First Year Curriculum

Admission Year 2026-27

Master of Technology
Construction Project Management

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 1

a. **Course Name:** Research Methodology & IPR
b. **Course Code:** 03020201HM01
c. **Prerequisite:** Knowledge of Electronics and Communication Systems and Technologies. Basic Computer Skills Fundamental Knowledge of Area of Interest in relevant discipline.
d. **Rationale:** students will apply matrix methods
e. **Course Learning Objective:**

CLOBJ 1	To develop skills to idealize, formulate, and analyse determinate and indeterminate structures (beams, trusses, and frames) using classical and matrix structural analysis methods.
CLOBJ 2	To present modern methods to determine the force distribution and deformed shapes of structures
CLOBJ 3	To develop skills in interpreting and predicting solutions from structural analysis
CLOBJ 4	To introduce computer-based applications for the analytical methods as presented

f. **Course Learning Outcomes:**

CLO 1	Analyse the skeleton structures using stiffness analysis code.
CLO 2	Use direct stiffness method understanding its limitations
CLO 3	Applications to Simple Problems
CLO 4	Approximate Solution of Boundary Value Problems
CLO 5	Application of Linear problems
CLO 6	Use of Shape functions

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**0**	**0**	**2**	**60**	**20**	**-**	**20**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	**20%**	**5**
2	Effective literature studies approaches, analysis Plagiarism, Research ethics,	**15%**	**5**
3	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	**15%**	**5**
4	Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development:technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	**20%**	**5**
5	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	**15%**	**5**
6	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	**15%**	**5**

i. Text Book and Reference Book:

1. Intellectual Property Rights Under WTO T. Ramappa; S. Chand, 2008
2. Research methodology: an introduction for science & engineering students Stuart Melville and Wayne Goddard; Juta & Co Ltd
3. Research Methodology: An Introduction Wayne Goddard, Stuart Melville; Juta and Company Ltd, 2004
4. Research Methodology : A Step by Step Guide for Beginners Ranjit Kumar; PEARSON; 3rd
5. Resisting Intellectual Property Halbert; Taylor & Francis Ltd., 2007
6. Industrial Design Mayall; McGraw Hill, 1992
7. Product Design Niebel; McGraw Hill, 1974

8. Introduction to Design Asimov; Prentice Hall, 1962
9. Intellectual Property in New Technological Age Robert P. Merges, Peter S. Menell, and Mark A. Lemley; 2016

a. **Course Name:** Project Management
b. **Course Code:** 03021601PC01
c. **Prerequisite:** Understanding of construction processes and basic project scheduling tools.
d. **Rationale:** To equip students with systematic planning, scheduling, and controlling skills for managing construction projects effectively.
e. **Course Learning Objective:**

CLOBJ 1	Prepare work break down plan and estimate resources requirements.
CLOBJ 2	Solve problems of resource allocation and leveling using network diagrams.
CLOBJ 3	Plan and develop management solutions to construction projects.
CLOBJ 4	Understand the principles of project management, resource management and inventory.

f. **Course Learning Outcomes:**

CLO 1	Develop a Work Breakdown Structure (WBS) and estimate resource requirements for a construction project.
CLO 2	Analyze resource allocation problems using CPM/PERT network diagrams.
CLO 3	Construct project schedules and optimize time and resource usage.
CLO 4	Explain principles of inventory, resource, and project management.
CLO 5	Evaluate project monitoring and control techniques like Earned Value Management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Basics of project management:**	**15%**	**7**

	Types of project, Phase of project, project management and its relevance, stake holders of a project, structure of project organization, management levels, and traits of a project manager, Failures and success of a project.		
2	**Construction planning:** Introduction, activities involved types of project plan, work breakdown structure. Planning terminologies, CPM, PERT, Ladder network, Precedence network, Line of balance, GERT, RAMPS analysis	**30%**	**14**
3	**Project Scheduling and Controlling:** Introduction, Resource allocation and levelling of Major resources, Multi Resource allocation, Optimal scheduling	**10%**	**6**
4	**Project Monitoring and Control:** Feasibility report, Project updating, Cost control, Earned value management, project progress reports, project control techniques, change management, reasons for failure	**15%**	**7**
5	**Construction Management:** Reasons for success and failure, basics of projects, Construction Equipment and Management, Construction Account Management, Construction Material management, Construction Quality Management, Construction Safety Management, Computer Application In Construction Management, Workforce Motivation And Human Factors In Construction Management, Plant Management, Project Communication.	**30%**	**14**

i. Text Book and Reference Book:

1. Project Management: A Systems Approach to Planning, Scheduling and Controlling By Harold Kerzner | Wiley Publications
2. Construction Project Management: Planning, Scheduling and Controlling By K. K. Chitkara | Tata McGraw Hill, New Delhi
3. Construction Project Management: Theory and Practice' By Kumar Neeraj Jha | Pearson Education
4. Lock, Gower, Project Management Handbook.

a. **Course Name:** Project Management Laboratory
b. **Course Code:** 03021601PC02
c. **Prerequisite:** Understanding of construction processes and basic project scheduling tools.
d. **Rationale:** To equip students with systematic planning, scheduling, and controlling skills for managing construction projects effectively.
e. **Course Learning Objective:**

CLOBJ 1	To develop understanding of various conventional and modern construction techniques along with their limitations in construction projects.
CLOBJ 2	To impart knowledge of modular and industrialized construction practices for improving efficiency, quality, and sustainability in construction.
CLOBJ 3	To enable students to analyse and evaluate different construction techniques based on project requirements, cost, time, and constructability.

