

## M. Tech – Construction & Planning Management

### First Semester

S. No.	Course Code	Course Title	Hrs./ Week			Credits
			L	T	P	
1	PSCC – MTCP101	Operation Management	3	1	0	4
2	PSCC – MTCP102	Project Economics and Financial Management	3	1	0	4
3	PSMC – MTCP101	Probability & Data Analysis	3	0	0	3
4	PSEC – MTCP101	Elective -I	3	0	0	3
5	LC – MTCP101	Construction Management Lab - I	0	0	4	2
6	LC – MTCP102	Design Studio -I	0	0	4	2
7	MLC – MTCP101	Construction Planning and Site Management (Bridge Course)	2	0	0	2
8	AUD – MTCP101	Disaster Management	2	0	0	0
<b>Total Credits</b>						<b>20</b>

<b>Elective-I</b> (PSEC – MTCP101)	
1	Urban Planning & Sustainable Construction
2	Human Resource Development in Construction Industry
3	Marketing in Project Management

<b>AUD- MTCP101</b>	<b>Disaster Management</b>	<b>2L:0T:0P (2hrs)</b>	<b>2Credits</b>
---------------------	----------------------------	------------------------	-----------------

**Objectives:** To understand the conceptual applications of principles of management to mitigate various disasters.

**Module 1 Understanding Disaster (08 Hrs)**

Understanding Disasters, Disaster Management, Disaster Management Cycle, Key Phases of disaster management, Acceptable risk, Capacity, Capacity development, Contingency planning, Coping capacity, Critical facilities, Disaster risk, Disaster risk reduction, Emergency services, Environmental impact assessment, Hazard, Mitigation, Preparedness, Recovery, Response, Retrofitting, Risk, Sustainable development, Vulnerability.

**Module 2 Types, Trends, Causes, Consequences and Control of Disaster (10 Hrs)**

Geological Disasters (earthquakes, landslides, tsunami, mining), Hydro Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves). Biological Disasters (epidemics, pest attacks, forest fire). Technological Disasters (chemical, industrial, radiological, nuclear) and Man-made Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters

**Module 3 Economic and Financial Aspect of Disaster Management (12 Hrs)**

Financial Planning and control of disaster mitigation and management implementation programmes. Comparative analysis models for disaster mitigation and management. Budgeting, Identifying sources of funds and provision of funds. Economic consequences of disaster and intangible economic impacts of disaster. Principles of economic recovery and strategies for economic recovery. Financial recovery from disaster- disaster insurance, natural disaster relief arrangements and public disaster appeals.

**Module 4 Strategic Disaster Management (12Hrs)**

Understanding the application of the principles and procedures of strategic management in the domain of disaster mitigation and management. Strategy formulation, understanding strategic intent, vision, mission for better forecasting of disaster threats and their prevention and strategic

management of disaster. Strategic management principles, methods and tools. planning, organizing, leadership and monitoring and evaluation of all role-players in disaster management.

### **Course Outcomes:**

Students will be able to

CO 1. Understand disasters, disaster preparedness and mitigation measures

CO 2. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

CO 3. Understand the economic and financial aspect of .disaster management.

CO 4. Understand the different strategies involved in disaster management.

### **Text/Reference Books and IS Codes:**

1. Wehrich, H. and Koontz, H Management, “A Global Perspective”, , McGraw Hill, New York, 1<sup>st</sup> Edition, 1996.
2. Kapur Anu and Neti , “Disasters in India: Studies of Grim Reality”, Rawat Publication, 1<sup>st</sup> Edition, 2005
3. H. N. Srivastava & G. D. Gupta, “Management of Natural Disasters in developing countries”, Daya Publishers, Delhi, 2nd Edition 2006.
4. Disaster Management Act 2005, Publisher by Govt. of India.
5. National Disaster Management Policy, 2009, Govt. of India.
6. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
7. Mrinalini Pandey, “Disaster Management”, Wiley India Pvt. Ltd, 1<sup>st</sup> Edition 2012

### **Web Materials:**

1. [www.nidmindia.nic.in](http://www.nidmindia.nic.in)
2. <http://quake.usgs.gov>

<b>LC –MTCP101</b>	<b>Construction Management Lab I</b>	<b>0L:0T:4P (Hrs)</b>	<b>2 Credits</b>
--------------------	--------------------------------------	-----------------------	------------------

**Objectives:** To bring about an understanding of use of computers for solving scheduling and other related problems by applying critical path methods and program evaluation review techniques

<b>Sr. No</b>	<b>Practical Name</b>	<b>Application</b>
1	Study of different software's available in the field of construction planning and management.	To understand the importance of available software in construction industry.
2	To calculate the expected mean time of any network using CPM, PERT and finally comparing results with PRIMAVERA software.	To get the theoretical understanding of basics and hands on practice on PRIMAVERA.
3	To calculate the earliest expected time of any network using CPM, PERT and finally comparing results with PRIMAVERA software.	To get the theoretical understanding of basics and hands on practice on PRIMAVERA.
4	To calculate the latest allowable occurrence time of any network using CPM, PERT and finally comparing results with PRIMAVERA software.	To get the theoretical understanding of basics and hands on practice on PRIMAVERA.
5	To calculate the variance time and standard deviation of any network using CPM, PERT and finally comparing results with	To get the theoretical understanding of basics and hands on practice on PRIMAVERA.

	PRIMAVERA software.	
6	To prepare a project report of any single room for plastering using PRIMAVERA and comparing the results manually.	Application of PRIMAVERA & Validation of results.
7	To prepare a project report of any single room for white washing using PRIMAVERA and comparing the results manually.	Application of PRIMAVERA & Validation of results.

**Course Outcomes:**

Students will be able to

CO1. To identify choice of technology and construction method through construction planning.

