JSPM University Pune
Faculty of Science and Technology
School of Civil and Environmental Sciences

NEP aligned Syllabus
for
FY M. Tech. (Construction Management)

(Effective from AY: 2024-25)

	JSPM University Pune	**COURSE STRUCTURE (NEP 2020 Aligned)**	
	FACULTY OF SCIENCE & TECHNOLOGY	**W. E. F**	**2024-2025**
	SCHOOL OF CIVIL AND ENVIRONMENTAL SCIENCES	**RELEASE DATE**	**01/07/2025**
	FIRST YEAR MASTER OF TECHNOLOGY (CONSTRUCTION MANAGEMENT)	**REVISION NO.**	**1.0 (NEP)**

SEMESTER I (LEVEL 6.5)

COURSE			TEACHING SCHEME				EXAMINATION SCHEME AND MARKS									
			Hours / Week				THEORY (Equal Weightage for CIE and ESE)				PRACTICAL (Equal Weightage for CIE and ESE)		ORAL (Equal Weightage for CIE and ESE)		TOTAL	CREDITS
TYPE	CODE	COURSE NAME	L	T	P	EL	CONTINUOUS INSEMESTER EVALUATION (100 Marks)			END SEMESTER EXAMINATION (100 / 50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)		
							T1 (30 Marks)	T2 (30 Marks)	Assign-ments (40 Marks)							
PSMC	230GMAM03_01	Probability and Statistics	2	1	-	-	30	30	40	100	-	-	-	-	100	3
PCC	231GCMM01_01	Construction Project Planning and Management	3	-	-	-	30	30	40	100	-	-	-	-	100	3
PCC	231GCMM02_01	Construction Materials and Materials Management	2	-	-	2	30	30	40	100	-	-	-	-	100	2.5
PCC	250GCMM01_01	Construction Cost Analysis	2	-	-	-	30	30	40	50	-	-	-	-	50	2
MMC	-	Multidisciplinary Minor Course- I	1	-	2	-	-	-	-	-	50	50	50	50	100	2
SEC	230GTEM19_01	Geospatial Analysis	2	-	2	-	-	-	-	-	50	50	50	50	100	3
VSC (HSMC)	230IDCB01_01	Design Thinking and Creativity	1	-	-	2	-	-	-	-	-	-	50	50	50	1.5
AEC (HSMC)	231UENM01_01	Communicative English for Professionals	1	-	2	-	-	-	-	-	50	50	-	-	50	2
RMC	230IRMM01_01	Research Methodology	2	-	-	-	30	30	40	50	-	-	-	-	50	2
LC	230GCMM26_01	Project Planning Lab	-	-	2	-	-	-	-	-	50	50	-	-	50	1
TOTAL			16	1	8	4									**750**	**22**

Sem	Multidisciplinary Minor Course	
I (MMC – I)	Course Code	230GRAM24_01
	Course Name	Sensors and Automation
II (MMC – II)	Course Code	230GETM16_02
	Course Name	IoT Basics and Applications

JSPM University Pune

FACULTY OF SCIENCE & TECHNOLOGY		W. E. F	2024 - 2025
SCHOOL OF CIVIL AND ENVIRONMENTAL SCIENCES		RELEASE DATE	01/07/2025
FIRST YEAR MASTER OF TECHNOLOGY (CONSTRUCTION MANAGEMENT)		REVISION NO.	1.0 (NEP)

COURSE STRUCTURE (NEP 2020 Aligned)

SEMESTER II (LEVEL 6.5)

COURSE			TEACHING SCHEME				EXAMINATION SCHEME AND MARKS									
			Hours / Week				THEORY (Equal Weightage for CIE and ESE)				PRACTICAL (Equal Weightage for CIE and ESE)		ORAL (Equal Weightage for CIE and ESE)		TOTAL	CREDITS
TYPE	CODE	COURSE NAME	L	T	P	EL	CONTINUOUS INSEMESTER EVALUATION (100 Marks)			END SEMESTER EXAMINATION (100 / 50 marks)	CONTINUOUS INSEMESTER EVALUATION (50marks)	END SEMESTER EXAMINATION (50 marks)	CONTINUOUS INSEMESTER EVALUATION (50marks)	END SEMESTER EXAMINATION (50 marks)		
							T1 (30 Marks)	T2 (30 Marks)	Assign-ments (40 Marks)							
PCC	230GCMM03_02	Construction Contracts, Administration and Management	2	1	-	-	30	30	40	100	-	-	-	-	100	3
PCC	230GCMM04_02	Construction Techniques	2	-	-	2	30	30	40	100	-	-	-	-	100	2.5
PCC	230GCMM05_02	Construction Equipment and Machinery	3	-	-	-	30	30	40	100	-	-	-	-	100	3
MMC	-	Multidisciplinary Minor Course- II	1	-	2	-	-	-	-	-	50	50	50	50	100	2
SEC	230GSEM19_02	Building Information Modelling	2	-	2	-	-	-	-	-	50	50	50	50	100	3
VSC (HSMC)	230IINB02_02	Innovation	1	-	-	2	-	-	-	-	-	-	50	50	50	1.5
AEC (HSMC)	231UENM02_02	Business Communication	1	-	2	-	-	-	-	-	50	50	-	-	50	2
RMC	230IRMM02_02	Research Design and Techniques	2	-	-	-	30	30	40	50	-	-	-	-	50	2
LC	230GCMM17_02	Project Management Lab	-	-	2	-	-	-	-	-	50	50	-	-	50	1
IITP/FP/ CEP	230GCMM25_02	Internship / Field Project / Community Engagement Programme	4 to 6 weeks										50	50	50	2
TOTAL			14	1	8	4									750	22

Note: A **Postgraduate Diploma** will be awarded if a student exits after first year.
For Exit at the end of first year the student must complete: (Total credits = 8)
a) An internship / OJT of 8 - 10 weeks (4 credits)
b) Additional Course 1 (4 credits) (Vocational Skill Course (VSC) / Skill Enhancement Course (SEC))

Sem	Multidisciplinary Minor Course	
I (MMC – I)	Course Code	230GRAM24_01
	Course Name	Sensors and Automation
II (MMC – II)	Course Code	230GETM16_02
	Course Name	IoT Basics and Applications

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: PSMC	**Course Title:** Probability and Statistics	
Course Code: 230GMAM03_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 1 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory:** 100 Marks

Prerequisite Courses, if any: -

Course Objectives:

- The course objective of this course is to give students a foundation in statistical and probabilistic analysis, which is usually utilized in a variety of engineering and scientific applications.

