material requirement planning, planning, purchase procedure, legal aspects.	7
3	Inventory Management: Inventory Control techniques. EOQ, Advantages and limitation of use of EOQ, Periodic ordering, order point control, safety stock, stock outs, application of ABC analysis in inventory control, Stores Management: Receipt and inspection, care and safety in handling, loss on storage, wastage, Bulk purchasing, site layout and site organization, scheduling of men, materials and equipment.	7
4	Materials Management Systems: Applications of material management system, planning of MMS, procurement, inventory, control, cost control etc.	7



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5	Equipment Management: Working out number of construction equipment required based on the individual equipment work cycle, and based on the total time available and quantum of work, working out the total hourly cost and the cost per unit of item for the various construction machinery, Concept of equipment log book, Concept of equipment selection based on optimal used.	7
6	Human Resource Development: Flow diagram of human resource development and human resource management, Training, competency development, capacity building of resources required at grass root level and at the managerial level in construction.	7

Text Books:

- 1 K. S. Menon, "*Purchasing and Inventory Control*", Wheeler Publishing, 1st edition
- 2 Dr. Mahesh Verma, "*Construction Equipment Planning and Applications*", Tata McGraw Hill, 1st edition
- 3 R. L. Peurifoy, "*Construction Planning, Equipment and Methods*", Tata McGraw Hill Publications, 7th edition, 2005.
- 4 Biswajeet Pattanayak, "*Human Resource Management*", PHI Learning Pvt. Ltd., 3rd edition, 2014.
- 5 George Bohlander & Scott Snell, "*Managing Human Resources*", Cengage Learning, 16th edition, 2012.

Reference Books:

- 1 TERI, "*Sustainable Building - Design Manual: Sustainable Building Design Practices*", TERI Press, 1st edition, 2009.
- 2 M. G. Shah, C. M. Kale, S. Y. Patki, "*Building Drawing*", Tata McGraw-Hill Education, 5th edition
- 3 Peter Gevorkian, "*Green Buildings*", McGraw-Hill, 1st edition
- 4 Satish Chandra Agarwala, "*Architecture & Town Planning*", Dhanpat Rai & Co (P) Ltd., 1st edition
- 5 Loretta Hall Haselbach, "*The Engineering Guide to LEED: New Construction – Sustainable Construction for Engineers*", McGraw-Hill, 1st edition, 2008.



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Course Name: Construction Safety Course Code: P25CM203	L	T	P	Credits
	3	--	--	3
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Building Materials and Construction and Project Management

Course Objectives: The course aims,

- 1 To Learn about the causes construction accidents.
- 2 To Understand the different construction safety management and the safety measures in civil structures.
- 3 To Interpret the various safety concepts, requirements applied to construction Project.
- 4 To Learn about the safety training program and safety polices.

Course Outcomes: Students will be able to

CO1	Understand the fundamental causes of construction accidents, human factors, legal implications, and government safety regulations.
CO2	Explain the roles and responsibilities of various stakeholders in construction safety management and the procedures.
CO3	Apply appropriate safety measures, equipment handling procedures, and accident prevention techniques.
CO4	Evaluate the effectiveness of safety policies, training programs, job-site assessments.

Course Contents

Unit No.	Contents	Hours
1	Construction Accidents: Accidents and their Causes, Human Factors in Construction Safety, Costs of Construction Injuries, Occupational and Safety Hazard Assessment, Legal Implications Accident Prevention: Principles of accident prevention; job safety analysis; fault tree analysis; accident management.	7
2	Construction Safety Management: Introduction to Construction Safety and Safety Technology Government's policy in industrial safety, safety & health legislation in India, Construction Sites (Safety) Regulations, Codes of practice, Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring, Writing safety manuals, preparing safety checklists and inspection reports.	8
3	Safety in Typical Civil Structures: Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, water Tanks, Retaining walls, etc. safety at various stages of construction, Critical factors for failure, Prevention of accidents, Regular Inspection and monitoring, Safety measures.	7
4	Safety in Use of Construction Equipment: Vehicles, cranes, hoist and lifts etc., Safety of scaffolding and working platforms, Safety in Erection and closing operation, Safety while using electrical appliances, Explosives.	6



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5	<p>Safety Process: Workplace ergonomics, first aid and emergency preparedness, Safety Culture, Safe Workers, Safety and First Line Supervisors, Safety and Middle Managers, Top Management Practices, Company Activities and Safety, Safety Personnel, Sub contractual Obligation, Project Coordination and Safety Procedures , Workers Compensation.</p>	7
6	<p>Safety Training Programs and Safety Policies: Construction Safety Management and Accident Prevention Safety training, safety policy, Safety Meetings, safety committees, safety inspection, safety audit, reporting accidents and dangerous occurrences, Safety Incentives. Problem areas in Construction Safety, Elements of an Effective Safety Programme, Job-Site Safety Assessment, , Methods, equipment, and training provided on any ISO approved Construction Company, safety in office.</p>	7

Text Books:

- 1 NICMAR Mumbai, "*Safety Management in Construction Industry – A Manual for Project Managers*", National Institute of Construction Management and Research, 1st edition, 2002.
- 2 Bureau of Indian Standards, "*ISI for Safety in Construction*", BIS Publications
- 3 Giri Maldi and Simonds, "*Safety Management*", AITBS Publishers, New Delhi, Revised edition, 2008.

Reference Books:

- 1 V. S. Davies and K. Thomasin, "*Construction Safety Handbook*", Telford Publications, 2nd edition, 1996.
- 2 National Safety Commission of India, "*Construction Safety Manual*", NSCI Publications, 1st edition, 2010.



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Program Elective – II

Sr. No.	Course Code	Course Name	Semester
1	P25CM204A	Disaster Management	II
2	P25CM204B	Operation Research	
3	P25CM204C	Building Systems and Services	

Program Elective-II	L	T	P	Credits
Course Name: Disaster Management	3	--	--	3
Course Code: P25CM204A	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basic Management Principles, Environmental Science or Engineering

Course Objectives: The course aims,

- 1 To introduce students to the fundamental concepts of disasters and hazards, along with their significance in both global and Indian contexts.
- 2 To educate students on various types and impacts of manmade disasters such as chemical, industrial, nuclear, and fire hazards.
- 3 To develop an understanding of disaster management policies, including their objectives, legal, financial, and administrative frameworks.
- 4 To equip students with knowledge of disaster management measures across all phases and the roles of key institutions like NIDM and NDMA.

Course Outcomes: Students will be able to

CO1	Identify various types of natural disasters and assess their direct, indirect, and long-term impacts on society and the environment.
CO2	Recognize manmade disaster risks and evaluate contributing human and environmental factors.
CO3	Analyze disaster management policies and interpret legal, financial, and administrative coordination during emergency response.
CO4	Develop and implement effective disaster mitigation and preparedness plans through risk assessment and the use of structural defense measures.

Course Contents

Unit No.	Contents	Hours
1	Disasters in Construction: Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change. Natural Disasters - Natures and extent of disasters, natural calamities such as earthquake, floods, drought, coasts hazards, cloud burst, Avalanches, Cyclone, landslides etc.	7



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2	Manmade Disasters: Chemical and industrial hazards, nuclear hazards, fire hazards, etc., Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	7
3	Management: Objective of disaster management policy, Paradigm shift in disaster management, Policy and administration: Importance and principles of disaster management policies, command and coordination in disaster management. Financing relief expenditure, legal aspects, rescue operations, casualty management, and risk management, study of flowchart showing the entire process.	7
4	Aspect: Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams, International relief aid agencies and their role in extreme events.	7
5	Public Awareness and Emergency Management Program: Administrative setup and organization, Hazard analysis, training of personnel, information management, emergency facilities and equipment necessary. Importance of public awareness, Preparation and execution of emergency management program , Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India, Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations, Use of Internet and softwares for effective disaster management, Applications of GIS, Remote sensing and GPS in this regard.	8
6	Disaster Measure: Pre-disaster, during disaster and post-disaster measures in some events in general Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication, Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk.	6

Text Books:

- 1 S. Vaidyanathan, "*An Introduction to Disaster Management: Natural Disasters and Man-Made Hazards*", Ikon Books, 1st edition, 2010.
- 2 Seetharaman, "*Construction Engineering and Management*", Umesh Publications, Revised edition, 2005.
- 3 K. Nagarajan, "*Project Management*", New Age International Ltd., 6th edition, 2017.
- 4 Jack Pinkowski, "*Disaster Management Handbook*", CRC Press (Taylor and Francis Group), 1st edition, 2008.