CO2. Understand the principles of CPM and PERT.

CO3 Develop software skills.

CO4. Prepare the project reports.

<b>LC-MTCP102</b>	<b>Design Studio-1</b>	<b>0L:0T:4P (Hrs)</b>	<b>2 Credits</b>
-------------------	------------------------	-----------------------	------------------

**Objectives:** Practical training for conducting site visits related to construction techniques and planning. Capability to use software's for analysis and planning.

### **Module 1**

Minimum Two site visits to study construction techniques and use of major construction equipment associated with ongoing major construction works. Visit Report to be submitted

### **Module 2**

Collection of techno-commercial information as regards new construction materials, new construction methods, new type of construction equipment.

### **Module 3**

Performing and reporting on time and motion study work measurement of any one construction activity.

### **Module 4**

Field exercise on EOQ and bulk purchase.

### **Module 5**

Preparation, crashing and updating of precedence-network for a major construction work.

### **Module 6**

Exercise on Cash Flow analysis.

### **Module 7**

Preparation of models/charts related to various construction techniques, equipment, organizational structures of existing companies etc. (Group Activity to generate interest and explore creativity-Group of 4 students per model/chart).

### **Course Outcomes:**

Students will be able to

- CO1. Computational thinking development through creative programming
- CO2. IS Code based modeling
- CO3. Analyze and interpret the results
- CO4. Design the framed structures

<b>MLC-MTCP101</b>	<b>Construction Planning &amp; Site Management</b>	<b>L2:T0:P0 (2hrs)</b>	<b>2 Credits</b>
--------------------	--	------------------------	------------------

**Objectives:** To study about the construction project management, site management and improvement labour productivity in construction industries.

**Module 1 Introduction (10 Hrs)**

Traditional Management and modern scientific management, Principles of management, Theories of Taylor, Fayol, Mayo, McGregor, Weber, Gilbreth.

**Module 2 Construction Management (10 Hrs)**

Construction Management -Basic forms of organization. Role of planning department in construction projects.

**Module 3 Project Management (10Hrs)**

Project life cycle. Construction scheduling using Gantt chart, milestone chart. Network techniques like CPM, PERT, Precedence, updating, time-cost tradeoffs. Resource constrained scheduling and resource leveling.

**Module 4 Site Administration Site Controlling (10Hrs)**

Site layout and mobilization, Site organization, Execution, Monitoring, Material and equipment procurement, completion of work and closing the site.

**Module 5 Labor Productivity Improvement (08 Hrs)**

Fundamental Principles of Workforce Management, Productivity Evaluation, Detailed Analysis.

**Course Outcomes:**

Students will be able to

- CO 1. Determine the practical application of construction management.
- CO2. Determine the time duration, manpower requirement of construction project.
- CO 3. Modern project planning and management practices.
- CO4. Monitor project planning and its execution.

CO 5. Site Management ethics, strategies and control.

**Text/Reference Books:**

1. Sengupta and Guha, “Construction Management and Planning”, Tata McGraw Hill Publication 2003.
2. K Nagrajan , “Project Management” , New age International Limited 2017.
3. Barrie & Paulson, Professional Construction Management, McGraw Hill Institute Edition. 1992
4. Roy, Pilcher” Construction Management” S.S. Sastry, “Introductory methods of numerical analysis”, PHI, 4th Edition, 2005.
5. “Construction site management and labor productivity improvement”, Ellis, Ralph D.; Thomas, H. Randolph 2017.



<b>PSCC-MTCP101</b>	<b>Operation Management</b>	<b>3L:1T:0P (4hrs)</b>	<b>4 Credits</b>
---------------------	-----------------------------	------------------------	------------------

**Objectives:** Operations Management is a discipline that deals with designing, managing, and controlling business processes, including acquisition and utilization of resources and distribution of its goods/services. It is essential for all business managers to acquire an understanding and appreciation of operations.

**Module 1 Introduction (10Hrs)**

System Productivity, Capital Productivity, Labour Productivity, Personnel Productivity, Training Definition, production functions, Functions & Responsibilities of Production management and its relations to other management functions, Automation. Difference between services and Manufacturing. Competitiveness Strategy and productivity. Computing productivity.

**Module 2 Operations Strategy (10Hrs)**

Operations Strategy, Competitive Capabilities and Core Competencies, Operations Strategy as a Competitive Weapon, Linkage Between Corporate, Business, and Operations Strategy, Developing Operations Strategy, Elements or Components of Operations Strategy, Competitive Priorities, Manufacturing Strategies, Service Strategies, Global Strategies and Role of Operations Strategy, Case-lets.

**Module 3 Operations Analysis (10Hrs)**

Objectives of Layout, Classification of Facilities, Basis for Types of Layouts, Why Layout decisions are important, Nature of layout problems, Redesigning of a layout, Manufacturing facility layouts, Types of Layouts, Layout Planning, Evaluating Plant Layouts, Assembly Line Balancing, Material handling

**Module 4 Operations forecasting (10Hrs)**

The Strategic Importance of Forecasting, Benefits, Cost implications and Decision making using forecasting, Classification of Forecasting Process, Methods of Forecasting, Forecasting and Product Life Cycle, Selection of the Forecasting Method, Qualitative Methods of Forecasting, Quantitative Methods, Associative Models of Forecasting, Accuracy of Forecasting

## **Module 5 Operational Planning and controlling**

**(08Hrs)**

Strategies for adjusting capacity, Aggregate Planning, Material Requirements Planning (MRP), Scheduling, Capacity Requirements Planning (CRP), Enterprise Resource Planning (ERP), Project Management Life Cycle, Project Monitoring and Control, Change Control, Risk Management, Project Closure

### **Course Outcomes:**

Students will be able to

- CO1. Demonstrate comprehension of the business operations and their role within an organization.
- CO2. Identify important factors in designing, managing, and controlling business processes and how to improve.
- CO3. Demonstrate understanding of the relationship of the organizations within the supply chain and the role of planning, information sharing, and forecasting.
- CO4. Perform the mathematical techniques and computer software skills to solve managerial problems.
- CO5. Articulate an appreciation of various fields of operations management and how to adapt the knowledge learned to those issues.