f. **Course Learning Outcomes:**

CLO 1	Develop a Work Breakdown Structure (WBS) and estimate resource requirements for a construction project.
CLO 2	Analyze resource allocation problems using CPM/PERT network diagrams.
CLO 3	Construct project schedules and optimize time and resource usage.
CLO 4	Explain principles of inventory, resource, and project management.
CLO 5	Evaluate project monitoring and control techniques like Earned Value Management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**2**	**0**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

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h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**BASICS OF PROJECT MANAGEMENT**	**20**	**3**

2	**CONSTRUCTION PLANNING**	**20**	**3**
3	**PROJECT SCHEDULING AND CONTROLLING**	**20**	**3**
4	**PROJECT MONITORING AND CONTROL**	**20**	**3**
5	**CONSTRUCTION MANAGEMENT**	**20**	**3**

a. **Course Name:** Quality and Safety Management in Construction Projects
b. **Course Code:** 03021601PC03
c. **Prerequisite:** Knowledge of basic safety measures and construction activities
d. **Rationale:** To ensure quality control and instill safety consciousness among future construction managers.
e. **Course Learning Objective:**

CLOBJ 1	Understand the principles of quality management, quality assurance, and quality control in construction projects.
CLOBJ 2	Identify construction hazards and apply appropriate safety measures, standards, and regulations at construction sites.
CLOBJ 3	Develop skills to implement quality and safety management systems for effective project execution and risk reduction.
CLOBJ 4	Analyze construction practices to improve productivity, ensure compliance, and promote a culture of quality and safety in the construction industry.

f. **Course Learning Outcomes:**

CLO 1	Explain the principles of quality assurance and control in construction.
CLO 2	Apply advanced QA/QC tools and techniques to assess construction quality.
CLO 3	Assess potential hazards and formulate effective safety programs.
CLO 4	Illustrate the environmental and social factors impacting construction safety.
CLO 5	Design standard operating procedures for construction quality and safety compliance.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**QUALITY MANAGEMENT** Quality policy in the construction industry-Consumer satisfaction- Ergonomics, Time of Completion-Statistical	**20**	**10**

	Tolerance's concept of quality- Contract and construction programming-Inspection procedures., total quality control concept, sustainable construction methods		
2	**QUALITY ASSURANCE AND CONTROL** Contracting, Construction management; Design and manage; Discretionary Procurement Systems; Project partnering; Strategic partnering; Project Alliances; Relational Contracting; Contract Administration; Contract Management.	**25**	**16**
3	**STANDARDIZATION** Standardization preparation-Construction activity, the SOP method	**30**	**10**
4	**SAFETY PROGRAMMES AND ORGANIZATION** Environmental safety, Social and environmental factors, Hazards in construction projects, mitigation and preventive measures, OSHAAS guidelines for construction safety, repercussions of construction accidents, construction accident reporting, Contractual obligations for construction safety, EHS budgeting.	**25**	**9**

i. Text Book and Reference Book:

1. "Total Quality Management",
   By Dale H. Besterfield, | Pearson Education.
2. Al Endres, Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, Wiley

a. **Course Name:** Construction Equipment Management
b. **Course Code:** 03021601PC05
c. **Prerequisite:** Basic knowledge of construction methods and project planning. Knowledge about various types of equipment used in construction industry.
d. **Rationale:** Construction Equipment Management helps to choose, use, and maintain machines to make construction faster, safer, and more cost-effective.
e. **Course Learning Objective:**

CLOBJ 1	Understand the principles of construction equipment management, economics, and operational efficiency.
CLOBJ 2	Identify suitable construction equipment for earthwork, hauling, lifting, and structural operations.
CLOBJ 3	Develop skills to analyze equipment cost, productivity, life cycle, and replacement decisions.
CLOBJ 4	Apply construction equipment planning and management techniques for safe, economical, and efficient project execution.

f. **Course Learning Outcomes:**

CLO 1	Determine the most suitable construction equipment for different construction tasks and environments.
CLO 2	Analyze cost components involved in equipment ownership and operation.
CLO 3	Develop construction activity schedules using productivity rates and equipment cost parameters
CLO 4	Analyze problems and practices in construction methods and equipment management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Equipment Economics** Equipment records, Cost of Capital, Elements of ownership Cost, Operating Cost, Replacement Decisions, Rent and Lease Considerations	15%	6
2	**Planning For Earthwork Construction And Equipment** Planning, Graphical Presentation of Earthwork, Earthwork Quantities, Mass Diagram, Pricing Earthwork Operations, Compaction of Soil and rock, Types of Compacting Equipment, Dynamic Compaction, Stabilizing soils with Lime, Cement Soil Stabilization., Earthwork equipment and performance parameter	20%	9
3	**Piling And Rcc Works** Piling rigs, concrete pumps, batching plant, feasibility and efficiency of batching plant, RMC, placer booms, tower cranes, construction powe & water, Automatic Bar bending machines	20%	9
4	**Mobile Equipment Power Requirements** Required Power, Available power, Usable power, Performance Charts	10%	5
5	**Steel Structure Works** Cranes for structural works, crane load charts, crane safety, jacks for heavy lifts, productivity analysis of a crane, operating cost, idling and utilization efficiency, special equipment for accessibility in tall structures.	20%	10
6	**Trucks And Hauling Equipment, Finishing Equipment** Trucks, productivity, Performance Calculations, Graders, Trimmers	15%	6

i. Text Book and Reference Book:

1. Construction Planning, Equipments and Methods
   By R.L. Peurifoy and W.B. Ledbetter | McGraw-Hill Publishers
2. Construction Equipment and Management
   By S.C. Sharma | Khanna Publishers
3. Construction Equipment Operation & Maintenance
   By Y. Pokras and M. Tushnyakov | MIR, Moscow
4. Construction Equipment and Management
   By Dr. L. R. Kadiyali | Khanna Publishers

a. **Course Name:** HR in Construction Management
b. **Course Code:** 03021601PE05
c. **Prerequisite:** Basic understanding of organizational management.
d. **Rationale:** To ensure effective personnel and labor management in large-scale construction projects.
e. **Course Learning Objective:**

CLOBJ 1	Understand the principles, functions, and importance of human resource management in construction organizations.
CLOBJ 2	Identify manpower requirements and apply effective recruitment, selection, and training methods in construction projects.
CLOBJ 3	Develop knowledge of personnel administration, labor relations, and employee management practices.
CLOBJ 4	Analyze legal and organizational aspects related to labor welfare, grievance handling, and HR management in the construction industry.

f. **Course Learning Outcomes:**

CLO 1	Describe the principles and functions of personnel management.
CLO 2	Estimate manpower requirements for various project phases.
CLO 3	Apply recruitment, selection, and training strategies in HR management.
CLO 4	Examine the roles and responsibilities of HR departments at the site and the head office.
CLO 5	Evaluate legal frameworks related to labor and grievance handling.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**INTRODUCTION** Basic of personnel management, manpower planning, labour laws and industrial relations. The role of personnel management in construction enterprises.	20	9
2	**PERSONNEL MANAGEMENT** Concepts, definitions, growth, role and functions, new developments in HRD and HRM, manpower estimation for the company and project, methods and procedures of estimation at various stages.	20	9
3	**RELATED ASPECTS** Methods of recruitment, selection, training, placement, financial compensation, discipline, separation, etc., in employing and retaining engineers and managers.	20	9
4	**PERSONNEL OFFICE AT HEAD OFFICE AND PROJECT SITE** Role, functions, status and relationship with other departments, personnel office records and procedures.	20	9
5	**LEGAL ASPECTS** Labour legislation, related labour acts, grievance handling, enquiry procedure, Labour administration and judiciary in regards to construction industry.	20	9

i. Text Book and Reference Book:

2. Economics of Human Resource Development: A perspective analysis
By Dr. D. L. Narayana & Dr. Boppana Nagarajuna | Serials Publication

3. Human Resource and Personnel Management
By Aswathappa K. (1999) | Mc Grow Hill, New Delhi.

4. Human Resource Development
By P P Arya & B B Tandon

5. Personnel / Human Resource Management
By+ De Cenzo D. A. and Robbin S. P. | McMraw Hill

a. **Course Name:** Value Engineering
b. **Course Code:** 03021601PE07
c. **Prerequisite:** Basic understanding of construction project management and civil estimation, and costing.
d. **Rationale:** Value Engineering teaches how to improve the value of a product or project by analysing its function and reducing unnecessary costs.
e. **Course Learning Objective:**

CLOBJ 1	Understand the concepts, principles, and systematic approach of value engineering in construction projects.
CLOBJ 2	Identify functions, costs, and worth of construction systems using functional analysis techniques and FAST diagrams.
CLOBJ 3	Develop skills to apply value engineering job plans, cost models, and optimization techniques for effective decision-making.
CLOBJ 4	Analyze life cycle costs, environmental impacts, and alternative solutions to improve project value and sustainability.

f. **Course Learning Outcomes:**

CLO 1	Interpret the concepts and stages of value engineering in relation to construction industry practices.
CLO 2	Demonstrate the use of functional analysis techniques like FAST diagrams for value improvement in construction projects.
CLO 3	Analyze value engineering job plans, cost models, and environmental assessments to optimise resources in construction systems.
CLO 4	Evaluate alternative solutions using life cycle cost analysis and value indices to recommend cost-effective and sustainable design options.
CLO 5	Apply value engineering principles to improve project performance, quality, and resource utilization in construction projects.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**0**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**FUNDAMENTALS OF VALUE ENGINEERING** Basic terms and definitions, Overview of the systematic approach, general phase, information phase, function phase, creative phase, valuation phase, investigation and recommendation phase.	20	8
2	**VALUE ENGINEERING JOB PLAN** Project selection, phases, Function–cost–worth, FAST diagramming, VE versus quality, performance and other parameters. Value Engineering from Design to Hand-over, optimization techniques, Cost control theory, life cycle cost theory, Environmental impact assessment with value engineering approach. Case studies, applications of value engineering for a building project and waste-water treatment plant.	30	13
3	**FUNCTIONAL ANALYSIS** Functions at various levels and of various types, cost and worth of function, importance of functional analysis, FAST Diagramming	25	12
4	**COST MODEL** Introduction, Value, Cost and Worth, True and Poor value, Factors affecting the value, Value Index, Cost and Value Gap, importance of cost model in Value Engineering, Function and Matrix Cost model, Life cycle cost analysis	25	12

i. Text Book and Reference Book:

1. Value Engineering : A Systematic Approach
   By Arthur E. Mudge | Mc GrawHill
2. Value Engineering a Practical Approach for Owners Designers & Constructions
   By Zimmerman LW & Gilen HD | CBS, New Delhi.
3. Value Engineering A how to Manual
   By S. S. Iyer | New age International Publishers

a. **Course Name:** Research Methodology & IPR
b. **Course Code:** 03020201HM01
c. **Prerequisite:** Basic Analytical and analysis skill
d. **Rationale:** The course introduces AI concepts and tools that can be applied to the design process, enabling students to create innovative, efficient, and user-centric designs in various creative domains.
e. **Course Learning Objective:**

CLOBJ 1	To develop understanding of mathematical modelling concepts and their applications in research and engineering problem-solving.
CLOBJ 2	To enhance students' experimental and simulation skills for conducting systematic and data-driven research activities.
CLOBJ 3	To provide knowledge of statistical and computational techniques for effective data analysis and interpretation of research findings.
CLOBJ 4	To familiarize students with simulation methods for modelling practical engineering problems and validating research hypotheses.
CLOBJ 5	To develop awareness about Intellectual Property Rights (IPR), including patents, copyrights, trademarks, trade secrets, and technology transfer in research and innovation.

f. **Course Learning Outcomes:**

CLO 1	Understand Mathematical Modeling – Explain the principles of mathematical modeling and its applications in research and problem-solving.
CLO 2	Develop Experimental and Simulation Skills – Gain proficiency in designing and executing experiments, as well as using simulation techniques for data-driven research.
CLO 3	Perform Data Analysis and Interpretation – Apply statistical and computational tools to analyze research data and derive meaningful insights.
CLO 4	Utilize Simulation Techniques – Implement various simulation methods to model real-world scenarios and validate research hypotheses.
CLO 5	Understand Intellectual Property Rights (IPR) – Explain the importance of IPR, including trademarks, copyrights, patents (and their types), trade secrets, and technology transfer in research and innovation.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** Research: Definition, Characteristics, Motivation and Objectives, Research Methods vs Methodology, Types of Research — Descriptive vs Analytical, Applied vs Fundamental, Quantitative vs Qualitative, Conceptual vs Empirical.	10%	4
2	**Methodology** Research Process, Formulating the Research Problem, Defining the Research Problem, Research Questions, Research Methods vs. Research Methodology.	10%	4
3	**Literature Review** Review Concepts and Theories, Identifying and Analyzing the Limitations of Different Approaches.	20%	6
4	**Formulation and Design** Concept and Importance in Research, features of a Good Research Design, Exploratory Research Design, Concept, Types and Uses, Descriptive Research Designs, Concept, Types and Uses, Experimental Design: Concept of Independent & Dependent Variables.	20%	6
5	**Data Modeling And Simulations:** Mathematical Modeling, Experimental Skills, Simulation Skills, Data Analysis and Interpretation	20%	6
6	**Introduction To IPR** IPR importance, Trademark, copyright, patent and its types, Trade secret, IPR and Technology Transfer	20%	6

i. Text Book and Reference Book:

1. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches By John W. Creswell, SAGE Publications Ltd
2. Research Methodology: Methods and Techniques By C.R. Kothari, New Age International Publishers.
3. QuaIitative Research By David SiIverman, SAGE Publications Ltd

a. **Course Name:** English for Research Paper Writing
b. **Course Code:** 03020001MC01
c. **Prerequisite:** Basic Knowledge about sentence formation using different words in present, past tenses and future time. Also, basic knowledge on use of suitable nouns, adjectives, verbs, preposition, etc.
d. **Rationale:** To provide a better insight into the effective use of grammar knowledge especially in writing and to put their own thoughts into writing.
e. **Course Learning Objective:**

CLOBJ 1	To develop students' writing skills and improve the readability, clarity, and effectiveness of academic and research writing.
CLOBJ 2	To familiarize students with the structure and content requirements of different sections of a research paper.
CLOBJ 3	To enhance the skills required for drafting effective research paper titles and other essential academic writing components.
CLOBJ 4	To develop the ability to prepare high-quality research papers suitable for successful first-time submission and publication.

f. **Course Learning Outcomes:**

CLO 1	Understand how to improve your writing skills and level of readability
CLO 2	Learn about what to write in each section
CLO 3	Understand the skills needed when writing a Title
CLO 4	Ensure the good quality of paper at the very first-time submission

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**0**	**-**	**50**	**-**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Unit 1** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	**16%**	**5**
2	**Unit 2** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction	**17%**	**5**
3	**Unit 3** Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	**17%**	**5**
4	**Unit 4** Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.	**17%**	**5**
5	**Unit 5** Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.	**16%**	**5**
6	**Unit 6** Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	**16%**	**5**

i. Text Book and Reference Book:

1. Writing for Science By Goldbort R, Springer
2. How to Write and Publish a Scientific Paper By Day R, Cambridge University Press
3. Handbook of Writing for the Mathematical Sciences By Highman N, SIAM. Highman's book
4. English for Writing Research Papers By Adrian Wallwork, Springer New York Dordrecht Heidelberg London.

a. **Course Name:** Disaster Management
b. **Course Code:** 03021601MC01
c. **Prerequisite:** Basic knowledge of Environmental Science or Geography
d. **Rationale:** This course enables students to understand, assess, and manage various types of disasters, their impacts, and mitigation strategies, thereby fostering resilience and sustainable development.
e. **Course Learning Objective:**