Course Outcomes: On completion of the course, learner will be able to

CO1: Understand statistical problem concepts.
CO2: Observe and analyze the behavior of given sample.
CO3: Apply the concept of correlation and regression to find relation between data.
CO4: Learn discrete and continuous probability
CO5: Acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
CO6: Understand of probability principles and be familiar with standard distributions, which can be used to explain phenomena in real life.

Course Contents

Unit I	**Introduction to Statistics**	**(7 Hrs)**
Statistical methods, Scope and limitations, Population and sample, Frequency distribution, Measures of Central Tendency		
Unit II	**Measures of Dispersion**	**(7 Hrs)**
Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness, Kurtosis		
Unit III	**Correlation and Regression**	**(7 Hrs)**
Coefficient of correlation, Rank correlation, Regression coefficients, Lines of regression		
Unit IV	**Probability Distributions**	**(8 Hrs)**
Binomial Distributions, Mean, Variance and Recurrence formula for Binomial distribution, Poisson Distributions, Mean, Variance and Recurrence formula for Poisson distribution, Normal Distributions		
Unit V	**Statistical Decisions**	**(8 Hrs)**

Significance levels-Tests concerning Mean, Type I & Type II errors, critical region, Null and Alternative hypothesis, Chi-square test for goodness of fit, The T-Test, Confidence interval, Forecasting and time series analysis problems		
Unit VI	**Probability**	**(8 Hrs)**
Review, Dependent and Independent events, Addition & Multiplication Rules, Conditional Probability, Total Probability, Bayes' Theorem and independence		

Learning Resources

Text Books:

1. Gupta, S.C. and Kapoor V.K. *"Fundamentals of Mathematical statistics"*, Sultan Chand and Sons, 1978.
2. Miller & Freund's, *"Probability & Statistics, for Engineers & Scientists"*, 6th Edition, Pearson Education.

Reference Books:

1. Johnson R and G. Bhattacharya, *"Statistics-Principles and methods"*. John Wiley, NY, 1985.
2. Vijay K. Rohatgi and A.K. Md. Ehsanes Saleh, *"An Introduction to Probability and Statistics"*, John Wiley, second edition, 2001.
3. Sheldon M. Ross, *"Introduction to Probability and Statistics for Engineers and Scientists"*, Academic Press, 2009.

MOOC / NPTEL Courses:

1. NPTEL Course *"Introduction to theory of probability",* Prof. Mrityunjoy Chakraborty, IIT Kharagpur.
   Link of the Course: http://nptel.ac.in/courses/117105085/
2. NPTEL Course *"Introduction to probability theory and Statistics*", Prof. S. Dharmaraja, IIT Delhi.
   Link of the Course: https://onlinecourses.nptel.ac.in/noc22_ma81/preview
3. Swayam Course *"Probability and Probability Distribution"* by Dr. P. Nagesh.
   Link of the Course: https://onlinecourses.swayam2.ac.in/cec23_ma09/preview

Additional Web Resources:

1. https://www.coursera.org/learn/probability-statistics
2. https://www.coursera.org/learn/introductiontoprobability
3. https://www.coursera.org/learn/basic-statistics

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: PCC	**Course Title:** Construction Project Planning and Management	
Course Code: 231GCMM01_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: Nil

Course Objective:

- To analyze the evolution of management theories and their relevance to modern organizations.
- To evaluate diverse management theories and their practical applications.
- To comprehend project management principles for effective execution.
- To apply strategic planning techniques for optimized project outcomes.
- To develop skills in scheduling, updating, and optimizing project plans.

Course Outcomes: On completion of the course, learner will be able to,
CO1: Analyze and apply management theories to enhance decision-making and strategy.
CO2: Assess and implement advanced project/construction management practices.
CO3: Develop, execute, and optimize modern project planning and management.
CO4: Design and update management plans for construction project
CO5: Evaluate the time cost trade-off of various resources needed on construction project.
CO6: Strategically manage and optimize resources for effective project execution.

Course Contents

Unit I	**Evolution of Management: Theories and Principles**	**(7 Hrs)**

Evolution of Management Theories, Traditional vs. Modern Scientific Management, Classical Management Theories, Theories of Taylor, Theories of Fayol, Theories of Weber, Principles of Management

Unit II	**Management Theories & Construction Project**	**(8 Hrs)**

Shift from Classical to Behavioral Theories, Behavioral Management Theories, Theories of Mayo, Theories of McGregor, Theories of Gilbreth, Modern Management Theories, Systems Theory, Contingency Theory, Total Quality Management (TQM), Construction Industry Overview, History and Types of Construction Industries, Early Developments in Construction Industries, Introduction to Projects, Types of Projects, Construction Project.