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Program Elective-II	L	T	P	Credits
Course Name: Operation Research	3	--	--	3
Course Code: P25CM204B	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Optimization Technique

Course Objectives: The course aims,

- 1 To understand and apply the fundamental principles of Operations Research, including optimization techniques such as Gradient Methods and Newton's Method.
- 2 To formulate and solve Linear Programming Problems (LPP) using appropriate methods like the Graphical Method, Simplex Method, and Big M-method.
- 3 To analyze and solve transportation and assignment problems for efficient resource allocation and cost minimization.
- 4 To understand the concepts and applications of queuing theory and game theory in decision-making processes.

Course Outcomes: Students will be able to

CO1	Analyze mathematical models for civil engineering systems and apply operations research methods.
CO2	Interpret and solve Linear Programming Problems using methods like the Graphical Method, Simplex Method, Big M-method, duality, and perform sensitivity analysis.
CO3	Solve specialized linear programming problems such as transportation and assignment problems for optimal resource allocation.
CO4	Interpret the applications of queuing models and compute key performance measures relevant to service systems.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Operations Research: Introduction, Use of Operations Research in Civil Engineering and Managerial Decision making process, Structure of the Mathematical Model, Limitations of Operations Research, Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction, Multivariable optimization with and without constraints, Gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/descent technique, Newton's Method, Lagrange Multiplier Technique.	6
2	Linear Programming: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, duality, Sensitivity Analysis, Civil engineering applications.	8
3	Transportation Problem: Formulation, solution, Assignment problem, unbalanced Transportation problem, finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and	6



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	MODI method.	
4	Integer, Dynamic and Non-Linear programming: Integer programming Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique, Introduction to Decomposition algorithms. Dynamic programming Multi stage decision processes, Principle of optimality, Recursive equation, Application of D.P., Decision theory. Non-Linear programming: Single variable unconstrained optimization –Local & Global optima, Uni-modal Function- Sequential Search Techniques: Dichotomous, Fibonacci, Golden Section methods.	8
5	Simulation: Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte- Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation.	7
6	Queuing Theory and Game Theory: Queuing Theory, Simulation, Sequencing model, n jobs through 2, 3 and M machines, Competitive games, rectangular game, saddle point, minimax, maximin method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle, Rectangular games without saddle point – mixed strategy for 2 X 2 games.	7

Text Books:

- 1 H. A. Taha, *"Operations Research – An Introduction"*, Prentice Hall, 7th edition, 2002.
- 2 A. Ravindran, D. T. Phillips, and J. J. Solberg, *"Operations Research: Principles and Practice"*, John Wiley and Sons, 2nd edition, 2009.
- 3 F. S. Hiller and G. J. Liebermann, *"Introduction to Operations Research"*, Tata McGraw Hill, 7th edition, 2002.
- 4 S. D. Sharma, *"Operations Research"*, Kedar Nath Ram Nath, Meerut, Revised edition, 2010.
- 5 Kanti Swarup, P. K. Gupta, and Man Mohan, *"Operations Research"*, Sultan Chand & Sons, 15th edition, 2014.

Reference Books:

- 1 Shah, Kale, and Patki, *"Building Drawing"*, Tata McGraw-Hill Education, 5th edition, 2008.
- 2 Jacky Gevorkian, *"Green Buildings"*, McGraw-Hill Education, 1st edition, 2008.
- 3 Lorraine G. Haselbach, *"The Engineering Guide to LEED: New Construction – Sustainable Construction for Engineers"*, McGraw-Hill, 1st edition, 2008.
- 4 Satish Chandra Agarwala, *"Architecture & Town Planning"*, Dhanpat Rai & Co. (P) Ltd., Revised edition, 2010.



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Program Elective-II	L	T	P	Credits
Course Name: Building Systems and Services	3	--	--	3
Course Code: P25CM204C	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Building Planning & Design

Course Objectives: The course aims,

- 1 To understand the principles of acoustical design and noise control methods used in buildings.
- 2 To gain knowledge of thermal behavior, insulation materials, and environmental control for effective thermal design.
- 3 To acquire skills for designing and maintaining domestic and commercial water supply and drainage systems.
- 4 To introduce the principles and practices of rainwater harvesting and building ventilation for sustainable architectural planning.

Course Outcomes: Students will be able to

CO1	Design acoustically sound and well-lit building environments by evaluating lighting requirements strategies.
CO2	Evaluate and design thermally efficient building enclosures using appropriate insulation materials.
CO3	Design safe and efficient electrical wiring layouts along with vertical transportation systems.
CO4	Plan and design efficient water supply and drainage systems while applying proper installation techniques.

Course Contents

Unit No.	Contents	Hours
1	Acoustics and Lighting: Acoustical Designs, Noise and its control, Natural and artificial Light in Building, Lighting, Measurement, Design of Lighting system.	7
2	Material Planning and Analysis: Thermal properties of buildings, Thermal insulation and insulating material, Thermal design of enclosures, Thermal environment inside building, cooling & heating loads, Centralized systems of air-conditioning.	7
3	Electrical Services: Electric wiring system in building, conductor, cable & conduits, Elevators, Escalators and conveyer, Design, Type, Location, bye- laws etc.	7
4	Water Supply Systems: Domestic and commercial Hot water and water supply system for multi-storeyed buildings, Swimming pools-Design criteria, Springboards, pressure filters for recirculation, maintenance. Drainage system: Nature of Drainage phenomenon, Ant siphon & vent piping - Installation, pipe joinery, External drainage System in building, Design aspects of Sewage Treatment Plants.	8
5	Fire Fighting in Buildings & Other services and Approvals: Controlling features in architectural planning Norms for fire prevention and mitigation measures, Fire rating of materials, Fire control devices. Gas services & distribution piping, Roof water harvesting & water conservation, Approval of authorities for water supply.	8



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6	Rain Water Harvesting: Introduction to rainwater harvesting, concept of rainwater gutters, rainwater outlet & down tank systems Ventilation: Definition, necessity of ventilation, functional requirements, various system & selection criteria.	5
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Text Books:

- 1 V. O. Kusen and C. M. Harris, "*Acoustical Designing in Architecture*", John Wiley & Sons, 1st edition, 1991.
- 2 R. L. Suri, "*Acoustic Designing & Practice*", Asia Publishing House, 1st edition, 1980.
- 3 B. Govoni, "*Main Climate & Architecture*", Elsevier Publishing Co., 1st edition, 1982.
- 4 J. P. Van Straaten, "*Thermal Performance of Buildings*", Elsevier Publishing Co., 1st edition, 1967.

Reference Books:

- 1 Functional requirement of building (other than Industrial Building), BIS Handbook
- 2 SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
- 3 I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings



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Open Elective Courses – I

Sr. No.	Course Code	Course Name
1	P25CM205A	Environment and Development
2	P25CM205B	Engineering Economics
3	P25CM205C	Project Management
4	P25CM205D	Healthcare Engineering

Open Elective-I	L	T	P	Credits
Course Name: Environment and Development	3	--	--	3
Course Code: P25CM205A / P25CS205A / P25ET205A / P25MD205A / P25MP205A	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basic Knowledge of Environmental Science and Sustainable Practices

Course Objectives: The course aims,

- 1 To understand the interrelationship between environment and development
- 2 To identify and examine the impacts of developmental activities on ecosystems and biodiversity.
- 3 To analyze the principles of sustainable development, environmental ethics, and green technologies.
- 4 To evaluate national and international strategies, policies, and practices .

Course Outcomes: Students will be able to

CO1	Understand the linkages between environment and human development, and their influence on ecological systems.
CO2	Analyze the impact of developmental activities on natural resources, ecosystems, and biodiversity.
CO3	Apply principles of sustainability and green technologies to address environmental challenges in real-world scenarios.
CO4	Interpret and propose climate change mitigation strategies based on global environmental patterns and policy frameworks.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Environment and Development: Definition and Scope, Need for Sustainable Development, Historical Background, and Environmental Movements.	7
2	Natural Resources and Environmental Degradation: Types of Natural Resources, Resource Depletion, Land Degradation, Pollution and Biodiversity Loss.	7



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3	Sustainable Development and Environmental Ethics: Principles of Sustainability, Environmental Ethics, Ecological Footprint, Green and Clean Technologies.	7
4	Climate Change and Global Concerns: Climate Change Causes and Impacts, Global Warming, Carbon Cycle, Adaptation and Mitigation Strategies.	7
5	Policy and Governance: Environmental Policies, Acts and Protocols (India & Global), Role of Government and NGOs, Environmental Impact Assessment (EIA).	7
6	Contemporary Issues and Case Studies: Urbanization and Environment, Renewable Energy, Case Studies on Sustainable Practices in India and Abroad.	7

Text Books:

- 1 Rajagopalan R., "*Environmental Studies: From Crisis to Cure*", Oxford University Press, 3rd edition, 2016.
- 2 Erach Bharucha, "*Textbook of Environmental Studies*", University Grants Commission (UGC), 1st edition, 2005.
- 3 Sharma P.D., "*Ecology and Environment*", Rastogi Publications, 13th edition, 2010.