CLOBJ 1	To develop understanding of different types of disasters, their causes, impacts, and consequences on society and the environment.
CLOBJ 2	To provide knowledge of disaster management principles, disaster response mechanisms, and effective mitigation strategies.
CLOBJ 3	To enhance the ability to assess vulnerability and recommend suitable disaster risk reduction and mitigation measures.
CLOBJ 4	To familiarize students with hazard assessment, vulnerability profiling, and the use of relevant tools and techniques for disaster analysis.
CLOBJ 5	To develop understanding of structural and non-structural approaches used in disaster prevention, preparedness, and mitigation.

f. **Course Learning Outcomes:**

CLO 1	Differentiate types of disasters, identify their causes, and evaluate their impact on the environment and society.
CLO 2	Analyse disaster damage and apply effective management strategies.
CLO 3	Assess vulnerability and recommend appropriate risk mitigation measures.
CLO 4	Develop a hazard and vulnerability profile using relevant tools and techniques.
CLO 5	Classify structural and non-structural disaster mitigation strategies.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**0**	**-**	**50**	**-**	**-**	**-**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Disaster:** Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity Disaster and Development and disaster management Types (Geological Disasters, Hydro-Meteorological Disasters, Biological Disasters, Technological Disasters and Man-made Disasters) , Global Disaster Trends, Causes, Consequences and Control of Disasters.	20%	12
2	**Disaster Management Cycle and Framework:** Disaster Management Cycle -Paradigm Shift in Disaster Management, Pre-Disaster -Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster -Evacuation -Disaster Communication -Search and Rescue -Emergency Operation Centre -Incident Command System -Relief and Rehabilitation -Post disaster -Damage and Needs Assessment, Restoration of Critical Infrastructure -Early Recovery -Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.	30%	14
3	**Disaster Management in India** Disaster Profile, Lessons Learnt from Major Disasters, Disaster Management Act 2005 -Institutional and Financial Mechanism National Policy on Disaster Management, Roles and responsibilities of Government (States, Centre) and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority (SDMA).	30%	12
4	**Technology for Disaster Management & Mitigation** Geo-informatics in Disaster Management (GIS, GPS), Disaster Communication System (Early Warning system), Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India.	20%	10

i. Text Book and Reference Book:

1. Introduction to Disaster Management By Modh Satish, Macmilan Publishers India
2. An overview on natural & man-made disasters and their reduction By R K Bhandani
3. Disaster Administration And Management Text And Case Studies By Goel S. L., Deep &Deep Publication Pvt. Ltd., New Delhi.

Disaster Management

Semester 2

a. **Course Name:** O.R. in Construction Management
b. **Course Code:** 03021602PC01
c. **Prerequisite:** Basic knowledge of construction management, project scheduling, and mathematical concepts related to optimization techniques.
d. **Rationale:** Operations Research in Construction Management helps in optimizing construction resources, improving decision-making, and enhancing project planning and scheduling efficiency using mathematical and analytical techniques.
e. **Course Learning Objective:** Students will be able to analyse structures using finite element method

CLOBJ 1	Understand the principles and applications of operations research techniques in construction management.
CLOBJ 2	Develop skills to solve transportation, assignment, and decision-making problems using optimization methods.
CLOBJ 3	Apply game theory, simulation, and linear programming techniques to construction project management problems.

f. **Course Learning Outcomes:**

CLO 1	Solve transportation and assignment problems using various optimization methods.
CLO 2	Apply decision theory concepts for analytical and probabilistic decision-making in construction management.
CLO 3	Analyze game theory models and simulation techniques for construction applications.
CLO 4	Evaluate solution methodologies such as graphical, algebraic, matrix, and LP methods for optimization problems.
CLO 5	Apply advanced CPM/PERT and Monte-Carlo simulation techniques for construction project scheduling and planning.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**MODULE 1: TRANSPORTATION AND ASSIGNMENT PROBLEMS** Transportation problem: Basic feasible solutions using N-W Corner rule, Minimum cost method, Vogel's approximation method.	10	6
2	**MODULE 2: OPTIMAL SOLUTIONS** Optimal solutions using Stepping Stone Method, Modified distribution method.	10	6
3	**MODULE 3: DECISION THEORY** Decision in certainty: Analytical hierarchy approach, Comparison Matrix, Consistency test, Probabilistic decision making: Expected value approach, sensitivity analysis on payoffs, Optimal decision strategy.	15	8
4	**MODULE 4: GAMES THEORY SIMULATIONS APPLIED TO CONSTRUCTION** n × m person zero sum games with finite strategies, Maximin & Minimax strategies, Saddle points, Rule of dominance.	20	10
5	**MODULE 5: SOLUTION METHODOLOGIES** Algebraic method, Graphical method, Method of matrices, LP method, Iterative method of approximate solution.	20	12
6	**MODULE 6: MODIFICATIONS AND IMPROVEMENT ON CPM/PERT TECHNIQUES** Beyond CPM/PERT: Overview of the pitfalls of making traditional CPM/PERT assumptions. PERT technique extended to Monte-Carlo simulation analyses.	15	8
7	**MODULE 7: CPM** Advantages of circle notation diagram for the presentation of CPM project plans. Concept of dependent operations overlapping in time.	10	6

i. Text Book and Reference Book:

1. Operations Research
   By Hamdy A. Taha | Pearson Education
2. Operations Research: Principles and Practice
   By Ravindran, Phillips & Solberg | Wiley India
3. Introduction to Operations Research
   By Frederick S. Hillier & Gerald J. Lieberman | McGraw Hill
4. Operations Research for Management
   By Kanti Swarup, P.K. Gupta & Man Mohan | Sultan Chand & Sons

a. **Course Name:** Strategy Management
b. **Course Code:** 03021602PC03
c. **Prerequisite:** : Construction Economics and Finance
d. **Rationale:** To identify the relevant government environment, laws, policies, and regulations with respect to a given industry or firm.
e. **Course Learning Objective:**