Unit III	**Project Management**	**(7 Hrs)**
Construction Project Management, Project Manager – Roles – Ethics. Project Planing - Role of planning department in construction projects. Work breakdown structure, Organization - Basic forms of organization.		
Unit IV	**Project Planning**	**(9 Hrs)**
Construction scheduling using Gantt chart, milestone chart. Network techniques like Critical Path Method (CPM), Proramme Evaluation and Review Technique (PERT), Precedence Network analysis (PNA), Ladder, Line of Balance technique (LoB).		
Unit V	**Project Updating**	**(8 Hrs)**
Updating of network, time-cost trade-offs. Construction Project life cycle, Resource constrained scheduling and resource levelling. Applications of CPM/PERT.		
Unit VI	**Resource Management**	**(6 Hrs)**
Man-Material-Machinery-money optimization. Site layout and mobilization, Work Study-time and motion study. Human resource management		

Learning Resources

Textbooks:

1. U.K. Shrivastava, *"Construction planning and management",* Galgotia publication
2. K.B. Dalal Rangwala, *"Construction Planning and Management",* Charotar publishing house
3. R.P. Rethaliya, *"Construction Project Management"* Atul Prakashan

Reference Books:

1. Sengupta and Guha, *"Construction Management and Planning"*, Tata McGraw Hill Publication.
2. K Nagrajan, *"Project Management"*, New age International Limited.
3. Barrie & Paulson, *"Professional Construction Management"*, McGraw Hill Institute Edition.
4. Jha, *"Construction Project Management Theory and Practice"*, Pearson
5. Chitkara, *"Construction Project Management – Planning, Scheduling and Controlling"*, McGraw Hill Education
6. Harris and McCaffer, *"Modern Construction Management"*, Wiley-Blackwell
7. Pilcher R. (1966). *"Principles of Construction Management"*, McGraw Hill Publishing Co Ltd
8. O'Brien, Plotnick, *"CPM in Construction Management"*, McGraw Hill (DEC) CM (DE)-19001

MOOC / NPTEL Courses:

1. NPTEL Course "*Principles of Construction Management*", Prof. Sudhir Misra, IIT Kanpur

Link of the Course:

https://archive.nptel.ac.in/courses/105/104/105104161/

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: PCC	**Course Title:** Construction Materials & Materials Management	
Course Code: 231GCMM02_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2.5	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 2	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Project Management
2. Construction Management

Course Objectives:

- To analyze advanced construction materials and evaluate their applications in construction.
- To apply and optimize various inventory models for effective material management in construction.
- To assess and implement government procurement processes, Management Information Systems (MIS), and critically reflect on field experiences related to materials.
- To evaluate and justify the cost, value, pricing, and material requirements for construction planning.

Course Outcomes: On completion of the course, learner will be able to

CO1: Analyze advanced construction materials and their applications.
CO2: Apply material management principles and inventory analysis.
CO3: Assess governmental procurement, MIS, and fieldwork insights.
CO4: Evaluate and justify material cost, value, and pricing.
CO5: Develop strategic material planning for optimal utilization.
CO6: Select, apply, and optimize inventory models in construction.

Course Contents

Unit I	**Advanced Materials**	**(5 Hrs)**

Materials and their properties required for Modern buildings. Special construction materials like fly ash, silica fume, FRP, FRC, admixtures SCC, HPC. Soils and Rock materials in different zones, cut off trenches in earth dam. Mode of transport and receipt of above materials. Testing at site, inspection procedures.

Unit II	Material Management	(5 Hrs)
Importance and functions of material management, Classification and Codification of materials, Procurement, identification of sources of procurement, vendor analysis. Application of ABC and EOQ analysis in inventory control. Use of Indices in materials/ inventory models Inventory Management, safety stock, stock outs, stores management: Quality Control		
Unit III	**Material Management System**	**(5 Hrs)**
Use of MIS and Materials Management Systems, Foreign purchase, Governmental buying. Introduction to materials productivity and role of materials management techniques in improved materials productivity.		
Unit IV	**Cost, Value & Price**	**(5 Hrs)**
Cost reduction and value improvement. Role of purchasing in cost reduction. Value analysis for right choice and rationalization of materials. Purchasing research identification of right sources of supplies. Vendor rating. Standardization and variety reduction. Negotiations and purchase. Price analysis. Organization of purchasing function.		
Unit V	**Material Planning**	**(5 Hrs)**
Product explosion. Materials requirements planning. Make or buy decision. Incoming materials control acceptance, sampling, inspection. Vendor certification plans. Vendor and supply reliability.		
Unit VI	**Inventory Management**	**(5 Hrs)**
Inventory management, inventory models. Inventory models with quantity discount. Exchange curve concept and coverage analysis. JIT. Information systems for inventory management. Stores management and warehousing. Optimal stocking and issuing policies. Inventory management of perishable commodities. Surplus management. Case studies related to procurement process, tendering process.		

Learning Resources

Text Books:

1. Ghose, "*Materials of Construction*"; by, Tata- McGraw Hill Publication, Edition- 4
2. Gopalkrishnan, "*Handbook of Materials management"*, Prentice Hall Publication, Edition- 2
3. A.K. Dutta, "*Materials Management",* Prentice Hall Publication, Edition- 2
4. Lee and Dobler, *"Purchasing and Material Management"*, McGraw Hill Publications, Edition- 5

Reference Books:

1. Dean S. Ammer, *"Materials Management and Purchasing"*, Taraporevala Publications, Edition- 2
2. A. Deb, "*Materials Management"* Academic Publ, Edition- 4
3. P. Gopalakrishnan and Sundaresan, *"Materials Management An Integrated Approach"*, Prentice Hall of India, Edition- 2011
4. K.S. Menon, *"Purchasing and Inventory Control"*, Wheeler Publishing, Edition- 3
5. Martin K. Starr and David W. Miller, *"Inventory Management"*, Prentice Hall of India Pvt. Ltd, Edition- 2

MOOC / NPTEL Courses:

1. NPTEL Course "*Principles Of Construction Management*", Prof. Sudhir Misra, IITK
   https://onlinecourses.nptel.ac.in/noc23_ce62/preview
   https://onlinecourses.nptel.ac.in/noc22_ce56/preview

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester- I

Course Type: PCC	**Course Title: Construction Cost Analysis**	
Course Code: 250GCMM01_01	**Teaching Scheme:**	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Practical (P):** 0 **Tutorial (T):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 50 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- To understand and apply engineering economic principles in decision-making.
- To analyze interest, time value, and cost factors in project planning.
- To estimate, control, and evaluate project and equipment costs.
- To assess economic alternatives using standard evaluation methods.
- To analyze cash flow, depreciation, and risk in financial decisions.
- To interpret financial statements and understand global finance aspects.