### **Text/Reference Books:**

1. Crosby, "Let's Talk Quality", McGraw-Hill, 1989
2. Heizer, Render, "Principles of Operations Management" 7th Edition, Prentice Hall, 2008.
3. Operations Management: "Processes and Supply Chains" 12th Edition 2017.
4. Eliyahu M Goldratt "The Goal: A Process of Ongoing Improvement" 30<sup>th</sup> Edition 2014.

<b>PSCC-MTCP102</b>	<b>Project Economics and Financial Management</b>	<b>3L:1T:0P (4hrs)</b>	<b>4 Credits</b>
---------------------	---	------------------------	------------------

**Objectives:** To understand the Economics in civil engineering, concept of alternatives for decision making, analyze financial returns, and evaluate the value added tax and the concept financial management, construction costing and financial statement analysis.

**Module 1 Introduction (10Hrs)**

Introduction & Basics of Economics & Finance: Meaning & necessity of: Economics, Costing & Finance, History & fundamentals of Economics, Basics of Finance & Accounting, rates of interest, Basics of Financial Statement, Financial Analysis, Inflation, etc

**Module 2 Economic Analysis (10Hrs)**

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. Cost pricing method.

**Module 3 Financial Planning (10Hrs)**

Need and sources of Finance, Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves. Budget: Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual.

**Module 4 Corporate Sector (10Hrs)**

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

**Module 5 Construction Accounts (08Hrs)**

Accounting process, preparation of profit and loss account and balance sheet as per the

companies Act 2013, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis. Escrow Account for PPP Project

**Course Outcomes:**

Students will be able to

- CO1. To understand concept of alternatives for decision making.
- CO2. To analyses financial returns.
- CO3. To evaluate the value added tax.
- CO4. To understand the concept financial management, construction costing and financial statement analysis.
- CO5. To understand the construction accounts and accounting process.

**Text/Reference Books:**

1. Mubarak, "Construction project scheduling and control" Wiley India. 2<sup>nd</sup> Edition 2011.
2. D Lal, "Construction Management & PWD Accounts" S. K. Kataria & Sons 2012.
3. Singh H. "Construction Management and Accounts" Tata McGraw Hill, New Delhi, 1988
4. Cormican D., "Construction Management: Planning and finance" Construction press, London, Feb 2002.
5. Brealey R.A., "Principles of Corporate Finance" Tata McGraw Hill, New Delhi, 2003.

<b>PSEC – MTCP101</b>	<b>Urban Planning and Sustainable Construction</b>	<b>3L:0T:0P (3Hrs)</b>	<b>3 Credits</b>
-----------------------	--	------------------------	------------------

**Objectives:** To study the defects, mistakes and weaknesses in developing towns for attempting to eliminate them gradually and to fulfill a city's most serious needs and removing its problems.

**Module 1 Introduction to Urban Planning (10 Hrs)**

Meaning of Planning, Urban Planning, Elements of a City, Need for Urban Planning, Outcome of Planning is a Plan, Levels of Urban Planning, Process of Planning, Forms of Planning, Urban Planning Devices.

**Module 2 Urban Planning in India (10Hrs)**

Urbanization: Global and Indian Scenario, History and Evolution of Urban Planning, Challenges and Issues of Urban Planning in India.

**Module 3 Planning Theories (10 Hrs)**

Ebenezer Howard's The Three Magnets Theory, Concentric Model Zone Theory, The Sector Model Theory, The Multiple Nuclei Model Theory.

**Module 4 Infrastructure Planning (10Hrs)**

Definition of Public Works and Infrastructure, Overview of Infrastructure: Electric, Telecom, Transport, Water, Categories of Infrastructure Projects, Infrastructure Planning Steps, Infrastructure Management.

**Module 5 Smart Cities and Sustainable Development (10Hrs)**

Sustainability, Information and Communication Technology (ITC) Revolution, City Transformation system, Urban Networks, Urban Challenges, Smart City Concept.

**Course Outcomes:**

Students will be able to

- CO1. To understand the key concept and need for urban planning
- CO2. To acquaint with the status of urban planning in India
- CO3. To study the various theories involved in urban planning and its implementation

CO4. To inculcate the idea about infrastructure planning.

CO5. To incorporate the fundamental concept of smart cities and sustainability.

**Text/Reference Books:**

1. Hall, P., Jones, M. T., “Urban and Regional Planning”, Taylor and Francis 2010.
2. Hall, P., “Cities of Tomorrow, an Intellectual History of Urban Planning and Design since 1880”. 4th Edition, Wiley-Blackwell 2014.
3. Crane, R., Weber, R., “The Oxford Handbook of Urban Planning”. Oxford University Press 2012.
4. Bracken, I., “Urban Planning Methods, Research and Policy Analysis”, Routledge, Taylor & Francis 2009.
5. Dimitriou, H.T., Gakenheimer, R., “Urban Transport in the Developing World, A Handbook of Policy and Practice”. Edward Elger, USA 2011,
6. Sen, J., “Sustainable Urban Planning, The Energy and Resources Institute”, New Delhi, India 2013.
7. Lopez, R., “The Built Environment and Public Health”. John Wiley & Sons 2012.

<b>PSEC-MTCP101</b>	<b>Human Resources Development in Construction Industry</b>	<b>3L:1T:0P (4hrs)</b>	<b>4 Credits</b>
---------------------	---	------------------------	------------------

Objectives: Study of human resource development in the construction industries, the recruitment process, their training, performance management and their performance appraisal.