Reference Books:

- 1 Cunningham W.P. & Cunningham M.A., "*Principles of Environmental Science*", Tata McGraw-Hill, 2nd edition, 2004.
- 2 Botkin D.B. & Keller E.A., "*Environmental Science: Earth as a Living Planet*", Wiley India, 8th edition, 2011.
- 3 Sachs J.D., "*The Age of Sustainable Development*", Columbia University Press, 1st edition, 2015.



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Open Elective-I	L	T	P	Credits
Course Name: Engineering Economics	3	--	--	3
Course Code: P25CM205B / P25CS205B / P25ET205B / P25MD205B / P25MP205B	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Management Information Systems (MIS)

Course Objectives: The course aims,

- 1 To understand fundamental economic concepts and cost analysis in engineering.
- 2 To apply interest formulas and cash flow techniques to evaluate alternatives.
- 3 To analyse depreciation and asset replacement decisions.
- 4 To evaluate public vs private projects with cost-benefit considerations.

Course Outcomes: Students will be able to

CO1	Understand the foundational principles of engineering economics.
CO2	Apply value engineering techniques and interest formulas.
CO3	Analyze and compare project alternatives using cash flow-based evaluation methods.
CO4	Evaluate economic life, maintenance strategies, and public versus private financing options.

Course Contents

Unit No.	Contents	Hours
1	Introduction Engineering Economy: Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering – Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis, P – V ratio, Elementary economic Analysis– Material selection for product, Design selection for a product, Process planning.	7
2	Value Engineering: Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications– Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor–equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.	8
3	Cash Flow: Methods of comparison of alternatives – Present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, Cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, Cost dominated cash flow diagram), rate of return method, Examples in all the	7



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	methods.	
4	Replacement And Maintenance Analysis: Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with an ewasset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.	7
5	Depreciation: Depreciation – Introduction, Straight line method of depreciation, – Declining balance method of depreciation – Sum of the years digits method of depreciation, – Sinking fund method of depreciation/Annuity method of depreciation, service output method of depreciation – Evaluation of public alternatives – Introduction – Examples – Inflation adjusted decisions – Procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.	8
6	Financing & Public vs Private Projects: Financing sources, economic evaluation in public projects, social costs, and regulatory factors.	5

Text Books:

- 1 Panneer Selvam, R., "*Engineering Economics*", Prentice Hall of India Ltd., New Delhi, 2001.
- 2 Suma Damodaran, "*Managerial Economics*", Oxford University Press, 2006.
- 3 Stonier, A.W. and Hague, D.C., "*A Textbook of Economic Theory*", Pearson Publications, Revised Edition.

Reference Books:

- 1 Sampat Mukherjee, "*Modern Economic Theory*", New Age International Publishers, Revised Edition.
- 2 DeGarmo, E. Paul, "*Engineering Economics*", Prentice Hall, 12th Edition.
- 3 Bo Södersten, "*International Economics*", Macmillan Publishers, 3rd Edition.



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Open Elective-I	L	T	P	Credits
Course Name: Project Management	3	--	--	3
Course Code: P25CM205C / P25CS205C / P25ET205C / P25MD205C / P25MP205C	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Engineering Mathematics, Engineering Physics, Engineering Mechanics

Course Objectives: The course aims,

- 1 To understand fundamentals of project management including project life cycle, stakeholders, and organizational structures.
- 2 To develop planning and scheduling skills using tools like WBS, CPM, and PERT.
- 3 To apply cost, quality, risk, and resource management techniques for effective project execution.
- 4 To enhance decision-making and leadership skills required for monitoring, controlling, and successful project completion.

Course Outcomes: Students will be able to

CO1	Explain project management concepts, project life cycle, and roles of stakeholders.
CO2	Prepare project plans using scheduling and network techniques such as CPM and PERT.
CO3	Analyze project costs, risks, quality, and resources for effective control.
CO4	Evaluate project performance and apply modern tools for successful project closure.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Project management: Definition of project and project management, Characteristics of a project, Project life cycle phases, Project vs operations, Role of project manager, Project stakeholders, Project organization structures (functional, matrix, projectized)	7
2	Project Identification and Selection: Project identification methods, Feasibility study (technical, economic, financial, social), Project selection techniques, Cost-benefit analysis, Project charter, Project scope definition, Work Breakdown Structure (WBS).	7
3	Project Planning and Scheduling: Project planning process, Bar charts and milestone charts, Network techniques, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Time estimation, Float and slack analysis.	7
4	Project Cost and Resource Management: Project cost estimation techniques, Budgeting and cost control, Earned Value Analysis (EVA), Resource planning and allocation, Resource leveling, Project procurement management.	7
5	Project Risk and Quality Management: Concept of project risk, Risk identification and	7



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	classification, Risk analysis (qualitative and quantitative), Risk mitigation strategies, Quality planning and assurance, Total Quality Management (TQM), Six Sigma concepts in projects.	
6	Project Monitoring, Control, and Closure: Project monitoring techniques, Performance measurement, Project control systems, Project communication management, Project documentation, Project audit, Project termination and closure, Introduction to project management software (MS Project).	7

Text Books:

- 1 K.K. Chitkara, *Project Management: Planning, Implementation and Control*, Tata McGraw-Hill Education.
- 2 Prasanna Chandra, *"Projects: Planning, Analysis, Selection, Financing, Implementation and Review"*, McGraw Hill Education, 9th Edition, 2019.
- 3 B. B. Goel, *"Project Management: Principles and Techniques"*, Deep & Deep Publications, 1st Edition, 2002.
- 4 P. K. Ghosh, *Project Management*, Oxford University Press.

Reference Books:

- 1 Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, Wiley, 12th Edition.
- 2 Dennis Lock, *"Project Management Handbook"*, Gower Publishing, 9th Edition, 2013.
- 3 Erik W. Larson, Clifford F. Gray, *Project Management: The Managerial Process*, McGraw-Hill Education, 8th Edition.
- 4 Jack R. Meredith & Samuel J. Mantel Jr., *Project Management: A Managerial Approach*, Wiley India.



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Open Elective-I	L	T	P	Credits
Course Name: Health Care Engineering	3	--	--	3
Course Code: P25CM205D / P25CS205D / P25ET205D / P25MD205D / P25MP205D	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Human Biology

Course Objectives: The course aims,

- 1 To understand how the healthcare system works and what challenges it faces.
- 2 To learn how to improve hospital services using planning and optimization methods.
- 3 To study how patient waiting lines and hospital processes can be modeled and improved.
- 4 To explore new technologies like AI, remote care, and digital tools in future healthcare.

Course Outcomes: Students will be able to

CO1	Recall fundamental components of healthcare systems, including resource planning, queuing models, data flows, and innovations in digital health.
CO2	Interpret and formulate mathematical models for workforce optimization, facility layout, patient queuing, and healthcare delivery systems
CO3	Apply optimization, queuing theory, and simulation methods to enhance healthcare system efficiency, throughput, and patient experience.
CO4	Evaluate emerging healthcare technologies and simulation outcomes to improve clinical operations, policy design, and access to quality care.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Healthcare System: Facets of a Healthcare System, Size of a Healthcare System, Health Insurance and Financing, Healthcare Services, Healthcare Ecosystem, Healthcare System Challenges, Access to Healthcare, Healthcare Systems Engineering, Understanding Delivery of Data and Processes: Types of Healthcare Data, National Datasets, Healthcare Delivery Process Data, Process Throughput	7
2	Healthcare Resource Workforce and Access to Care Optimization: Optimization, Supply-Demand Matching, Assignment Models, Facility Optimization, Developing Facility Layout to Minimize Travel Wastage, Considering Multiple Conflicting Objectives, Optimization using a Modeling Language	7
3	Modeling Patient Queues: Kendall's Notation for Queuing Systems, Little's Law, Markovian Queuing Models: M/M/1, M/G/1 Queuing Model, Modeling Interconnected Services using Queuing Networks,	7



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4	Healthcare System Simulation: Building a Simulation Study Framework, Event Calendars in Discrete Event Simulation, Input Modeling in Simulation, Output Analysis in Simulation, Estimation in a Non-Terminating, Non-Stationary System: Emergency Department, Simulation of a Hospital Queuing Network	7
5	Future of Healthcare: Shifting from Volume to Value, Evidence-Based Medicine, Personalized Medicine, Vision of the Future, Connected Medicine. Disease and Condition Management: Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantable, Digital Health and Therapeutics, AI, Conversational AI.	7
6	Making and rationalizing decisions: Drug discovery, 3-D printing, Personalized prosthetics, Bio-printing and tissue engineering, Pharmacology and devices, Education, Gene therapy, Virtual and Augmented Reality, Merged Reality, Pain Management, Physical Therapy, Nursing and Delivery of Medicine, Virtual Appointments and Classrooms, Block-chain, Patient Record Access., Applications of AI in Healthcare.	7

Text Books:

- Sanjay Mehrotra, Kevin Bui, and Hari Balasubramanian, "*Healthcare Engineering*", Springer, 1st Edition, 2023.
- Arjun Panesar, "*Machine Learning and AI for Healthcare*", Apress, 1st Edition, 2019.