Course Outcomes: On completion of the course, learner will be able to

CO1: Analyze economic principles like demand, supply, cost, and interest.
CO2: Apply time value of money and interest factors in engineering problems.
CO3: Evaluate project and equipment costs using estimation techniques.
CO4: Compare alternatives using NPV, IRR, and other evaluation tools.
CO5: Perform cash flow, break-even, and risk analysis.
CO6: Interpret financial statements and assess global financial aspects.

Course Contents

Unit I	**Basics of Engineering Economics**	**(5 Hrs)**

Introduction to Engineering economics: Importance, demand and supply, types of costs, interest – simple, compound, continuous, effective. Value of Money - Time and equivalence, tangible and intangible factors, introduction to inflation. Break even analysis, Benefit-cost analysis.

- $*
%
1
$*
%
1 (

=-)

		1% = # % 1%$% =2=-=
Unit II	**Interest and Time Value Factors**	**(5 Hrs)**
Interest Factors and Their Use: Uniform series factors- Simple interest future worth factor, Compound amount factor, Sinking fund factor, capital recovery factor, Present worth factor, gradient series factors		
Unit III	**Cost Estimation & Control**	**(6 Hrs)**
Cost estimating: Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost. Equipment economics: Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis. Fixed contract Pricing- Cost plus pricing- Escalation clause- Construction cost control, Personnel costs, Equipment costs, Job in directs and markup		
Unit IV	**Economic Evaluation Methods**	**(5 Hrs)**
Economic comparisons – Present worth method, equivalent annual cost method, capitalized cost method, net present value, and internal rate of return evaluation, ARR, urgency-payback period, assessment of various methods.		
Unit V	**Cash Flow & Risk Analysis**	**(4 Hrs)**
Project cash flow, Factors affecting project cash flow. Depreciation and tax considerations in alternative, replacement analysis comparisons. Benefit cost ratio, Break even analysis, risk analysis.		
Unit VI	**Financial Statements & Global Finance**	**(5 Hrs)**
Financial statements – Profit and loss, Balance sheets, financial ratios, Working capital management, Inventory valuation. Mortgage Financing - International financial management- foreign currency management.		

Learning Resources

Text Books:

3. Panneerselvam, R., "*Engineering Economics"*, PHI Learning Pvt. Ltd., 2nd Edition, 2013.
4. Park, Chan S., *"Contemporary Engineering Economics",* Pearson Education, 6th Edition, 2015.
5. Banga, T.R., and Sharma, S.C., "*Industrial Engineering and Management"*, Khanna Publishers, 22nd Edition, 2014.

Reference Books:

4. Sullivan, W.G., Wicks, E.M., and Koelling, C.P., "*Engineering Economy"*, Pearson Education, 17th Edition, 2020.
5. DeGarmo, E.P., Sullivan, W.G., and Bontadelli, J.A., "*Engineering Economy"*, Macmillan Publishing Co., 9th Edition, 1993.
6. Chandra, Prasanna, "*Financial Management: Theory and Practice"*, McGraw Hill, 10th Edition, 2019.
7. Barish, N.N., and Blank, L.T., *Engineering Economy Analysis*, McGraw-Hill, 5th Edition, 1998.
8. Kesavan, R., Elanchezhian, C., and Ramnath, B.V., *Engineering Economics and Costing*, Laxmi Publications, 1st Edition, 2004.

Website Links:

NPTEL Course: Construction Economics and Finance
https://nptel.ac.in/courses/105103023

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: MMC	**Course Title:** Sensors & Automation	
Course Code: 230GRAM24_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (OR):** 50 marks

Prerequisite Courses, if any:

1. Basic Electronics
2. Instrumentation & Control

Course Objectives:

- Study of means of measuring various physical variables using sensors.
- Study of various kinds of actuators.
- Introduce technologies related to upcoming Industry 4.0 paradigm.
- To prepare the learner for a career in industrial automation.

Course Outcomes: On completion of the course, learner will be able to…
CO1: Identify sensor characteristics, calibration and error analysis
CO2: Understand how different physical variables are measured
CO3: Identify different types of actuators and their implementation
CO4: Understand Hydraulic and Pneumatic actuators
CO5: Explain scope and benefit of industry 4.0 technologies.
CO6: Plan, design and implement automation systems

Course Contents

Unit I	Instrumentation & Sensors characteristics	(3 Hrs)

Instrumentation & Sensors: Significance of Sensor Measurements, Classification of sensors based on domain, technology and operation.
Static characteristics: Static calibration, Linearity, Static Sensitivity, Accuracy, Static error, Precision, Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span & Range etc.
Dynamic Characteristics: Sensor bandwidth and frequency response.
Signal conditioning: Amplifier, Conversion, Filtering, Impedance Buffering

Unit II	Measurements	(3 Hrs)

Proximity and Distance Measurement: Limit Switch, Reed switch, Inductive, Capacitive, Hall Effect Sensors, Optical and Ultrasonic distance measurement.
Displacement Measurement: Transducers for displacement, potentiometer, LVDT, Capacitance Types, Digital Transducers (optical encoder).
Measurement of Angular Velocity: Tachometers, Digital tachometers and Stroboscopic Methods. MEMS 3 axis Gyroscope.
Acceleration Measurement: Theory of accelerometer and vibrometers, accelerometers, strain gauge based and piezoelectric accelerometers. MEMS 3 Axis Accelerometer.

Unit III	**Electrical Actuating systems**	**(2 Hrs)**

Electrical Actuating systems:
DC motors: Review of DC motor, Modelling of DC motor behaviour, Servo Amplifier, DC motor drive. DC Servo Motors.
Stepper Motors: Characteristics of a Stepper motor, Classification of a Stepper motor, Principle of Operation, Step Angle, Electrical model of energized coil, Drive method, Stepper motor performance.