**Module 1 Introduction (10Hrs)**

Need of HRD in the context of globalization, Organization Policies various HRD parameters viz. Elements of the ICDP i.e. integrated construction development paradigm, key elements of HRD such as basic literacy, functional skills, supervisory skills, entrepreneurship skills. Database concept & application in Human Resource Information System

**Module 2 Recruitment process (10Hrs)**

Recruitment policies, Pre requisites skills- Soft and technical skills. Employee testing & selection. Personal Management – Concept of Personal Management, Responsibilities & authority Role and Function of Personal Manager, Necessity of Personal Management

**Module 3 Training (10Hrs)**

Training of multi-skilled workforce, quality, productivity and employee relations in construction, contractors & sub-contractors – selection, training & development, performance appraisal, potential appraisal, training rewards etc. Selection of contractors regionwise & retaining, Upgrading HRD for construction MNC/Multi portfolio project handling organization. Formation of joint ventures, privatization and BOT type of systems. CIDC – IGNOU Training programs

**Module 4 Performance Management (10Hrs)**

Introduction to the field of people management -basic Individual psychology motivation -job design and performance management -Managing groups at work - self managing work teams- Intergroup behavior and conflict in organizations –Leadership- Behavioral aspects of decision-making; and communication for people management

**Module 5 Performance Appraisal (10Hrs)**

Compensation- Wages and Salary, Employee Benefits, employee appraisal and assessment- Employee services -Safety and Health -Discipline and discharge -Special Human resource

problems, Performance appraisal-Employee hand book and personnel manual -Job descriptions and organization structure and human relation.. -Productivity of Human resources.

### **Course Outcomes:**

Students will be able to

CO1. Understand the basics of human resource development.

CO2. Understand the Recruitment policies, Pre requisites skills- Soft and technical skills.  
Employee testing & selection.

CO3. Understand Training of multi-skilled workforce, quality, productivity and employee relations in construction.

CO4. Understand the performance management of employee with different techniques.

CO5. Understand the Wages and Salary, Employee Benefits, employee appraisal, Safety and Health laws.

### **Text/Reference Books:**

1. Biswajeet Pattanayak, "Human Resource Management" PHI Learning 2018.
2. Monappa A "Personnel Management" Tata McGraw Hill, new delhi.1997
3. Carleton Counter II and Jill Justice Coutler, "The Complete Standard Handbook of Construction Personnel Management" Prentice Hall, Inc., New Jersey, 2009.
4. Memoria .C.B "Personnel Management", Himalaya Publishing Co., 2002.
5. Josy .J, Familiaro, "Handbook of Human Resources Administration", McGraw-Hill International Edition, 2007.



<b>PSEC - MTCP101</b>	<b>Marketing in Project Management</b>	<b>3L:0T:0P (3Hrs)</b>	<b>3 Credits</b>
-----------------------	--	------------------------	------------------

**Objectives:** Project marketing focused on customer based approach helps build and maintain long- lasting relationships with key clients and stakeholders avoiding short term opportunism. Project marketing also builds and maintains relationships between two projects with key customers and stakeholders

**Module 1 Introduction to Marketing concept (10 Hrs)**

Evolution of marketing & Customer orientation, Marketing Environment and Evaluation of Market opportunities, Market research & Marketing Information Systems, Demand forecasting and Market potential analysis, Consumer buying process & Organizational buying behavior ,Pillars of Marketing.

**Module 2 Market segmentation (10Hrs)**

Target marketing Positioning & Differentiation,Marketing Mix,Product decisions — Product Life cycle,New Product development process,Distribution decisions— Logistics & Channel decisions,Promotion decisions— Integrated.

**Module 3 Marketing communications (10Hrs)**

Marketing communications concept, communication tools, Personal Selling & Sales management - , Pricing decisions

**Module 4 project Introduction (10Hrs)**

Introduction what is a project? Why and how to plan a project, Organizing the project team, the role of the project manager, Time estimating, Planning the budget, Project cost reports

**Module 5 The Owner's Perspective The project life cycle (10Hrs)**

The Owner's Perspective The project life cycle-Major Types of Construction-Selection of Professional Services-Construction contractors-Financing of constructed facilities-Legal and regulatory Requirements-The changing Environment of the construction Industry-The Role Project Managers

## **Course Outcomes:**

Students will be able to

- CO1. Understand the marketing concept, Market research & Marketing Information Systems.
- CO2. Know the different segment of marketing.
- CO3. Understand the communication tools and sales management.
- CO4. Understand the project and organizing team of project.
- CO5. Know the role of project manager, financing of constructed facilities, Legal and regulatory Requirements of project

## **Text/Reference Books:**

1. Barnard Cova, "Project Marketing: Beyond Competitive Bidding" Wiley 2002.
2. Scott bercun, "Making Things Happen: Mastering Project Management" O'Reilly Media 2008.
3. Michael Kleinaltenkamp, "Business Project Management and Marketing" Springer; 1<sup>st</sup> Edition 2016.

<b>PSMC - MTCP101</b>	<b>Probability and Data Analysis</b>	<b>3L:0T:0P (4hrs)</b>	<b>3 Credits</b>
-----------------------	--------------------------------------	------------------------	------------------

**Objectives:** This mathematical study is related to data analysis, probability and statistical techniques which are significant in the research projects.

**Module 1 Data Collection and Presentation (10Hr)**

Data Collection: Primary and Secondary Sources of data, Survey Design, sources of various data in India Data Presentation: Classification of Data, Tabulation of Data, Charting of Data, Choice of Suitable Diagrams, etc.