CLOBJ 1	Understand the concepts, frameworks, and processes involved in strategic management and corporate planning.
CLOBJ 2	Analyze competitive environments, organizational capabilities, and strategic advantages for sustainable business growth.
CLOBJ 3	Develop strategic decision-making skills using various analytical tools, portfolio models, and management frameworks.
CLOBJ 4	Apply strategic implementation, evaluation, and control techniques for effective organizational and project management.

f. **Course Learning Outcomes:**

CLO 1	Identify various strategies to manage projects and organizations effectively.
CLO 2	Analyze strategic requirements for successful project execution and organizational growth.
CLO 3	Maximize project profitability by adopting optimized strategies according to project scenarios and market conditions.
CLO 4	Evaluate competitive advantages, business strategies, and portfolio models for strategic planning.
CLO 5	Apply strategic evaluation and control techniques to measure and improve organizational performance.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**00**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**STRATEGY AND PROCESS** Conceptual framework for Strategic Management, The Concept of Strategy and the Strategy Formation Process, Stakeholders in business, Vision, Mission and Purpose, Business definition, Objectives and Goals, Corporate Governance and Social responsibility	15	7
2	**COMPETITIVE ADVANTAGE** External Environment, Porter's Five Forces Model, Strategic Groups Competitive, Globalization and Industry Structure, National Context and Competitive Advantage Resources, Capabilities and competencies, Core competencies, Generic Building Blocks of Competitive Advantage, Distinctive Competencies, Resources and Capabilities durability of competitive Advantage, Avoiding failures and sustaining competitive advantage, Case study	20	10
3	**STRATEGIES** The generic strategic alternatives, Stability, Expansion, Retrenchment and Combination strategies, Business level strategy, Strategy in the Global Environment, Corporate Strategy, Vertical Integration, Diversification and Strategic Alliances, Building and Restructuring the corporation, Strategic analysis and choice, Environmental Threat and Opportunity Profile (ETOP), Organizational Capability Profile, Strategic Advantage Profile, Corporate Portfolio Analysis, SWOT Analysis, GAP Analysis, Mc Kinsey's 7s Framework, GE 9 Cell Model, Distinctive competitiveness, Selection of matrix, Balance Score Card, case study	20	10
4	**FINANCIAL STRATEGIES** Growth strategy, stabilization strategy and retrenchment strategy. Portfolio strategies G.E, B.C.G & Arthur D. Littles model	10	5
5	**STRATEGY IMPLEMENTATION & EVALUATION** The implementation process, Resource allocation, Designing organizational structure, Designing Strategic Control Systems, Matching structure and control to strategy, Implementing Strategic change, Politics, Power and Conflict, Techniques of strategic evaluation & control, Case study	20	10
6	**STRATEGIC MANAGEMENT EVALUATION AND CONTROL** Strategy implementation and evaluation control of strategic performance-performance gap, ROI, Budget and Financial Ratios, Strategy Audit	15	6

i. Text Book and Reference Book:

1. Strategic Management and Business Policy
   By Azhar Kazmi | Tata McGraw Hill
2. Strategic Management
   By Fred R. David | Pearson Education
3. Concepts in Strategic Management and Business Policy
   By Thomas L. Wheelen & J. David Hunger | Pearson
4. Strategic Management: Theory and Cases
   By Hill & Jones | Cengage Learning

a. **Course Name:** Construction Contract Management
b. **Course Code:** 03021602PC05
c. **Prerequisite:** : Construction Economics and Finance
d. **Rationale:** To make students aware of legal aspects of construction projects, construction contracts, and issues related to contract administration. To expose students to various dispute resolution techniques including arbitration.
e. **Course Learning Objective:**

CLOBJ 1	Understand the legal framework and laws governing construction projects and contracts.
CLOBJ 2	Identify various types of construction contracts, contract documents, and contract management procedures.
CLOBJ 3	Develop knowledge of arbitration, litigation procedures, and dispute resolution mechanisms in construction projects.

f. **Course Learning Outcomes:**

CLO 1	Explain various types of construction contracts and their applications.
CLO 2	Interpret terms and conditions of construction contracts.
CLO 3	Differentiate between general and special conditions of contracts.
CLO 4	Analyze laws and regulations prevailing in India related to construction project arbitration and conflicts.
CLO 5	Apply contract administration procedures and dispute resolution techniques in construction management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**CONSTRUCTION LAWS** Public law, Government Department and Local authorities, Private law, contracts, Tort, property law and building law, Labour Laws, Company Act	25	12
2	**CONSTRUCTION CONTRACTS AND CONTRACT MANAGEMENT** Contract specification, types of contract documents used for construction, Selecting a contractor, project closure and handing over, International Contracts	35	16
3	**ARBITRATION** Disputes, arbitration and litigation procedure-preparation, settlement, evidence	20	10
4	**CONTRACT CONDITIONS** Contract administration, standard procedures for contract administration, coordination between various agencies, general and special terms of contract	20	10

i. Text Book and Reference Book:

1. Construction Contracting
   By Richard H. Clough, Glenn A. Sears & S. Keoki Sears | Wiley India
2. Construction Contracts and Claims
   By B. Sengupta & H. Guha | Tata McGraw Hill
3. Engineering and Construction Contracts Management
   By Joseph A. Huse | Wiley Publications

a. **Course Name:** Project Risk Management
b. **Course Code:** 03021602PE01
c. **Prerequisite:** : Project Management
d. **Rationale:** To give knowledge of various aspects of risk management to students so that they are able to identify risk events, use risk prompts, apply risk assessment tables, and understand the utility of grading construction entities.
e. **Course Learning Objective:**

CLOBJ 1	Understand the concepts, importance, and types of risks involved in construction projects.
CLOBJ 2	Develop knowledge of risk analysis and management techniques used in construction project planning and execution.
CLOBJ 3	Apply risk assessment tools, probability analysis, and decision-making methods for evaluating project risks.
CLOBJ 4	Analyze risk mitigation measures, insurance policies, and strategies to minimize uncertainties in construction projects.

f. **Course Learning Outcomes:**

CLO 1	Identify different types of project risk factors and recommend suitable alternative solutions effectively.
CLO 2	Plan and develop risk management solutions for construction projects.
CLO 3	Explain the principles of project risk management, resource management, and inventory management.
CLO 4	Apply risk analysis techniques such as sensitivity analysis, scenario analysis, and decision tree analysis for construction projects.
CLO 5	Evaluate risk mitigation strategies and insurance policies related to construction project management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**COURSE CONTENT** Importance of Risk, types of risks, quantifiable and unquantified risks	20	10
2	**RISK ANALYSIS AND MANAGEMENT** FOR PROJECTS (RAMP) Identifying risk events, Probability distribution, Stages in Investment life-cycle, determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows. Sensitivity analysis, scenario analysis simulation, decision tree analysis, risk profile method, certainty 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	30	14
3	**RISK MITIGATION** Risk mitigation by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of unquantified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy, (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy, (LOP) – Loss of profit policy	30	14
4	**TRANSIT INSURANCE POLICY** (LOPCE) Loss of performance of construction equipment policy	20	10

i. Text Book and Reference Book:

1. Project Risk Management
   By Rory Burke | Wiley Publications
2. Risk Management in Projects
   By K. Nagarajan | New Age International Publishers
3. Construction Risk Management
   By S. J. Smith, Tony Merna & Paul Jobling | Wiley-Blackwell
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling
   By Harold Kerzner | Wiley Publications

a. **Course Name:** Cost Management of Engineering Projects
b. **Course Code:** 03021602PE07
c. **Prerequisite:** : Basic civil engineering knowledge.
d. **Rationale:** Project planning management and economics, cost concepts.
e. **Course Learning Objective:**

CLOBJ 1	Understand the principles and processes of strategic cost management in engineering projects.
CLOBJ 2	Develop knowledge of cost concepts, costing systems, and decision-making techniques related to project management.
CLOBJ 3	Analyze project execution stages, project cost control methods, and profit planning techniques.
CLOBJ 4	Apply quantitative techniques and modern management tools for effective cost management and project optimization.

f. **Course Learning Outcomes:**

CLO 1	Explain the principles of strategic cost management in engineering projects.
CLO 2	Apply various cost concepts and costing systems for managerial decision-making.
CLO 3	Analyze cost behavior, profit planning, and project cost control techniques.
CLO 4	Apply quantitative techniques such as PERT/CPM, linear programming, and simulation for cost management.
CLO 5	Evaluate budgeting, pricing strategies, and performance measurement methods in engineering project management.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**INTRODUCTION** Introduction and overview of strategic cost management process	10	4
2	**COST CONCEPTS** Cost concepts in decision making; Relevant cost, Differential cost, Incremental Cost, Opportunity cost, Objectives of costing system; Inventory valuation, Creation of database for operational control, Provision of data for decision making	18	4
3	**PROJECT** Project meaning, different types, why to manage, cost overrun centers, various stages of project execution from conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed engineering activities. Pre-project execution main clearances and documents. Project team: role of each member. Importance of project site data and significance. Project contracts: types and contents. Project execution, project cost control, Bar charts and Network diagram. Project commissioning: mechanical and process	26	13
4	**COST BEHAVIOR AND PROFIT PLANNING** Marginal Costing: Distinction between Marginal Costing and Absorption Costing; Break-even analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Standard Costing and Variance Analysis, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing, Costing of service sector, Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of Constraints, Activity-Based Cost Management, Benchmarking, Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets, Performance budgets, Zero-based budgets, Measurement of divisional profitability pricing decisions including transfer pricing	26	13
5	**QUANTITATIVE TECHNIQUES** Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory	20	10

i. Text Book and Reference Book:

1. Cost Accounting: A Managerial Emphasis
   By Prentice Hall of India
2. Advanced Management Accounting
   By Charles T. Horngren and George Foster
3. Principles and Practices of Cost Accounting
   By Ashish K. Bhattacharya

a. Course Name: IOT and Smart Cities

b. **Course Code:** 03020702UE01
c. **Prerequisite:** Basic knowledge of computer networks, communication systems, and smart technologies.
d. **Rationale:** To provide knowledge of IoT technologies, smart infrastructure, communication systems, and intelligent applications used in smart cities for improving urban services, sustainability, security, and quality of life.
e. **Course Learning Objective:**

CLOBJ 1	Develop knowledge of IoT communication technologies, protocols, cloud platforms, and secure architectures.
CLOBJ 2	Analyze smart transportation, energy systems, and smart infrastructure applications using IoT technologies.
CLOBJ 3	Apply IoT security, privacy, blockchain, and smart monitoring techniques for sustainable and intelligent urban systems.