Unit IV	**Pneumatic and Hydraulic actuating systems**	**(2 Hrs)**

Pneumatic and Hydraulic actuating systems: Components of pneumatic and hydraulic systems, pumps, compressor, filter, control valves, pressure regulation, relief valves, accumulator. Single Acting and Double acting cylinders, Hydraulic motors. Simple single actuator circuits. Harmonic drive, Comb drive.

Unit V	**Industry 4.0 and Evolution of automation**	**(3 Hrs)**

Industry 4.0: Industrial Revolutions 1,2,3,4, Productivity in Manufacturing, how manufacturing changed at each IR, Work Study & motion study, Need and Types of Automation,
Evolution of automation: Automation hierarchy. Relentless increase in computational power (Moore's law), basket of technologies, which make up Industry 4.0. Reference Architecture Model of Industry 4.0 (RAMI)

Unit VI	**Automation Circuits**	**(2 Hrs)**

Automation Circuits: Introductory Principles in Designing, Electrical and mechanical latch, Logical Design of Automation PLC and SCADA.
Case Studies: Data Acquisition & Control Systems in Process Plants like chemical, railways and defence applications
Communication: Communication protocols, Device Interfaces

Learning Resources

Text Books:

1. Clarence W Silva, "*Sensors and Actuators: Control System Instrumentation*", CRC Press USA.
2. Frank Lamb, "*Industrial Automation Hands-On*", McGraw Hill Education 2013.

Reference Books:

1. E.O. Doebelin, "*Measurement Systems (Applications and Design)*", McGraw Hill., 5th Ed.
2. A. Smaili and F. Mrad, "*Applied Mechatronics*", OXFORD university press.
3. Thomas Beckwith, N.Lewis Buck, "*Mechanical Engineering Measurement*", Roy Marangoninarosa Publishing House, Bombay
4. Kataria Sanjay *"Industrial Automation Solutions For Plc, Scada, Drive And Field Instruments: Easy To Learn Industrial Automation"*
5. Arshadeep Bagha , Vijay Madisetti "*Internet of Things A Hands-ON Approach*", Universities Press 2018

MOOC / NPTEL Courses:

1. **https://nptel.ac.in/courses/108/105/108105064/**
2. **https://nptel.ac.in/courses/112/107/112107242/**
3. **https://nptel.ac.in/courses/108105088**
4. **https://nptel.ac.in/courses/106105195**

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: MMC	**Course Title:** Sensors & Automation	
Course Code: 230GRAM24_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (OR):** 50 marks

Prerequisite Courses, if any: -

List of Laboratory Experiments	
Group A	
1.	Characterization of Temperature Sensor (RTD).
2.	Linear Conveyor Control System
3.	Study of Two-Dimensional Position Control
4.	Demonstration of Electro hydraulic Controls through Trainer Kit
5.	Characterization of Linear Variable Differential Transformer (LVDT) (Virtual Lab) https://sl-coep.vlabs.ac.in/exp/characterize-temperature-sensor/
Group B	
6.	Demonstration of Electro pneumatic Controls through Trainer kit
7.	Study of Rotary Encoder for Speed & angle measurement
8.	Data acquisition system
9.	Demonstration of Programmable Logic Controller (PLC) based Servo motor Controller
Group C	
10.	Characterization of Strain Gauges (virtual Lab) https://sl-coep.vlabs.ac.in/exp/strain-gauge-sensor/

Virtual LAB Links:

1. **Lab Name: COEP, Pune**

   https://sl-coep.vlabs.ac.in/exp/characterize-temperature-sensor

   https://sl-coep.vlabs.ac.in/exp/strain-gauge-sensor

JSPM University Pune

F.Y. M. Tech "Transportation Engineering"

Semester I

Course Type: SEC	**Course Title:** Geospatial Analysis	
Course Code: 230GTEM19_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (OR):** 50 marks

Prerequisite Courses, if any:

1. Basic Computer Knowledge
2. Remote Sensing basics

Course Objectives:

- Apply the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain.
- Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
- Illustrate Energy interactions with atmosphere and with earth surface features, interpretation of satellite and top sheet maps.
- Understand different components of GIS and Learning about map projection and coordinate system.
- Develop knowledge on conversion of data from analogue to digital and working with GIS software.

Course Outcomes: On completion of the course, learner will be able to

CO1: Understand the concepts of Photogrammetry and compute the heights of objects
CO2: Apply knowledge of GIS and understand the integration of Remote Sensing and GIS
CO3: Understand the basic concept of GIS and its applications, know different types of data representation in GIS
CO4: Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer are
CO5: Apply knowledge of GIS software and able to work with GIS software in various application fields
CO6: Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems

Course Contents

Unit I	**Introduction to GIS**	**(5 Hours)**

Basic concepts: Definition and history, Components of GIS, Recent trends and applications of GIS; Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Data inputting in GIS. Rectification, Transformation Methods; Root Mean Square (RMS) Error.		
Unit II	**Data Types and Data Models**	**(5 Hours)**
Data Types; Spatial Data; Non-Spatial Data, Data Input; Existing GIS Data, Metadata; Conversion of Existing Data, Creating New Data, Data Models; Vector Data Model; Raster Data Model; Integration and Comparison of Vector and Raster Data Models.		
Unit III	**Spatial Data Editing**	**(5 Hours)**
Types of Digitizing Errors, Causes for Digitizing Errors; Topological Editing and Non-topological Editing; Other Editing Operations; Editing Using Topological Rules.		
Unit IV	**Attribute Data and Data Exploration**	**(5 Hours)**
Attribute Data in GIS, Attribute Data Entry, Manipulation of Fields and Attribute Data, Data Exploration; Attribute Data Query, Raster Data Query, Map- Based Data Manipulation,		
Unit V	**Spatial Analysis**	**(5 Hours)**
Spatial Data: Definition, Analysis, Processes & Steps, Software and Tools, Geodatabase Model, Role of Databases in GIS, Creating, Editing and Managing, Classification scheme of Vector- Based and Raster- Based GIS Operation Raster- Based Techniques: Methods of reclassification, overlay analysis, Digital Terrain Analysis and Modeling- TIN and DEM, Surface representation and analysis, Slope and Aspect, Geographic Visualization Data Classification, Map Comparison,		
Unit VI	**Geo Statistical Analysis Techniques:**	**(5 Hours)**
Introduction to Spatial Interpolation: Control Points, Global Method- Trend surface analysis, regression model, local methods- Thiessen polygons, density estimation, Inverse Distance weighted Interpolation, Kriging- Ordinary Kriging and Universal Kriging, GIS and decision support system, Introduction to AHP, basic principle of AHP. Principal and components of multiple criteria decision making		