**Module 2 Data Analysis (10Hr)**

Data Analysis: Measures of Central Tendency: characteristics of a Good Average, Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean, etc. Measures of Variation: Significance of Measuring Variation, Methods of Studying Variation, Average Deviation, Standard Deviation, etc. Skewness, Moments and Kurtosis: Measures of Skewness, Moments, Kurtosis, etc. Probability and Data Sampling

**Module 3 Probability (10Hr)**

Probability: Types of Probability, Random Variable, Probability Function, Sampling: Purpose and Principle of Sampling, Methods of Sampling, Size of Sample, Merits and Limitations of sampling, Sampling Distribution, etc.

**Module 4 Statistics (10Hr)**

Correlation Analysis: Significance, Correlation & Causation, Types of Correlation, Methods of Studying Correlation, Multiple Correlation, etc.

Regression Analysis: Difference between Correlation and Regression, Linear Bivariate Regression Model, Regression Lines, Equations, Coefficients, etc.

Index Numbers: Use of Index Numbers, Unweighted Index Numbers, Weighted Index Numbers, Quantity Index Numbers, Volume Index Numbers, Test for Perfections, etc

**Module 5 Forecasting and Time Series (10Hr)**

Analysis Forecasting: Introduction, Steps in Forecasting, Methods of Forecasting, etc

Time Series Analysis: Components of Time Series, Straight Line Trends, NonLinear Trend, etc.

Input-Output Analysis Hypothesis Testing: The Chi ( $\chi^2$ ) Test, The Z-Score Test, The T-Test, Test for Proportion

### **Course Outcomes:**

Students will be able to

- CO 1. Know about the data collection and survey design.
- CO 2. Learn the data analysis, central tendency Standard Deviation, Skewness, Measures of Skewness, Moments, Kurtosis, Probability and Data Sampling.
- CO 3. Learn probability, Principle and Methods of Sampling.
- CO 4. Apply various statistical techniques to civil engineering projects.
- CO 5. To learn Forecasting and Time Series analysis and Hypothesis Testing.

### **Text Books / Reference Books:**

1. Gupta S. P. and Gupta M. P. "Business Statistics", Sultan Chand & Sons, New Delhi (2005).
2. Gupta S. C. and Kapoor V. K. Sultan Chand & Sons, New Delhi (2014).
3. Rosenfeld, Zirekel "Understanding Statistics", McGraw Hill, USA (1972).
4. Kruckerberg and Silvers, "Urban Planning Analysis: Methods and Models", John Wiley & Sons, New York (1974).
5. Mode, "E B Elements of Statistics, Prentice Hall", New Jersey Naiman (1961).
6. Wannacott and Wannacott "Introductory Statistics", John Wiley & Sons, New York (1969).
7. Yamane, Taro, "Statistics – An Introductory Analysis", Harper, New York (1964).

## Second Semester

S.No.	Course Code	Course Title	Hrs./ Week			Credits
			L	T	P	
1	PSCC – MTCP201	Tendering and Contract Management	3	1	0	4
2	PSCC – MTCP202	Risk and Safety Management	3	1	0	4
3	PSEC – MTCP201	Elective -II	3	0	0	3
4	OEC – MTCP201	Operational Analysis	3	0	0	3
5	LC – MTCP201	Construction Management Laboratory - II	0	0	4	2
6	LC – MTCP202	Design Studio -II	0	0	4	2
7	MLC – MTCP201	Research Methodology & IPR	2	0	0	2
8	AUD – MTCP201	Stress Management	2	0	0	0
<b>Total Credits</b>						<b>20</b>

<b>Elective-II</b> (PSEC – MTCP201)	
1	Total Quality Management and MIS in Construction
2	Infrastructure Development and Management
3	Building Information Management

<b>LC - MTCP202</b>	<b>Design Studio-I1</b>	<b>0L:0T:4P (Hrs)</b>	<b>2 Credits</b>
---------------------	-------------------------	-----------------------	------------------

**Objectives:** Practical training for conducting site visits related to construction techniques and planning. Capability to use software's for analysis and planning.

### **Module 1**

Minimum two site visits 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

### **Module 2**

Use of spread sheet and data base application software for performing various functions of civil engineers as mentioned is to be demonstrated, Quantity Estimation, Rate Analysis, Bid preparation, Material and supplier information, Employee / equipment information etc.

### **Module 3**

Collection and study of tender notices, tender documents of contract document associated with Civil Engineering works.

### **Module 4**

Exercise on contract document associated with Civil Engineering works.

### **Module 5**

Exercise on Valuation: Valuation of land and building using various methods report to be submitted on prescribed format.

### **Module 6**

Web based project management.

### **Course Outcomes:**

Students will be able to

- CO1. Computational thinking development through creative programming
- CO2. IS Code based modeling
- CO3. Analyze and interpret the results
- CO4. Design the framed structures



<b>LC –MTCP201</b>	<b>Construction Management Lab-II</b>	<b>0L:0T:4P (Hrs)</b>	<b>2 Credits</b>
--------------------	---------------------------------------	-----------------------	------------------

**Objectives:** This course gives an exposure to students in utilizing the sophisticated spread sheets programs, estimation software.

<b>Sr. No</b>	<b>Practical Name</b>	<b>Application</b>
1	<p>All the students will be divided into different groups, every group has to choose the individual running projects government or private. All the students need to go to their respective site 2hrs/Week minimum and study the ongoing progress. Also each group has to give information regarding progress of work every week in the form of presentation.</p> <p>Finally each group has to model the project in primavera and find out the duration and cost of complete project. Also they need to check the results manually using CPM &amp; PERT method. Finally project report along with validation report need to submit.</p>	<ul style="list-style-type: none"> <li>• To train the students in the field work so as to have a firsthand knowledge of practical problems related to Construction Management in carrying out engineering tasks using software's.</li> <li>• To develop skills in facing and solving the problems experiencing in the field.</li> </ul>

**Course Outcomes:**

Students will be able to

- CO1. Do the Scheduling of a construction project using Primavera scheduling systems including reports and tracking
- CO2. Understand the working of field.
- CO3 Develop software skills and will be able to do the analysis of ongoing project.