Reference Books:

- S. M. Dehkordi, L. Monsef, T. Huschka, *Healthcare Systems Engineering*, Springer, 1st Edition
- Dinesh Kumar, *Health Systems: Planning, Organization and Management*, Oxford University Press, 1st Edition
- Paul M. Griffin (Ed.), *Healthcare Systems Engineering*, Wiley, 1st Edition



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Value Enhancement Course

Course Name: Technologies for Industrial Evolution Course Code: P25CM206	L	T	P	Credits
	2	--	--	2
	ISE-I	MSE	ISE-II	ESE
	50	--	50	--

Pre-Requisite: Engineering Management and Project Management

Course Objectives: The course aims,

- To help students understand the evolution of the construction industry and the role of modern technologies.
- To introduce tools and technologies that enhances construction quality, safety, and efficiency.
- To develop skills in planning and tracking construction projects using project management software.
- To explore the application of smart technologies in optimizing time, cost, and resource utilization in construction projects.

Course Outcomes: Students will be able to

CO1	Explain the role of digital tools in enhancing construction processes and recognize the benefits of adopting emerging technologies.
CO2	Apply modern construction tools to improve on-site activities and project planning efficiency.
CO3	Utilize digital tools to monitor project timelines, costs, and performance metrics effectively.
CO4	Analyze risks using simulation and data-driven tools to ensure timely and cost-effective project delivery.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Industrial Evolution and Modern Construction: How industries evolved from Industry 1.0 to Industry 5.0, Introduction to digital technologies in construction, Why technology is important in modern projects.	5
2	Technologies Used in Construction Projects: Use of BIM (Building Information Modeling), Drones for site surveys and monitoring, 3D printing for faster construction, Automation in construction equipment, Using AR/VR for better design understanding.	5
3	Tools for Project Monitoring and Control: Use of software like Primavera, MS Project, and PMIS, Creating and tracking project schedules, Measuring performance with KPIs and dashboards, Using EVM (Earned Value Management) to compare actual vs. planned work.	5
4	Automation and Smart Use of Resources: IoT for tracking materials and equipment, AI for planning and maintenance, Robotics in construction, Lean methods and Just-In-Time (JIT) delivery, Preparing the workforce for automation.	5
5	Simulation, Data Analysis, and Risk Management: Using data to make better project decisions, Simulation tools like Monte Carlo for risk prediction, Risk identification and analysis,	4



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	Tools like sensitivity analysis for decision-making.	
6	Sustainable Construction and Future Trends: Green building technologies, Saving energy through smart designs, Government rules and safety in construction, Importance of cyber security in digital systems, Future trends like smart cities, digital twins, Industry 5.0	4

Text Books:

- 1 K.K. Chitkara, *Construction Project Management: Planning, Scheduling and Controlling*, Tata McGraw-Hill.
- 2 Garold D. Oberlender, *Project Management for Engineering and Construction*, McGraw-Hill Education.
- 3 Willem Kymmell, *Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations*, McGraw-Hill Education.
- 4 Roy Chudley and Roger Greeno, *Construction Technology*, Pearson Education.

Reference Journals:

- 1 "Artificial Intelligence in Construction Engineering and Management" by Limao Zhang, Heng Li, and Cheng Zhang, Springer journal
- 2 "The Internet of Things in the Industrial Sector: Security and Device Connectivity" by Zaigham Mahmood, Springer journal
- 3 "Construction 4.0: An Innovation Platform for the Built Environment" by Anil Sawhney, Saeed Rokooei, Daniel Modesitt, Routledge journal



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Experiential Learning Course

	L	T	P	Credits
Course Name: Mini-Project	--	--	2	1
Course Code: P25CM207	ISE-I	MSE	ISE-II	ESE (OE)
	25	--	25	50

Pre-Requisite:

- 1 Basic and advanced knowledge of Project Management
- 2 Fundamentals, Functions and Techniques of construction management
- 3 Familiarity with research methodology and technical report writing.

Course Objectives: The course aims,

- 1 To identify and analyze engineering problems relevant to the Construction Management domain using foundational concepts.
- 2 To apply theoretical knowledge and engineering tools for the design, simulation, and implementation of management systems.
- 3 To foster self-directed learning, teamwork, and project management in a multidisciplinary engineering environment.
- 4 To build effective communication skills through documentation, report writing, and technical presentations.

Course Outcomes: Students will be able to

CO1	Identify and analyze real-world engineering problems using domain-specific knowledge.
CO2	Design and implement electronic systems or subsystems using appropriate simulation tools and hardware platforms.
CO3	Demonstrate effective teamwork and project management in completing assigned tasks within deadlines.
CO4	Prepare well-structured technical reports and deliver oral presentations with clarity and professionalism.

Course Contents

Sr. No.	Guidelines
1	Activities involved: <ol style="list-style-type: none"> 1. Mini project should be undertaken individually. 2. Topic should be relevant to construction management with focus on problem solving, innovation, or application 3. A detailed proposal should be submitted with problem statement, objectives, methodology, and timeline 4. Regular progress reviews should be conducted (at least two internal reviews) 5. Implementation can be software-based (MSP, Primavera, GIS, REVIT etc.) 6. Emphasis should be placed on originality, practical relevance, and feasibility 7. Maintain a project logbook detailing weekly progress, issues faced, and resolutions



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	<p>8. Final submission must include a well-structured report, simulation/implementation files, and presentation</p> <p>9. Viva-voce will be conducted to assess individual contribution and understanding</p>
2	<p>Format for Report (Spiral Bound & Soft Copy)</p> <ol style="list-style-type: none">1. Cover Page2. Certificate (Guide + Head of Department)3. Declaration4. Acknowledgement5. Abstract6. Table of Contents7. List of Figures/Tables (if applicable)8. Chapters:<ul style="list-style-type: none">o Introductiono Literature Reviewo Problem Statemento Objectiveso Data Collection and Methodologieso Implementation and Testing (if applicable)o Results and Discussionso Conclusion and Future Work9. References (IEEE format)10. Appendix (if applicable)
3	<p>Deliverables</p> <ul style="list-style-type: none">✚ Mini Project Proposal (hard copy & soft copy – before implementation begins)✚ Weekly Progress Logbook signed by the guide✚ Final Project Report in hard copy and PDF (as per the given format)✚ Working Model/Simulation Output (if applicable)✚ Presentation Slides (PPT)✚ Final Viva & Demonstration before PRC✚ Source Code/Design Files on CD/pen drive or shared via link



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Experiential Learning Course

	L	T	P	Credits
Course Name: PG Laboratory-II	--	--	4	2
Course Code: P25CM208	ISE-I	MSE	ISE-II	ESE (POE)
	25	--	25	50

Course Objectives: The course aims,

- 1 To provide practical exposure to construction processes.
- 2 To enhance understanding of on-site safety protocols.
- 3 To develop skills in project supervision and coordination.
- 4 To familiarize trainees with construction equipment, materials, and quality control practices.

Course Outcomes: Students will be able to

CO1	Improve practical knowledge of construction activities.
CO2	Interpret and apply construction drawings and specifications.
CO3	Understand the safety and quality standards of construction site.
CO4	Develop the effective communication and teamwork skills in a real-world project environment.

Course Contents

Sr. No.	Contents
1	One site visit to study the feasibility aspects, Tendering procedures, accounting systems, funds raising and other financial management aspects, billing procedures etc. associated with on-going major construction work-visit report to be submitted.
2	Study and use of various computer softwares, use in the field associated with Project.
3	One certification of management software such as REVIT or MSP or Primavera etc. is required

Note: The students are expected to complete any two from the above list and submit report of it.



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	L	T	P	Credits
Course Name: Internship / Field Training	--	--	--	2
Course Code: P25CM209	ISE-I	MSE	ISE-II	ESE
	25	--	25	--

Pre-Requisite:

- 1 Completion of core PG coursework in Construction Management.
- 2 Basic technical and communication skills.
- 3 Awareness of industrial tools, platforms, or technologies relevant to the chosen domain.
- 4 Readiness for professional work ethics and environment
- 5 Resume and basic documentation (cover letter, academic transcripts).