Learning Resources

Text Books:

1. Jahne, B. *"Digital Image Processing"* New York: Springer-Verlag
2. Lillsand, R.M. and R.W. Kiefer, *"Remote Sensing and Image Interpretation"*, New York: Wiley.

Reference Books:

1. Pratt, W.K., "*Digital Image Processing"* New York Wiley.
2. Jain, A.K., "*Fundamentals of Digital Image Processing*", Englewood Cliffs, NJ, Prentice Hall.

MOOC / NPTEL Courses:

1. Link of the Course: https://archive.nptel.ac.in/courses/107/105/107105088/, IIT Kharagpur

Additional Web Resources:

1. https://docs.qgis.org/3.28/en/docs/training_manual/index.html

JSPM University Pune

F.Y. M. Tech "Transportation Engineering"

Semester I

Course Type: SEC	**Course Title:** Geospatial Analysis	
Course Code: 230GTEM19_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (PR):** 50 marks
Prerequisite Courses, if any: -		

List of Laboratory Experiments

1. Familiarization with GIS Software, Data Input
2. Geo Referencing and Projections
3. Digitization of Map/ Toposheet
4. Creation of Thematic Maps
5. Base Map Preparation
6. Data Conversion – Vector to Raster, Raster to Vector
7. Adding Attribute Data – Querying on Attribute Data
8. Vector Analysis
9. Raster Analysis
10. Map Composition
11. Developing Digital Elevation Model
12. Simple Applications of GIS in Transportation Engineering

GIS SOFTWARE: Arc GIS 10.3

TEXT BOOKS:

1. "*Concept and Techniques of GIS*" by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: VSC	**Course Title:** Design Thinking and Creativity	
Course Code: 230IDCB01_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 1.5	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 2	**Oral (OR):** 50 marks

Prerequisite Courses, if any: Not Require

Course Objectives: -

Course Outcomes: On completion of the course, learner will be able to
CO1: Describe the Design thinking principles of Human Centeredapproach to real life problem solving
CO2: Demonstrate through the project-oriented approach thebasic theories and knowledge of design thinking and master the tools and principles of design thinking, and their application.
CO3: Experiment with design thinking principles to come up with innovative solutions to the problems, as new products, services, experiences, or new Business models.
CO4: Analysis of various applications of design thinking.
CO5: Determine the suitable design thinking approach to solve theproblem.
CO6: Develop a low fidelity prototype of the alternative Solutions to theidentified Problem

Course Contents

Unit I	**Design Thinking Introduction**	**(3 Hrs)**

Introduction & definition of design thinking, Principles, the process, Innovation in design thinking, importance of design thinking method, the relationship between design thinking and innovation & entrepreneurship. Five step method of Design thinking (Empathize, Define, Ideate, Prototype, Test).
Class Activity: Students are asked to form groups. Classroom Project begins: Share ideas with team members, discuss about meaning of DT, it"s importance in today"s world.
Case: ABC Nightline- IDEO Shopping Cart, (the video can be shown in classroom for discussion.)

Unit II	**Awareness of the five stages of design thinking,Empathize & Define**	**(5 Hrs)**

Stage 1 & 2: Empathize & Define
Introduction of the tools in the stage of empathy. Emphasize the skills and tactics of interviews. Understand the persona, Methods of collecting the data from interviews. The empathy map. Establishing the Problem statement using 5 Why"s technique as a tool to understand the root cause.

(Ex.26/11 attack, rescue team not able to move with ambulance due to stagnation) & Emphasis on establishing the "Problem Statement" only for faculty ref.

Classroom Project: Each group will write the Problem Statement by using Stages of Empathy and technique of 5 Why"s.
Each group member will do the interview round for writing the problem statement.
Take record of the interview process.

Unit III	Ideate	(5 Hrs)

Stage 3, Ideate
Process to Find and select ideas, The creative process and creative principles, Creativity techniques, Evaluation of ideas. Idea Generation Stage-Fine tuning process of ideas (every team member comes up with 1 idea and passes on to next person, each idea will be fine-tuned by each team member and ultimately matured ideas are established- round robin method) and selection of best three ideas by voting method.

Classroom Project: Through the project, students will know how to propose the point of view (POV) statement based on the analyses of data from user research via the brainstorm and others.
Students are asked to submit ideas as many as possible.
Note in POV practice: please define the problem which each group is finally going to resolve.
The practice process: unpack the interview data, select one interviewee as analysis target and solution. Make inferences to generate ideas and POV statement. Please remember:
No solution in the POV statement.

Unit IV	Prototype & Test	(4 Hrs)

Stage 4 and 5, Prototype & Test
Prototype and test stage, Prototype model, The role of prototype and test in the innovation and entrepreneurship. prototype and the way to test, visualization of ideas.
Classroom project: groups design the prototype to show ideas about the innovative way to resolve the problem in the dormitory life.
Concerning the test practice: Ask other group to visit your group and test your prototype, and then in turn.

Unit V	Understanding Business Viability	(3 Hrs)

Checking the Business viability of selected ideas derived in stage 3 using BXT model, Tools for the Design Journey, Pillars of Design thinking.