<b>OEC – MTCP201</b>	<b>Operational Analysis</b>	<b>3L:0T:0P (3Hrs)</b>	<b>3 Credits</b>
----------------------	-----------------------------	------------------------	------------------

Objectives: To determine the maximum (of profit, performance, or yield) or minimum (of loss, risk, or cost).

**Module 1 Linear Programming: (10 Hrs)**

OR Models, Convex Sets, Graphical Method, Simplex Method, Big M Method, Two Phase Method., Revised Simplex algorithm, Simplex algorithm for Bounded Variables, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis. Column Generation and Cutting Stock Problems, Decomposition Algorithm, Primal Dual Algorithm, Goodness of the Simplex Algorithm, Goal Programming, Some aspects of polynomial algorithm Integer

**Module 2 Programming Formulations, (10 Hrs)**

Zero-One Problem- additive algorithm, Gomory’s cutting plane algorithm, Branch and bound algorithm, all integer primal-dual algorithms Transportation and Assignment Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in TP; Assignment Problem, Hungarian Method, Traveling Salesman Problem.

**Module 3 Game Theory and Sequencing (10 Hrs)**

Two Person Zero Sum Game, Pure and Mixed Strategies, Algebraic Solution Procedure, Graphical Solution, Solving by Linear Programming; Sequencing Problem, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem. Games theory simulations applied to construction, Modifications and improvement on CPM/PERT techniques.

**Module 4 Inventory and Queuing Models (10 Hrs)**

Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model, Newsboy Problem. Elements of Queuing Model, Pure Birth Death Model, Single Server and Multi-Server Markovian Models with Infinite and Finite Capacity, Machine Repair Model, Networks of Queues

## **Module 4 Decision Theory & Project Management**

**(10 Hrs)**

Introduction, Decision under certainty, Decision under risk, Decision under uncertainty, MaxiMin criterion, MinMax criterion, savage Minimax regret criterion, Decision Tree.

Introduction to PERT and CPM, critical Path calculation, Float calculation and its importance, cost reduction by Crashing of activity.

### **Course Outcomes:**

Students will be able to

- CO 1. Select appropriate optimization technique
- CO 2. Apply optimization techniques in civil engineering problems.
- CO 3. Analyze practical application of operational analysis in construction projects.
- CO 4. Understand the Inventory and Queuing Models application.
- CO 5. Understand decision theory under certainty and uncertainty condition and project management techniques.

### **Text/Reference Books:**

1. Mohan, C. and Deep, Kusum, "Optimization Techniques", New Age, 2009.
2. Mittal, K. V. and Mohan, C., "Optimization Methods in Operations Research and Systems Analysis", New Age, 2003.
3. Taha, H.A., Operations Research - An Introduction, Prentice Hall, (7th Edition), 2002.
4. Ravindran, A., Phillips, D. T and Solberg, J. J., "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009
5. Hiller, F. S. and Liebermann, G. J., "Introduction to Operations Research", Tata McGraw Hill, 2002
6. Chandra, Suresh, Jayadeva and Mehra, Aparna, Numerical Optimization with Applications, Narosa, 2009

<b>PSCC-MTCP201</b>	<b>Tendering and Contract Management</b>	<b>3L:1T:0P (Hrs)</b>	<b>4 Credits</b>
---------------------	--	-----------------------	------------------

**Objectives:** To study about contract management in construction industries. Tender management and legal frame work of construction labour laws and industrial dispute.

**Module 1 Contract Management - I (10 Hrs)**

Types of Construction contract, Lump sum, Unit rate, cost plus-fee, Cost Plus percentage-fee, Incentive Contracts, Nature of Contract, Contract Documents and Contracting procedures, contract revisions, Negotiated contracts, contract claims

**Module 2 Contract Management - II (10Hrs)**

Technical Specifications, Drawings, Tender Bond, Labour and Material Payment Bonds, Scrutiny of Tenders, acceptance, letter of indent. Important Contract clauses, Terms of Payment, retention acceptance and final payment, maintenance period, Time for Completion, Extension of time, Variation in work and conditions, claims and disputes, liquidated damages, Termination rights and responsibility of client, Architect, Engineer, Contractor, Professional liability. Disputes in contracts, Sub-contracts. Purchase orders as contracts. Insurance Contract and Claims. Arbitration.

**Module 3 Tender Management (10Hrs)**

Advance Techniques of Estimating. Principles of Analysis of rates and Specification, legal requirement of planning, local government approval.

**Module 4 Legal Frame Work of Construction (10Hrs)**

Constitutional provisions relating to Business and industry, Master Plans, Indian Contract Act. Arbitration act and industrial dispute act,

**Module 5 Labour Laws and Legislation (10Hrs)**

Contract labour (RRA) ACT 1970, laws relating to wages, Workmanship compensation act, child labour act Maternity benefit Act.