f. **Course Learning Outcomes:**

CLO 1	Explain the concepts, characteristics, and applications of IoT in smart cities.
CLO 2	Analyze IoT communication technologies, protocols, and cloud-based smart city solutions.
CLO 3	Apply IoT technologies for smart transportation, smart energy systems, and infrastructure monitoring.
CLO 4	Evaluate security, privacy, and blockchain challenges in IoT-enabled smart city environments.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
4	**-**	**0**	**4**	**60**	**20**	**-**	**00**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**UNIT I: INTRODUCTION TO IOT FOR SMART CITIES** Definition and characteristics of smart cities, IoT-based solutions in domains such as Smart Home, Transport & Traffic Management, Smart city planning and infrastructure essentials, Role of AI/ML/DL in IoT-enabled smart cities	18	8
2	**UNIT II: TECHNOLOGIES FOR IOT IoT** communication technologies and recent protocols, Secure IoT architectures overview, Services powered by IoT within smart cities, Cellular IoT and Cloud IoT platforms, Case study comparing MQTT, WebSocket, and HTTP via Node-RED in smart-room setups	22	10
3	**UNIT III: SMART TRANSPORTATION AND ENERGY SYSTEMS** Traffic management systems and sensor networks, Electric Vehicles (EVs) and EV charging infrastructure, Renewable energy integration and smart distribution, Smart grid concepts, Image-processing for traffic control and bus movement analysis case study	18	8
4	**UNIT IV: SMART INFRASTRUCTURE AND CITY PLANNING** Fundamentals of Smart Infrastructure, Smart water management systems, Infrastructure for Connectivity and Monitoring (Wi-Fi, 5G, LPWAN, NB-IoT infrastructure), Rainwater harvesting and solar-based automation	20	9
5	**UNIT V: SECURITY, PRIVACY, AND BLOCKCHAIN IN IOT** Privacy and social values in smart urban environments, IoT information security challenges, Blockchain applications in IoT, Case studies on smart homes, buildings, street-lighting, parking, irrigation, and food-supply chain traceability, Threats and mitigation mechanisms	13	6
6	**UNIT VI: MINI PROJECT / CASE STUDY** Applications and Lab-Based Work	9	4

i. Text Book and Reference Book:

1. Internet of Things for Smart Cities
   By Waleed Ejaz & Alagan Anpalagan | Springer, 2019
2. IoT for Smart Cities
   By Ejaz & Anpalagan | Springer
3. Designing the Internet of Things
   By Adrian McEwen & Hakim Cassimally | John Wiley and Sons, 1st Edition, 2014

a. **Course Name:** Pedagogy Studies
b. **Course Code:** 03020002MC01
c. **Prerequisite:** A basic familiarity with education systems, classroom teaching–learning processes, and introductory research concepts is required.
d. **Rationale:** This course aims to develop a critical and research-informed understanding of pedagogical practices, curriculum, teacher education, and professional development, with a special focus on evidence-based approaches and contextual challenges.
e. **Course Learning Objective:**

CLOBJ 1	Understand key concepts, theories of learning, curriculum frameworks, and pedagogical approaches in education.
CLOBJ 2	Analyze pedagogical practices used in formal and informal educational environments.
CLOBJ 3	Develop knowledge of research methodologies and evidence-based approaches for evaluating pedagogical effectiveness.
CLOBJ 4	Evaluate professional development models, curriculum practices, and research gaps for improving teaching and learning processes.

f. **Course Learning Outcomes:**

CLO 1	Recall key concepts, theories of learning, and pedagogical terminology relevant to curriculum and teacher education.
CLO 2	Explain diverse pedagogical practices used in formal and informal classroom contexts.
CLO 3	Apply appropriate research methodologies to evaluate the effectiveness of pedagogical practices.
CLO 4	Analyze evidence from educational studies to assess strengths, limitations, and research gaps in pedagogy.
CLO 5	Evaluate professional development models and curriculum frameworks to recommend context-sensitive improvements.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**0**	**0**	**0**	**50**	**-**	**00**	**00**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**INTRODUCTION AND METHODOLOGY** Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions, Overview of methodology and Searching	25	6
2	**THEMATIC OVERVIEW** Pedagogical practices used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education	13	6
3	**EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES** Methodology for the in-depth stage, Quality assessment of included studies, Teacher education (curriculum and practicum), School curriculum and guidance materials supporting effective pedagogy, Theory of change, Strength and nature of evidence for effective pedagogical practices, Pedagogic theory and approaches, Teacher attitudes and beliefs, Pedagogic strategies	25	6
4	**PROFESSIONAL DEVELOPMENT** Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and community, Curriculum and assessment, Barriers to learning such as limited resources and large class sizes	25	6
5	**RESEARCH GAPS** Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact	12	6

i. Text Book and Reference Book:

1. Education for All, the Quality Imperative and the Problem of Pedagogy
   By Alexander, R | CREATE, University of Cambridge, 2008
2. Teaching for Quality Learning at University
   By Biggs, J. & Tang, C | Open University Press, 2011
3. Studying Teacher Education: The Report of the AERA Panel on Research and Teacher Education
   By Cochran-Smith, M. & Zeichner, K. | Lawrence Erlbaum Associates, 2005
4. Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement
   By Hattie, J. | Routledge, 2009
5. Education 2030: Incheon Declaration and Framework for Action By UNESCO | UNESCO, 2015