Unit VI	Presentation and closure	(3 Hrs)

The student groups will give the final presentation of the project they have done (Unit 1 to 5) and close the DT process.

Learning Resources

MOOC / NPTEL Courses:
Additional Web Resources:

1. How design thinking is transforming lives in rural India - https://www.youtube.com/watch?v=EH9u1bHqwpc.
2. Design Thinking in Netflix | | Case Studio - 04 - https://www.youtube.com/watch?v=8P8gspd_Bx8)

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: AEC	**Course Title:** Communicative English for Professionals	
Course Code: 231UENM01_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (P):** 50 Marks

Prerequisite Courses, if any: -

Course Objectives:

- Remember the different aspects of communication.
- Understand basics of grammar, sentence construction and vocabulary to write and speak effectively.
- Apply appropriate modes of expressions in written and oral communication.
- Analyze the attitude and aptitude of the speaker in the professional sphere for effective listening skill.
- Evaluate the non-verbal clues of the speaker for effective communication.
- Cultivate students to create commendable personalities.

Course Outcomes: On completion of the course, learner will be able to
CO1: Understand and practice different types of communication.
CO2: Reflect on basic language skills-listening, speaking, reading, and writing and attempt tasks by using functional grammar and vocabulary effectively.
CO3: Reproduce their understanding of concepts/principles of business communication skills.
CO4: Build relationships, solve problems, ensure understanding, resolve conflicts, and improve accuracy.
CO5: Become more self-confident and develop a strong determination.
CO6: Build social skills with ease and comfort.

Course Contents

Unit I	**Foundation of Communication**	**(3 Hrs)**

Importance and types of Communication, Types of communication: Verbal and Non-verbal, Channels of communication, Barriers to Effective Communication and ways to mitigate.

Unit II	**Language Competency/Functional English**	**(3 Hrs)**

Basic rules of Phonics, Parts of Speech, Sentence Constructions, Prefixes and Suffixes

Unit III	Business Communication at Workplace	(2 Hrs)
Types of business letter, Characteristics of good business letter, Letter Components and Layouts, Email Communication, memo.		
Unit IV	**Mindful Listening**	**(2 Hrs)**
The purpose and types of listening, Principles of effective listening, Ways to improve listening skills, Role of Active listening in professional interactions and conflict resolutions.		
Unit V	**Art of Effective Verbal Interaction**	**(2 Hrs)**
Identifying common fears and anxieties related to speaking, Techniques to build confidence and overcome stage fright, Voice modulation, pitch, and pace for engaging delivery, Impromptu Speaking.		
Unit VI	**Effective Body Language**	**(3 Hrs)**
Basic Principles of Body Language and Nonverbal Communication, Signs and Clusters, Kinesics & Proxemics, Gesture & Posture.		

Learning Resources

Textbook:

1. Adair, John. "*Effective Communication*". London: Pan Macmillan Ltd., 2003.

Reference Book:

1. Carnegie, Dale. "*The Quick and Easy Way to Effective Speaking*". New York: Pocket Books, 1977.
2. Mitra, Barun. "*Personality Development & Soft Skills*", New Delhi: Oxford Press, 2011

MOOC / NPTEL Course:

NPTEL Course "*Developing Soft Skills and Personality*" by Prof. T Ravichandran, IIT Kharagpur

Link of the Course: https://nptel.ac.in/courses/109104107

Additional Web Resources:

https://www.britishcouncil.in/english/online/resources-websites/moocshttps://www.dailywritingtips.com/

SPM University Pune F.Y. M. Tech "Construction Management" Semester I		
Course Type: AEC	**Course Title:** Communicative English for Professionals	
Course Code: 231UENM01_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (P):** 50 Marks
Prerequisite Courses, if any: - Nil		

List of Laboratory Experiments	
Group A	
1.	Phonics
2.	Parts of Speech
3.	Presentation Skills
4.	Tenses
5.	Verbal and Non-verbal Communication
Group B	
6.	Listening Skills
7.	Reading Skill
8.	Body Language
9.	Formal Writing
10.	Email Writing

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: RMC	**Course Title:** Research Methodology	
Course Code: 230IRMM01_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 50 Marks

Prerequisite Courses, if any: -

Course Objectives:

- To develop a research orientation among the students and to acquaint them with fundamentals of research methodology, research process and research design
- To develop skills in effectively searching for relevant literature sources and familiarize with formulation of research hypotheses
- To establish an understanding of various data types, data collection methods, and the importance of research ethics and integrity.
- To acquaint students with the process of crafting research reports and thesis

Course Outcomes: On completion of the course, learner will be able to
CO1: Demonstrate Proficiency in Research Fundamentals
CO2: Identify and Frame Research Problems
CO3: Conduct Comprehensive Literature Reviews and Formulate Testable Hypotheses
CO4: Collect and Differentiate the Types of Research Data
CO5: Practice Ethical Research Conduct
CO6: Create Effective Scientific Papers Through the Application of Scientific Writing Principles

Course Contents

Unit I	**Introduction to Research**	**(5 Hrs)**
Meaning and Definition of Research, Objectives of Research, Characteristics of Research Need of Research, Importance of Research, Types of Research		
Unit II	**Problem Identification & Formulation**	**(5 Hrs)**
Research Process, Research design, Defining the Research Problem, Formulation of Research Problem, Errors in selecting Research Problem, Research Questions, Research Methods vs. Research Methodology		
Unit III	**Literature Review and Hypothesis**	**(5 Hrs)**
Literature Review Concepts and Theories, Meaning of Hypothesis and Formulation of Hypothesis, Sources of Hypothesis, Characteristics of Hypothesis, Role of Hypothesis,		

Tests of Hypothesis		
Unit IV	**Research Data**	**(5 Hrs)**
Sampling Design and Types and Techniques, Types of Data, Methods of Data Collection, Questionnaires, Observation Method and Interview Method, Case Study Method		
Unit V	**Ethics in Research**	**(5 Hrs)**
Ethics in conduct of Research, Ethical challenges in Data Collection, Ethical issues in scientific Publication, Plagiarism and Self-Plagiarism, Cases of Scientific Misconduct		
Unit VI	**Scientific Writing**	**(5 Hrs)**
Preparation of Title, Keywords and Methods Section, Preparation of Figures and Schematics, Citations and Referencing, Report writing and Presentation, Layout of a Research Paper, Research Journals and its Impact factor, Research Metrics.		