## **Course Outcomes:**

Students will be able to

- CO1. Understand different types of contracts, contract document and contracting procedure.
- CO2. Understand technical Specifications, Drawings, Tender Bond, Labour and Material Payment Bonds, Scrutiny of Tenders, acceptance, letter of intent and different technical term related to contract management
- CO3. Understand tender management, advance techniques of Estimating. Legal requirement of planning and local government approvals.
- CO4. Know about constitutional provisions related to Business and industry, Master Plans, Indian Contract Act and Industrial disputes.
- CO5. Know about Contract labour (RRA) ACT 1970, laws relating to wages, Workmanship compensation act and different labour Laws and legislation

## **Text/Reference Books:**

1. Aqua group, "Tenders and Contracts for Building" Wiley-Blackwell 3rd Edition 1999.
2. S.R.C Nayar, Justice P.S Narayana, "Law of Contracts with special Reference to Tenders and Construction Agreements" Gogia Law Agency 6<sup>th</sup> Edition 2015.
3. Martin Brook, "Estimating and Tendering for Construction" A Butterworth-Heinemann Title 4th Edition 2008
4. J P Nayak, G B Deshpande, "Quantity Surveying Contracts and Tenders" Nirali Prakashan

<b>PSCC – MTCP202</b>	<b>Risk and Safety Management</b>	<b>3L:1T:0P (4Hrs)</b>	<b>4 Credits</b>
-----------------------	-----------------------------------	------------------------	------------------

**Objectives:** The study about risk and safety management in construction Industries, understanding the risk involve in the construction, access and analyze that risk, control or mitigate the risk and understanding safety measures.

**Module 1 Introduction to Risk Management Definition (10Hrs)**

The Development of Risk Management -Principles of Risk Management - The hazard and risk – knowledge of the contents the reasons for managing risk in the public and private sectors – Risk estimation – types of risk and classifications - benefits of having a risk management programme responsibilities of those involved in the risk management - Outline the elements of the various risk management standards

**Module 2 Risk Assessment, Analysis and Evaluation (10Hrs)**

Risk Assessment, Analysis and Evaluation, Risk Management Documentation – Risk Culture - Risk Identification - – life cycle risk management – multi dimensional analysis risk ranking event incident scenario – uncertainties and consequences – risk estimation – assessment – quantitative techniques – human factors – decision making under uncertainty

**Module 3 Risk Treatment and Control (10Hrs)**

Risk Reduction Transfer and Sharing of Risk - Elimination and Retention of Risk - Entrepreneurial risks - Pure risks - Internal risks Retaining insurable risks – Insurance - Self-insurance - Contractual Transfer of Risk – Captives - Responsibilities of Those Involved in Risk Transfer -- Factors Affecting Insurance as a Financing Tool . Risk Management and Internal How the Internal Audit Function Works - Control Systems - Auditing Risk Management – Setting

**Module 4 Construction accidents (10Hrs)**

Construction accidents -Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications .I Contractual obligations- Safety in Construction Contracts – Substance Abuse – Safety Record Keeping

## **Module 5 Designing for safety**

**(10Hrs)**

Designing for safety - 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

### **Course Outcomes:**

Students will be able to

- CO1. Understand the Principles of Risk Management and Outline the elements of the various risk management standards.
- CO2. Understand the assessment analyze and Evaluation of risk.
- CO3. Understand the treatment and controlling the risk.
- CO4. Know the different construction accident and hazards.
- CO5. Know about the safety measures, Project Coordination and Safety Procedures.

### **Text/Reference Books:**

1. Bhattacharjee S K, “Safety Management in Construction Principles and Practice”
2. Paul S.V., “Safety Management Systems and Documentation Training Programme Handbook” CBS Publishers & Distributors.
3. Richard Coble Jimmie W. Hinze **Construction Safety and Health Management** Pearson 2000.
4. Tim Howarth Paul Watson, “Construction Safety Management” Wiley-Blackwell 2008.

<b>PSEC – MTCP201</b>	<b>Total Quality Management and MIS in Construction</b>	<b>3L:0T:0P (3Hrs)</b>	<b>3 Credits</b>
-----------------------	---	------------------------	------------------

**Objectives:** To familiarize with quality management and to understand the leadership in construction industry.

**Module 1 Concept of Quality (10Hrs)**

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

**Module 2 Control tools and statistical quality Control (10Hrs)**

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

**Module 3 Study of ISO 9004 Quality System Standards (10Hrs)**

Development of quality circles, quality inspection team, inspection reports, monitoring and control, 360° feedback for quality. Study of ISO 9004- Quality System Standards. Purpose of ISO Standards. Difference between ISO 9001 and ISO 9004. Certification process for ISO 9001. Certification bodies involved. Eight Principles of ISO-Basic meaning, applying these principles for an effective quality process in the organization.

**Module 4 Achieving TQM on Construction Projects (10Hrs)**

Advantages, barriers, principles, steps in implementation, seven types of construction defects. Determining cost of poor quality including hidden cost. Quality functions deployment (QFD). Importance of third party quality audits. CIDCCQRA quality rating systems, customers satisfaction surveys, Non Conformity reports (NCR), remedial strategy for reducing NCR's. Six Sigma: Definition of six sigma, evolution – Historical aspects, probability distribution Six sigma ratings, Six sigma training, six sigma as an effective tool in TQM

## **Module 5 Management Information System in Construction**

**(10Hrs)**

Information System - Necessity of IT in management, Information flow, Data processing, Flow charting, System analysis and design, Decision – making, IT Project Management and project teams in one or multiple locations, Entrepreneurs Resources Planning (ERP) - Need for ERP concept, ERP system for organization ERP software available in market, Selection and implementation of ERP system.

### **Course Outcomes:**

Students will be able to

- CO1. Understand the basic concept of total quality management in the construction industries.
- CO2. Know different tools and methods for controlling the quality in construction.
- CO3. Learn the different quality standard in the construction industries and their application.
- CO4. Learn how to achieve the total TQM in construction.
- CO5. Learn the MIS (management Information system) in construction.

### **Text/Reference Books:**

1. P.I Jain, “Quality Control & Total Quality Management” Tata Mcgraw Hill Publishing Co Ltd 2007
2. Sunil Sharma, “Total Engineering Quality Management” Macmillan India Limited 2003.
3. Gordon B Davis, Margrethe H Olson, “Management Information Systems Conceptual Foundations Structure & Development” TMH Co Ltd 2014.