Course Objectives: The course aims,

- 1 To bridge the gap between academic learning and industry practices.
- 2 To expose students to real-world engineering environments and team collaboration.
- 3 To develop domain-specific technical skills through hands-on experience.
- 4 To enhance understanding of innovation, industry standards, and regulatory practices.
- 5 To build professional and interpersonal communication skills.
- 6 To enable understanding of innovation, standards, and regulatory practices in industry.

Course Outcomes: Students will be able to

CO1	Identify industrial problems relevant to their field of specialization
CO2	Demonstrate technical and professional skills acquired during the internship
CO3	Analyze industrial processes and workflows
CO4	Evaluate the role of engineering knowledge in solving practical problems
CO5	Develop industry-oriented solutions or contributions to assigned tasks
CO6	Prepare and present a professional internship report

Sr. No.	Guidelines
1	<p>Activities Involved</p> <ol style="list-style-type: none"> 1. Identifying and applying to companies or R&D organizations. 2. Completion of internship spanning 4 weeks. 3. Hands-on work under assigned construction industry mentors. 4. Weekly task updates and feedback sessions. 5. Final presentation and submission of training report.
2	<p>Requirements</p> <ul style="list-style-type: none"> • Internship should be in the construction industry related to construction work. • Prior approval must be taken from the Internship/Training Coordinator. • Maintain a daily logbook recording work done, observations, and reflections.



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	<ul style="list-style-type: none">• Internship certificate must be obtained from the industry at the end of the training.• Students are required to submit:<ol style="list-style-type: none">a) Internship Completion Certificateb) Internship Report (format below)c) Logbook or Weekly Activity Sheetd) Presentation and Viva before Evaluation Panel.
3	Internship Report Format (Hardbound Copy) <ol style="list-style-type: none">1. Cover Page (Institute, Title, Student Name, Industry Name, Duration)2. Certificate from Institute3. Certificate from Company4. Acknowledgment5. Table of Contents6. Chapter 1: Introduction – Overview of the organization and objectives7. Chapter 2: Training Activities – Tasks performed, tools used, departments visited8. Chapter 3: Technical Learning – Concepts, skills, technologies learned9. Chapter 4: Analysis and Outcomes – Contributions made, learnings, challenges10. Chapter 5: Conclusion – Summary and future scope11. References (if applicable)12. Appendices – Screenshots, tools used, code samples (if allowed)



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Semester: III

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
OE	P25CM301	Open Elective-II ^{\$}	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
MDM	P25CM302	Multi-Disciplinary Minor ^{\$}	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
ELC	P25CM303	Dissertation Phase- I*	-	-	20	10	ISE-I	25	20	40
							ISE-II	25		
							ESE (POE)	50	20	
ELC	P25CM209	Internship/Field Training [#]	-	-	-	2	ISE	50	20	
Total			06	00	20	18		350		
Total Contact Hours - 26						Total Credits - 18				

\$ It is mandatory to opt these courses certification from SWAYAM/NPTEL, MOOC platform.

* It is required to complete 30% work of Dissertation.

It is required to do Four weeks domain specific industrial internship after completing first year of the program evaluated in Semester-III



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Open Elective – II

Sr. No.	Course Code	Course Name
1	P25CM301A	Labour Welfare and Industrial Relations
2	P25CM301B	Sustainable Technology
3	P25CM301C	Entrepreneurship Development
4	P25CM301D	Industrial Automation

Open Elective-II	L	T	P	Credits
Course Name: Labour Welfare and Industrial Relations	3	--	--	3
Course Code: P25CM301A / P25CS301A / P25ET301A / P25MD301A / P25MP301A	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Labour Laws

Course Objectives: The course aims,

- 1 To Provide an in-depth understanding of labour welfare concepts and principles.
- 2 To Study the evolution and framework of industrial relations in India.
- 3 To Analyze the role of trade unions, collective bargaining, and dispute resolution mechanisms.
- 4 To Evaluate labour policies, legislation, and welfare measures with real-world applications.

Course Outcomes: Students will be able to

CO1	Define and explain the concepts of labour welfare and industrial relations.
CO2	Analyze the role of trade unions, employee participation, and dispute resolution mechanisms.
CO3	Examine labour laws and welfare measures applicable in industrial settings.
CO4	Evaluate the effectiveness of industrial relations strategies in promoting harmony and productivity.

Course Contents

Unit No.	Contents	Hours
1	Introduction to Labour Welfare: Concept of labour welfare and its importance, Principles and types of labour welfare, Role of the government and employers in labour welfare, Statutory and non-statutory welfare measures	7
2	Industrial Relations Framework: Evolution and scope of industrial relations, Objectives and importance of industrial relations, Approaches to industrial relations, Role of stakeholders (government, employers, employees)	7
3	Trade Unions in India: Trade unions: concept, structure, and functions, Growth of trade union movement in India, Trade union legislation, Role of trade unions in industrial relations, Challenges faced by trade unions	7



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4	Collective Bargaining and Employee Participation: Concept and process of collective bargaining, Types and importance of collective bargaining, Workers' participation in management, Joint management councils, Works committees	7
5	Industrial Disputes and Resolution Mechanisms: Causes and effects of industrial disputes, Methods of dispute resolution (conciliation, arbitration, adjudication), Role of grievance redressal systems, Disciplinary procedures	7
6	Labour Legislation and Contemporary Issues: Overview of key labour laws (Factories Act, Trade Unions Act, Industrial Disputes Act), Recent changes in Indian labour codes, Case studies on labour welfare and industrial relations, Emerging trends and challenges	7

Text Books:

- 1 Sinha, P.R.N., Sinha, I.B., and Shekhar, S.P. – *Industrial Relations, Trade Unions, and Labour Legislation*, Pearson Education
- 2 Mamoria, C.B. and Mamoria, S. – *Dynamics of Industrial Relations*, Himalaya Publishing House

Reference Books:

- 1 Monappa A., Nambudiri R. & Selvaraj, P. – *Industrial Relations and Labour Laws*, 2nd Edition, McGraw Hill
- 2 Srivastava, S.C. – *Industrial Relations and Labour Laws*, Vikas Publishing
- 3 Indian Labour Codes & Government Publications – Ministry of Labour and Employment

MOOC/NPTEL Platform:

- 1 NPTEL: https://onlinecourses.nptel.ac.in/noc25_mg159/preview



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Open Elective-II	L	T	P	Credits
Course Name: Sustainable Technology	3	--	--	3
Course Code: P25CM301B / P25CS301B / P25ET301B / P25MD301B / P25MP301B	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basic knowledge of science, environment, and technological applications, Awareness of current environmental challenges and sustainability needs.

Course Objectives: The course aims,

- 1 To introduce the concepts and principles of sustainable development and technology.
- 2 To evaluate the impact of current technologies on environmental, social, and economic systems.
- 3 To explore clean and green technologies that promote sustainability.
- 4 To enable students to design or adopt sustainable solutions for real-world applications.

Course Outcomes: Students will be able to

CO1	Explain the core principles of sustainability and sustainable development
CO2	Analyze various sustainable technologies in energy, water, and waste sectors
CO3	Evaluate lifecycle and environmental impact of a given technology
CO4	Propose sustainable technology solutions for specific local/global issues

Course Contents

Unit No.	Contents	Hours
1	Introduction to Sustainable Development and Technology: Sustainability principles, triple bottom line, SDGs, environmental degradation, ecological footprint, carbon emissions, circular economy	7
2	Sustainable Energy Technologies: Renewable energy sources, solar PV, wind, hydropower, biomass, green hydrogen, energy efficiency, smart grids	7
3	Sustainable Water and Sanitation Technologies: Rainwater harvesting, water purification technologies, wastewater treatment, greywater recycling, low-flow devices, SDG 6 focus.	7
4	Sustainable Waste Management: Waste hierarchy (Reduce-Reuse-Recycle), e-waste, composting, biodegradable packaging, plastic alternatives, waste-to-energy	7
5	Green Building and Smart Infrastructure: Energy-efficient building materials, passive solar design, green rating systems (LEED, GRIHA), smart cities, sustainable transportation	7
6	Life Cycle Assessment and Sustainable Innovation: LCA tools and methods, carbon footprint tools, eco-design, green product innovation, sustainable entrepreneurship, case studies	7



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Text Books:

- 1 Sustainable Engineering: Concepts, Design and Case Studies – D. Allen, D. Shonnard.
- 2 Sustainability Principles and Practice – Margaret Robertson.

Reference Books:

- 1 Green Technologies and Environmental Sustainability – R. Raveendran
- 2 Reports from UNEP, NITI Aayog, MoEFCC.

MOOC/NPTEL Platform:

- 1 **NPTEL:** Sustainable Engineering Concepts and Life Cycle by Prof. Brajesh Kumar Dubey, IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc25_ce117/preview



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Open Elective-II	L	T	P	Credits
Course Name: Entrepreneurship Development	3	--	--	3
Course Code: P25CM301C / P25CS301C / P25ET301C / P25MD301C / P25MP301C	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basics of Management, Market Research Fundamentals, Financial Accounting Basics.

Course Objectives: The course aims,

- 1 To introduce the fundamental concepts and evolution of entrepreneurship, including the role of creativity and innovation.
- 2 To enable students to recognize business opportunities and develop viable business models using structured techniques.
- 3 To equip students with knowledge of business planning, financial feasibility, legal structures, and institutional support for startups.
- 4 To explore funding strategies, growth management, and emerging trends in entrepreneurship and intrapreneurship.

Course Outcomes: Students will be able to

CO1	Explain the concepts, types, and evolution of entrepreneurship along with the importance of innovation.
CO2	Apply opportunity recognition and business modeling techniques like BMC and lean startup.
CO3	Analyze the feasibility of a business idea considering financial, legal, and institutional frameworks.
CO4	Evaluate different funding options and growth strategies, including emerging trends in entrepreneurship.

Course Contents

Unit No.	Contents	Hours
1	Fundamentals of Entrepreneurship: Definition, types and evolution of entrepreneurship, Entrepreneur vs intrapreneur, Importance of creativity and innovation in venture creation.	7
2	Opportunity Recognition & Business Models: Idea generation techniques - brainstorming, TRIZ, SCAMPER, Market research and feasibility analysis, Business Model Canvas and lean startup methodology.	7
3	Business Planning and Project Feasibility: Components of a business plan, Cost-benefit analysis - NPV, IRR, ROI, Financial planning, budgeting, cost structures.	7
4	Legal & Institutional Framework: Business entity types - sole proprietorship, LLP, Pvt. Ltd, Registration processes, IPR fundamentals - patents, trademarks, Schemes and support - Start-up India, SIDBI, NABARD.	7
5	Financing and Growth Management: Funding sources - bootstrapping, angel investors, VC, loans, Scaling strategies, growth stages, risk management, Role of incubation, accelerators, and mentorship.	7
6	Emerging Entrepreneurship Trends: Social, rural, digital entrepreneurship, Corporate	7



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intrapreneurship dynamics, Technology-driven ventures and ecosystem trends.

Text Books:

- 1 Engineering Entrepreneurship: From Idea to Business Plan – Paul Swamidass, Cambridge University Press, 2015.
- 2 The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Crown Business, 2011.
- 3 Entrepreneurship Development, S. Anil Kumar, Scientific Publishers, 2019.

Reference Books:

- 1 Disciplined Entrepreneurship: 24 Steps to a Successful Startup, Bill Aulet, Wiley, 2013.
- 2 Opportunity Recognition in Entrepreneurial Teams, Maureen McKelvey, Per Davidsson, Leif Wennberg, Springer, 2021.
- 3 Effectuation: Elements of Entrepreneurial Expertise, Saras D. Sarasvathy, Edward Elgar, 2008, 2nd ed. 2021.



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Open Elective-II	L	T	P	Credits
Course Name: Industrial Automation	3	--	--	3
Course Code: P25CM301D / P25CS301D / P25ET301D / P25MD301D / P25MP301D	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite:Electrical Networks and Control, Digital Electronics Basics.

Course Objectives: The course aims,

- 1 To familiarize students with the hierarchical structure of industrial automation systems and various sensing technologies used in the industry.
- 2 To impart knowledge of process control systems and tuning techniques including PID controllers and advanced control methods.
- 3 To train students in PLC programming, sequential control, and industrial networking protocols for automation.
- 4 To introduce advanced automation technologies including IIoT, CNC, robotics, and cyber-secure smart manufacturing systems.

Course Outcomes: Students will be able to

CO1	Explain the structure of industrial automation systems and describe the working principles of common industrial sensors and actuators.
CO2	Apply PID tuning techniques to control processes using feedback loops, cascade control, and feed-forward methods.
CO3	Develop ladder and structured text programs for automation using PLCs and integrate industrial communication protocols (e.g., Modbus, Profibus).
CO4	Analyze and evaluate the integration of advanced automation systems like SCADA, IIoT, and robotics for Industry 4.0 implementations.

Course Contents

Unit No.	Contents	Hours
1	Architecture and Sensing in Industrial Automation: Overview of Automation Systems - Architecture, CPS, levels of automation, discrete vs process systems, Industrial Sensors and Signal Conditioning - Temperature, pressure, displacement, flow, force sensors; calibration, error analysis and conditioning circuits.	7
2	Process Control and PID Techniques: Fundamentals of Control Systems - Feedback loops, stability, controller types, PID Controllers - P/PI/PID tuning methods Ziegler–Nichols, feed-forward, cascade, predictive control.	7
3	Sequence Control and PLC Programming: Components of a business plan, PLC Basics - Hardware architecture, scan cycle, I/O interfacing, Programming in Ladder and Structured Control - Relay logic, timers, counter blocks, structured design.	7



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4	Fieldbus Protocols, SCADA and DCS: Industrial Communication Networks -Modbus, Profibus, HART, Fieldbus, Ethernet/IP, SCADA/DCS Architecture and HMI - Data acquisition, historian logs, alarms, cyber security, OPC UA.	7
5	Actuators and Drive Systems: Actuator Technologies - Hydraulic, pneumatic valves, electric drives, stepper and servo motors, Drive Systems and VFDs - Variable frequency drives, speed control, energy-efficient operation.	7
6	Advanced Automation and Industry 4.0 Integration: CNC & Robotics Basics - Machine tool control loops, robotic manipulators, grippers, kinematics, IIoT, Analytics and Cyber security - Edge computing, data analytics, smart manufacturing and automation system security.	7

Text Books:

- 1 Industrial Automation: Hands-On, Frank Lamb, McGraw-Hill, 1st ed., 2013
- 2 Industrial Automation Solutions for PLC, SCADA, Drive and Field Instruments – Sanjay B. Katariya, Notion Press, 2020.
- 3 Industrial Automation and Process Control – Jon Stenerson, Prentice Hall, 2003.

Reference Books:

- 1 Standard Handbook of Industrial Automation – Douglas M. Considine & Glenn D. Considine, Springer, 1st ed., 1987.
- 2 Instrumentation for Process Measurement and Control – Norman A. Anderson, Chilton Company, 3rd ed., Circa 1990.
- 3 Industrial Automation from Scratch, Olushola Akande, Packt Publishing, 2023.



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Multi-Disciplinary Minor (MDM)

Sr. No.	Course Code	Course Name (MDM)	Semester	Offered by the Department
1	P25CM302	Principles of Construction Management	III	Civil Engineering
2	P25ET302	IoT and its Applications	III	Electronics & Telecommunication Engineering
3	P25CS302	Artificial Intelligence & Machine Learning	III	Computer Science and Engineering
4	P25MD302	Introduction to Industry 4.0 and Industrial Internet of Things	III	Mechanical Engineering
5	P25MP302	Product Life Cycle Management	III	Mechanical Engineering

Course Name: Principles of Construction Management Course Code: P25CM302	L	T	P	Credits
	3	--	--	3
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Project Management

Course Objectives: The course aims,

- 1 To understand the construction management principles, emphasizing the interdisciplinary nature of construction projects and project life cycle phases.
- 2 To gain the knowledge and skills required for accurate cost estimation in construction.
- 3 To introduce students to the fundamentals of project planning and scheduling.
- 4 To impart knowledge of effective resource management, project monitoring, and control techniques.

Course Outcomes: Students will be able to	
CO1	Comprehend the importance of construction management and describe the various phases of a project life cycle.
CO2	Identify and apply various types of cost estimation methods, material quantities, and cost analysis.
CO3	Create project schedules and interpret network diagrams such as CPM and PERT.
CO4	Apply resource leveling and allocation methods, utilize project monitoring and control systems, and implement quality control.



Course Contents

Unit No.	Contents	Hours
1	Introduction and Project Organization: Overview of construction management and its importance, Interdisciplinary nature of construction projects, Project life cycle and different phases, and Project organization structures and roles.	7
2	Cost Estimation: Types of cost estimation, Estimating quantities of materials, Cost breakdown and analysis, and Running account bills and payment procedures.	7
3	Construction Economics: Economic decision-making in construction, Depreciation of construction equipment, Time value of money and its application, and Financial planning and funding of projects.	7
4	Planning and Scheduling: Introduction to project planning and scheduling, Developing project schedules, Network diagrams (e.g., CPM, PERT), Critical path analysis.	7
5	Planning and Scheduling & Quality Management: Resource leveling and allocation, Project monitoring and control systems, Quality control in construction, and Quality assurance and standards.	7
6	Safety Management & Legal Aspects: Introduction to construction safety, Accidents in the construction industry, Safety organization and responsibilities, Legal issues in construction management, and Contract administration and relevant laws.	7

Text Books:

- 1 V.N. Vazirani & S.P. Chandola, *Construction Management and Accounts*, Khanna Publishers.
- 2 L.S. Srinath, *PERT and CPM – Principles and Applications*, East-West Press.
- 3 Jimmie Hinze, *Construction Contracts*, McGraw Hill Education.