<b>PSEC-MTCP201</b>	<b>Infrastructure development and management</b>	<b>3L:1T:0P (4hrs)</b>	<b>4 Credits</b>
---------------------	--	------------------------	------------------

**Objectives:** To understand various concepts of infrastructure planning and management. The focus is on imparting knowledge and skills required for planning, management, and effective delivery of large-scale infrastructure projects.

**Module 1 Introduction (10Hrs)**

An overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, Privatization of Road Transportation Infrastructure in India. Government's initiatives in infrastructure; Initiatives in 5-year plans.

**Module2 Infrastructure Planning and Implementation (10Hrs)**

Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure,

Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Designing Sustainable Contracts, Sustainable Development of Infrastructure, Information Technology and Systems for Successful Infrastructure Management, Innovative Design and Maintenance of Infrastructure Facilities.

**Module 3 Infrastructure Development Policies (10Hrs)**

Infrastructure Policy & Regulation; Land procurement; Project clearances; Appraisal of techno-legal and regulatory aspects of infrastructure. Infrastructure development models in India: Build-and Transfer, Build-Lease-and-Transfer, Build-Operate-and-Transfer, Build-Own-Operate-and Transfer, Build-Own-and-Operate, Build-Operate-Share-Transfer, Build-Own-Operate-Share Transfer. Legal and Regulatory Framework, Acts, Institutional Reforms.

**Module 4 Infrastructure Pricing and Financing (10Hrs)**

Meaning and Scope of infrastructure financing, Concept of SPV, Forms of financing: insurance of bonds, Loans from banks and financial institutions: prospects and limitations. Financing

market: bonds, credit rating agencies, repayment capacity, borrowing capacity, Cost components of infrastructure development; Socio-economic cost benefit analysis.

Cost recovery and affordability; feasibility of project, Net Present Value (NPV) and Internal Rate of Return (IRR). Subsidy and cross-subsidy of infrastructure project, Case studies of Infrastructure projects and their financing under JNNURM.

### **Module 5 Detail Project Report of Infrastructure Project (10Hrs)**

Detailed Project Report (DPR) for any components of city infrastructure as proposed in the Comprehensive City Infrastructure Development Plan prepared in previous planning studio.

The scope of the DPR shall confine to cover all the stages of project preparation includes: Identification of activities, Activity event chart (Network Chart), Cost estimation in detail, Time-cost chart (Gantt chart), Cost recovery plan (if required)

The DPR so prepared suitably in form of maps, charts, diagrams, photographs, sketches supported by detailed report for its submission and final evaluation.

#### **Course Outcomes:**

Students will be able to

- CO1. Design integrated framework for infrastructure planning and management.
- CO2. Analyze the strategies for Infrastructure Project implementation
- CO3. Perform Infrastructure modelling and Life Cycle Analysis Techniques
- CO4. Understand the requirement of industries in financial aspect.
- CO5. Prepare the detailed project report of infrastructure

#### **Text/Reference Books:**

1. Grigg, Neil, "Infrastructure engineering and management", Wiley, (1988).
2. Haas, Hudson, Zaniewski, "Modern Pavement Management", Krieger, Malabar,(1994).
3. Hudson, Haas, Uddin, "Infrastructure management: integrating design,construction, maintenance, rehabilitation, and renovation", McGraw Hill, (1997). Principles of Corporate Finance, Brealey R.A. Tata McGraw Hill, New Delhi, 2003.
4. JNNRUM (2005). Guidelines Ministry of Urban Development & Poverty Alleviation, Govt.of India, New Delhi.

5. P.Chandra, (2002). Projects Planning, Analysis, Financing, Implementation and Review,Sage Publishers, New Delhi.

<b>PSEC – MTCP201</b>	<b>Building Information Management</b>	<b>3L:0T:0P (3Hrs)</b>	<b>3 Credits</b>
-----------------------	--	------------------------	------------------

**Objectives:** To study building information management, BIM concept environmental aspect and services, architecture BIM modeling and Maintenance and safety of building.

**Module 1 BIM Concept (10Hrs)**

What is BIM, BIM development & History, Difference between BIM and Cad, Terms used in BIM, BIM Benefits, Risks and challenges, Present State of BIM Adoption and Road ahead

**Module 2 Environmental aspect and services (10Hrs)**

Environmental aspects and services Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – Illumination – Relevant systems integration with structural systems, Plumbing – Electricity – Vertical circulation and their interaction

**Module 3 Architecture BIM modeling (10Hrs)**

Architectural BIM modeling Building element and Revit element, Revit interface, basic operation, architectural element modeling, views and sheet documentation Structural BIM modelling Modelling structural element, create analytical model, structural analysis, documentation

**Module 4 MEP BIM Modeling (10Hrs)**

Modeling for HVAC system, air terminals, mechanical equipment, piping system & plumbing fixture, linking with cross discipline model, create customize families-System families, component families, in place families

**Module 5 Maintenance and safety (10Hrs)**

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces, Ability of systems to protect fire – preventive systems – fire escape system design – planning for pollution free construction environmental – Hazard free Construction execution.

**Course Outcomes:**

Students will be able to

- CO1. Understand the basic concept of BIM.
- CO2. Learn the different Environmental aspect and services of buildings.
- CO3. Learn Architecture modeling of BIM.
- CO4. Learn MEP system in BIM.
- CO5 Know the various maintenance and safety factors of Buildings.

**Text/Reference Books:**

1. Chuck Eastman, Paul Teicholz, “BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors” John Wiley & Sons 2011.
2. Nawari Nawari O., “Building Information Modeling” Taylor & Francis Inc
3. Portman J BUILDING SERVICES DESIGN MANAGEMENT Wiley-Blackwell 2014
4. Finith E Jernigan Aia, “Big Bim Little Bim: The Practical Approach to Building Information Modeling Integrated Practice Done the Right Way” 4site press 2007