Reference Books:

- 1 Kumar Neeraj Jha, *Construction Project Management: Theory and Practice*, Pearson Education India.
- 2 R.L. Peurifoy & Clifford J. Schexnayder, *Construction Planning and Equipment*, McGraw Hill.
- 3 R.L. Brauer, *Construction Safety Management*, Wiley Publications
- 4 Chris Hendrickson & Tung Au, *Project Management for Construction*, Carnegie Mellon University.

MOOC/NPTEL Platform:

- 1 NPTEL: https://onlinecourses.nptel.ac.in/noc25_ce95/preview or https://onlinecourses.nptel.ac.in/noc24_ce57/preview or <https://nptel.ac.in/courses/105104161>



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Course Name: IoT and its Applications Course Code: P25ET302	L	T	P	Credits
	3	--	--	3
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite: Basic knowledge of electronics, embedded systems and computer networking

Course Objectives: The course aims,

- 1 To introduce the foundational concepts, architecture, and enabling technologies of the Internet of Things (IoT).
- 2 To develop understanding of sensor networks, wireless protocols, and IP-based communication in IoT systems.
- 3 To provide insight into data acquisition, storage, analytics, and cloud computing platforms relevant to IoT.
- 4 To explore real-world applications of IoT across domains and address associated ethical and legal considerations.

Course Outcomes: Students will be able to

CO1	Describe the structure, components, and communication architecture of IoT systems.
CO2	Compare and apply various wireless technologies and IP-based protocols for IoT applications.
CO3	Implement basic IoT solutions using development platforms and interface them with cloud services for data logging and visualization.
CO4	Evaluate the potential of IoT in sectors such as healthcare, agriculture, industry, and smart cities considering ethical and legal implications.

Course Contents

Unit No.	Contents	Hours
1	Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M	7
2	Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, Raspberri Pi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT	7
3	Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT: IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols.	7
4	Data Handling & Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to	7



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	Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications.	
5	Cloud computation: Evolution of Cloud Computation, Commercial clouds and their features, open source IoT platforms, cloud dashboards, Interfacing and data logging with cloud: Blync, Thing speak, platforms.	7
6	Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.	7

Text Books:

- 1 Adrian Mcewen, Hakin Cassimally, Designing The Internet of Things, First Edition, Wiley
- 2 The Internet of Things: Enabling Technologies and Solutions for Design and Test, Application Note, 2016.
- 3 Vijay Madiseti, Arshdeep Bahga, Internet of Things A Hands-On- Approach

Reference Books:

- 1 Raj Kamal, Internet of Things: Architecture and Design, McGraw Hill.2nd edition June 2022
- 2 Pethuru Raj, Anupama C. Raman, The Internet of Things Enabling Technologies, Platforms, and Use Cases, Taylor and Francis group. February 2017
- 3 Peter Waher, Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3, First Edition, Packt Publishing, 2018



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Course Name: Artificial Intelligence & Machine Learning Course Code: P25CS302	L	T	P	Credits
	3	--	--	3
	ISE-I	MSE	ISE-II	ESE
	10	30	10	50

Pre-Requisite:

- Course Objectives: The course aims,**
- 1 Apply AI techniques to solve the given problems.
 - 2 Implement trivial AI techniques on relatively large system
 - 3 Explain uncertainty and Problem-solving techniques.
 - 4 Compare various learning techniques.

Course Outcomes: Students will be able to

CO1	Identify and analyze AI-based problems.
CO2	Apply appropriate techniques and advanced search methods.
CO3	Discuss and apply various learning techniques.
CO4	Design expert systems.

Course Contents

Unit No.	Contents	Hours
1	Introduction to AI : Basic Concepts of AI and State space search, Introduction to unguided and guided search	7
2	Heuristic Search and Intelligent Learning Methods: Problems in search and solutions, Genetic algorithms, Neural Networks, BPNN, learning process in BPNN	7
3	Advanced Search, Planning, and Problem Solving: Some other search methods and Admissibility, Planning, Game Playing	7
4	Game Playing and Knowledge Representation: Minimax and other game playing algorithms , using predicate logic for Knowledge Representation	7
5	Advanced Knowledge Representation and Reasoning: Resolution and non-monotonic reasoning, Strong methods for knowledge representation, Fuzzy logic and certainty factors (CD)	7
6	Expert Systems and Machine Learning Concepts: Scripts and introduction to expert systems, Developing expert systems, Basics of machine learning	7



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Text Books:

- 1 Stuart J. Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, 4th edition, 2021.
- 2 Elaine Rich, Kevin Knight, Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd edition, 2017.

Reference Books:

- 1 Elaine Rich, Kevin Knight, Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd edition (Indian Adaptation), 2019.
- 2 Wolfgang Ertel, Introduction to Artificial Intelligence, Springer, 2nd edition, 2017.
- 3 Saroj Kaushik, Artificial Intelligence, Cengage Learning India, Revised edition, 2020.



Experiential Learning Course

	L	T	P	Credits
Course Name: Dissertation Phase- I	--	--	20	10
Course Code: P25CM303	ISE-I	MSE	ISE-II	ESE (POE)
	25	--	25	50

Pre-Requisite:

- Understanding of core and elective subjects related to the chosen domain.
- Familiarity with research methodology, academic writing, and referencing.
- Knowledge of simulation tools, programming platforms, or hardware (as required by the topic).

Course Objectives: The course aims,

- 1 To identify a research problem relevant to Electronics and Telecommunication Engineering.
- 2 To conduct an in-depth literature survey and identify research gaps.
- 3 To formulate objectives, scope, and methodology of the proposed work.
- 4 To enhance research planning, time management, and technical writing skills.

Course Outcomes: Students will be able to

CO1	Identify and define a research problem with appropriate scope and relevance.
CO2	Conduct a comprehensive literature survey and identify research gaps.
CO3	Formulate problem statements, objectives, and methodology.
CO4	Prepare and present a project proposal with justification and expected outcomes.

Sr. No.	Guidelines
1	<p>Activities Involved</p> <ol style="list-style-type: none"> 1. Selection of a relevant research topic in consultation with a guide. 2. Literature review using journals, conference papers, patents, and technical reports. 3. Identification of research gaps, problem statement formulation. 4. Planning of methodology, tools, datasets, and experimental setup (if applicable). 5. Partial implementation or simulation (as feasible). 6. Periodic presentations and documentation.
2	<p>Format for Report (Spiral Bound & Soft Copy)</p> <ol style="list-style-type: none"> 11. Cover Page 12. Certificate (Guide + Head of Department) 13. Declaration 14. Acknowledgement 15. Abstract 16. Table of Contents 17. List of Figures/Tables (if applicable) 18. Chapters:



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	<ul style="list-style-type: none">○ Introduction○ Literature Review○ Problem Statement○ Objectives○ Proposed Methodology○ Preliminary Work Done○ Conclusion and Future Work <p>19. References (IEEE format)</p> <p>20. Appendix (if applicable)</p>
3	Deliverables <ul style="list-style-type: none">• Synopsis (approved by guide and PRC).• Interim progress report.• Final report of Dissertation Phase-I.• Presentation and viva before the department PRC.



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Semester: IV

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme		
			L	T	P	Cr	Components	Max	Min. for Passing
ELC	P25CM401	Dissertation Phase- II*	-	-	40	20	ISE-I	50	80
							ISE-II	50	
							ESE (POE)	100	
	Total		-	-	40	20		200	
Total Contact Hours - 40						Total Credits - 20			

**Note – It is required to publish two papers out of which at least one paper should be in a SCI/ SCIE/ SCOPUS/ Web of Science/ Peer-Reviewed Journal before Thesis Submission.*

	L	T	P	Credits
Course Name: Dissertation Phase- II	--	--	40	20
Course Code: P25CM401	ISE-I	MSE	ISE-II	ESE (POE)
	50	--	50	100

Pre-Requisite:

- ✚ Completion of Dissertation Phase-I with approved synopsis and partial implementation.
- ✚ Working knowledge of design tools, software, or experimental testing materials.
- ✚ Familiarity with academic writing, plagiarism policies, and peer-reviewed publishing process.

Course Objectives: The course aims,

- 1 To implement the proposed methodology as outlined in Dissertation Phase-I.
- 2 To carry out rigorous experimentation, simulation, or design and analyze the results.
- 3 To interpret outcomes with reference to existing research and identify their impact.
- 4 To prepare and submit a complete dissertation report adhering to academic standards.
- 5 To demonstrate technical knowledge, communication skills, and research aptitude through presentation and publications.

Course Outcomes: Students will be able to

CO1	Apply the proposed design or methodology effectively using relevant tools and techniques.
CO2	Analyze experimental or simulation results critically to draw meaningful conclusions.
CO3	Demonstrate innovation and problem-solving skills in the chosen domain.
CO4	Publish research findings in reputed journals or conferences.
CO5	Compile and submit a comprehensive dissertation report with complete documentation.



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CO6 | Defend the dissertation work confidently during final viva-voce.

Sr. No.	Guidelines
1	<p>Activities Involved</p> <ol style="list-style-type: none"> 1. Full implementation of the system/methodology. 2. Conduct simulations, hardware experiments, or data analysis. 3. Compare results with existing methods or baseline systems. 4. Write and submit research papers to suitable conferences or journals. 5. Prepare the final dissertation report. 6. Final seminar and viva-voce before internal and external examiners.
2	<p>Mandatory Paper Publication Requirements</p> <ul style="list-style-type: none"> • Each student must publish a minimum of two research papers based on their dissertation work before submission. • The papers must be: <ul style="list-style-type: none"> ○ At least one in a SCI/ SCIE/ SCOPUS/ Web of Science/ Peer-Reviewed Journal. ○ The second can be in a national/international conference with review and proceedings. • Proof of acceptance or publication must be submitted along with the final dissertation. • Co-authorship with guide or peer students is acceptable, but the student must be the primary contributor.
	<p>Report Format (Hardbound Copy)</p> <ol style="list-style-type: none"> 1. Cover Page 2. Certificate (Guide, HoD, External Examiner) 3. Declaration 4. Acknowledgement 5. Abstract 6. Table of Contents 7. List of Figures and Tables 8. Chapters: <ul style="list-style-type: none"> ○ Introduction ○ Literature Review ○ Gap Identification ○ Problem Statement ○ Objectives ○ Methodology ○ Implementation ○ Results and Discussion ○ Conclusion and Future Scope 9. References (IEEE format) 10. Appendices (if applicable) 11. Copies of Published Papers (as Annexure)
3	<p>Deliverables</p>



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- **Hardbound final dissertation report** (in prescribed format).
- **Soft copy of report and presentation** (PDF and PPT).
- **Plagiarism report** (Turnitin/Urkund $\leq 10\%$).
- **Proof of 2 paper publications** (acceptance letters/certificates/published copy).
- **Source code, design files, datasets** (if applicable).
- **Final presentation and viva sheet** signed by the PRC.



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Exit Courses after Semester– II - P.G. Diploma

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme		
			L	T	P	Cr	Components	Max	Min. for Passing
ELC	P25CM209	Internship/Field Training [#]	-	-	-	2	ISE-I	50	40
							ISE-II	50	
AEC	P25CM210	Employability Skill Development*	4		-	4	ISE	50	40
							ESE	50	
Total			04	00	00	06		200	
Total Contact Hours - 04						Total Credits - 06			

*It is mandatory to opt this course certification from SWAYAM/NPTEL MOOC platform

Four weeks domain specific industrial internship after successfully completing first year of the program.

	L	T	P	Credits
Course Name: Internship / Field Training	--	--	--	2
Course Code: P25CM209	ISE-I	MSE	ISE-II	ESE
	50	--	50	--

Pre-Requisite:

- 1 Completion of core PG coursework in Construction Management.
- 2 Basic technical and communication skills.
- 3 Awareness of industrial tools, platforms, or technologies relevant to the chosen domain.
- 4 Readiness for professional work ethics and environment
- 5 Resume and basic documentation (cover letter, academic transcripts).

Course Objectives: The course aims,

- 1 To bridge the gap between academic learning and industry practices.
- 2 To expose students to real-world engineering environments and team collaboration.
- 3 To develop domain-specific technical skills through hands-on experience.
- 4 To enhance understanding of innovation, industry standards, and regulatory practices.
- 5 To build professional and interpersonal communication skills.
- 6 To enable understanding of innovation, standards, and regulatory practices in industry.



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Course Outcomes: Students will be able to	
CO1	Identify industrial problems relevant to their field of specialization
CO2	Demonstrate technical and professional skills acquired during the internship
CO3	Analyze industrial processes and workflows
CO4	Evaluate the role of engineering knowledge in solving practical problems
CO5	Develop industry-oriented solutions or contributions to assigned tasks
CO6	Prepare and present a professional internship report

Sr. No.	Guidelines
1	<p>Activities Involved</p> <ol style="list-style-type: none"> 6. Identifying and applying to companies or R&D organizations. 7. Completion of internship spanning 4 weeks. 8. Hands-on work under assigned construction industry mentors. 9. Weekly task updates and feedback sessions. 10. Final presentation and submission of training report.
2	<p>Requirements</p> <ul style="list-style-type: none"> • Internship should be in the construction industry related to construction work. • Prior approval must be taken from the Internship/Training Coordinator. • Maintain a daily logbook recording work done, observations, and reflections. • Internship certificate must be obtained from the industry at the end of the training. • Students are required to submit: <ol style="list-style-type: none"> a) Internship Completion Certificate b) Internship Report (format below) c) Logbook or Weekly Activity Sheet d) Presentation and Viva before Evaluation Panel.
3	<p>Internship Report Format (Hardbound Copy)</p> <ol style="list-style-type: none"> 13. Cover Page (Institute, Title, Student Name, Industry Name, Duration) 14. Certificate from Institute 15. Certificate from Company 16. Acknowledgment 17. Table of Contents 18. Chapter 1: Introduction – Overview of the organization and objectives 19. Chapter 2: Training Activities – Tasks performed, tools used, departments visited 20. Chapter 3: Technical Learning – Concepts, skills, technologies learned 21. Chapter 4: Analysis and Outcomes – Contributions made, learnings, challenges 22. Chapter 5: Conclusion – Summary and future scope 23. References (if applicable) 24. Appendices – Screenshots, tools used, code samples (if allowed)



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Course Name: Employability Skill Development Course Code: P25CM210	L	T	P	Credits
	4	--	--	4
	ISE-I	MSE	ISE-II	ESE
	25	--	25	50

Pre-Requisite: Basic English communication

Course Objectives: The course aims,

- 1 To develop effective communication, teamwork, and interpersonal skills.
- 2 To enhance professional readiness through resume building and interview practice.
- 3 To build leadership qualities and critical thinking for workplace adaptability.
- 4 To inculcate ethics, etiquette, and time management in professional settings.

Course Outcomes: Students will be able to

CO1	Demonstrate effective communication and interpersonal skills
CO2	Apply leadership and teamwork principles in professional settings
CO3	Prepare resumes and participate effectively in interviews and group discussions
CO4	Practice workplace etiquette, time management, and ethical behavior

Course Contents

Unit No.	Contents	Hours
1	Communication Skills: Verbal and non-verbal communication, active listening, barriers to communication, clarity and coherence, email and business communication, public speaking, presentation skills	7
2	Personality Development and Interpersonal Skills: Positive attitude, self-confidence, grooming and body language, self-awareness, empathy, emotional intelligence, teamwork and collaboration, conflict resolution	7
3	Resume and Cover Letter Writing: Types of resumes, components of an effective resume, tailoring resumes to job roles, cover letter writing, common errors in resumes, creating a LinkedIn profile	7
4	Interview Preparation and Group Discussion: Types of interviews, interview etiquette, commonly asked questions, STAR technique, mock interviews, types of group discussions, do's and don'ts in GD, communication in a group setting	7
5	Professional Skills and Workplace Etiquette: Workplace behavior, ethics and integrity, corporate etiquette, professionalism, time management, goal setting, stress management, adaptability	7
6	Career Planning and Employability Readiness: Career planning techniques, self-assessment and SWOT analysis, decision-making skills, building confidence, job search strategies, facing challenges in the workplace	7



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Text Books:

- 1 Barun K. Mitra , Personality Development and Soft Skills, Oxford University Press.
- 2 Andrews, Sudhir , How to Succeed at Interviews, Tata McGraw Hill.

Reference Books:

- 1 Dr. K. Alex – *Soft Skills: Know Yourself & Know the World*, S. Chand.
- 2 Wallace & Masters – *Personal Development for Life and Work*, Cengage Learning.
- 3 Dale Carnegie – *How to Win Friends and Influence People*, Simon & Schuster.
- 4 NSDC / NASSCOM soft skills modules, National Skill Development Corporation resources.

MOOC/NPTEL Platform:

- 1 **Developing Soft Skills and Personality** by Prof. T. Ravichandran (IIT Kanpur]
NPTEL Link: <https://nptel.ac.in/courses/109/104/109104115>