Learning Resources

Text Books:

1. Wayne Goddard, Stuart Melville, "*Research Methodology: An Introduction*", Juta, Lansdowne, Second Edition.
2. Ranjit Kumar "*Research Methodology*: A Step-by-Step Guide for Beginners", SAGE Publications Pvt. Ltd Fourth Edition.
3. Dr. C. R. Kothari, "*Research Methodology: Methods and Trends*", New Age International Publishers, Third Edition

Reference Books:

1. Nicholas Walliman, *"Research Methods: The Basics",* Routledge – Taylor and Francis Group, Third Edition.
2. Vinod Chandra, Anand, Hareendran "*Research Methodology*", Pearson 1st Edition
3. Dr. Prabhat Pandey, Dr. Meenu Mishra Pandey, "Research Methodology: Tools and Techniques", Bridge Center, 2015.
4. Alan Bryman & Emma Bell, "*Business Research Methods*", Oxford University Press, Third Edition.

MOOC / NPTEL Courses:

1. NPTEL Course "*Research Methodology*", Prof. Edamana Prasad, Prof. Prathap Haridoss, IIT Madras.
   Link of the Course: https://onlinecourses.nptel.ac.in/noc23_ge36/preview
2. NPTEL Course "*Research Methodology*", Prof. Soumitra Banerjee, IISER Kolkata.
   Link of the Course: https://archive.nptel.ac.in/courses/127/106/127106227/

Additional Web Resources:

1. https://www.coursera.org/learn/research-methods
2. https://www.coursera.org/specializations/data-collection
3. https://www.coursera.org/learn/introduction-to-academic-writing

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester I

Course Type: LC	**Lab Course Title:** Project Planning Lab	
Course Code: 230GCMM26_01	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 0 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks

Prerequisite Courses, if any: -

1. Project Management
2. Construction Management

List of Laboratory Experiments

1.	Introduction to Microsoft Project Software
2.	Setting of calendars for the work
3.	Activity setup for the work
4.	Duration assigning for the activities of the work
5.	Assigning of the Indents & Outdents
6.	Assigning of Successor & Predecessor for the activities
7.	Preparation of the resource sheet
8.	Allocation of the resources for the activities
9.	Cost management
10.	Tracking of the planned activities
11.	Report generation

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: PCC	**Course Title:** Construction Contracts, Administration & Management	
Course Code: 230GCMM03_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 1 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management
2. Estimation & Costing

Course Objectives:

- To learn the fundamentals of legal systems in construction.
- To understand different kinds of construction contracts.
- To learn contract administration such as claims and disputes, change orders & progress payments.
- To investigate how to avoid the possibilities of construction disputes via alternative dispute resolution.
- To understand the different acts related to Indian Arbitration and Conciliation.
- To understand the process around the bailment.

Course Outcomes: On completion of the course, learner will be able to

CO1: Interpret key provisions of the Indian Contract Act and their application in construction projects

CO2: Analyze contract formation processes, tendering methods, and contract closure practices.

CO3: Evaluate general and particular contract conditions, including government model forms.

CO4: Assess construction claims, causes, documentation, and dispute prevention strategies

CO5: Analyze arbitration and conciliation processes under the Indian Arbitration and Conciliation Act, 1996

CO6: Examine bailment principles, responsibilities, and legal implications in construction.

Course Contents

Unit I	**Construction Contracts**	**(6 Hrs)**

a) Indian Contract Act (1872): Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. (from model 5)

b) Clauses 1 to 75- Contract formation, contract performance, valid excuses for nonperformance, Breach of contract, effects of breach- understanding the clauses and applying them to situations/scenarios on construction projects. Importance of the Workmen 's Compensation Act on construction projects.		
Unit II	**Contract Formation**	**(5 Hrs)**
Standard forms of contracts, methods of inviting tenders, pre-bid meetings, pre-qualification system, scrutiny of tenders and comparative statement. Contract formation, conditions of contracts, contracts with various stakeholders on a major construction project, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure.		
Unit III	**Contract Conditions**	**(5 Hrs)**
General condition and Particular conditions, Conditions of Ministry of Statistics and Program Implementation- Government of India. Model forms of contract.		
Unit IV	**Construction Claims and Dispute Resolution**	**(5 Hrs)**
Construction Claims: Extra items and causes of claims. Types of construction claims, documentation. settlement of claims Dispute Resolution: Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards.		
Unit V	**Conciliation & Arbitration**	**(5 Hrs)**
Indian Arbitration and Conciliation Act 1996 Difference between 1940 Act and 1996 Act. Extent of application of 1996 Act. Objectives, general provisions. Composition of the arbitral tribunal, jurisdiction of arbitral tribunal, duties, power of arbitrators. Conciliation: Conciliation and its provisions in the Act, Conduct of conciliation and arbitral proceedings, grounds for challenge.		
Unit VI	**Bailment**	**(5 Hrs)**
Nature of transactions, delivery of bailee, care to be taken, Bailee's responsibility, termination, Bailment of pledges		

Learning Resources

Text Books:

1. John Murdoch, Will Hughes, "*Construction Contracts*"; by, Taylor & Francis, Edition- 2008
2. Justin Sweet, Marc M. Schneier, "*Legal Aspects of Architecture, Engineering and the Construction Process*"; by, Cengage Learning, Edition- 2008

Reference Books:

1. B. S. Patil, *"Civil Engineering Contracts and Estimates"*; by, Universities Press, Edition- 2009
2. "*The Indian Contract Act (9 of 1872), 1872- Bare Act*"; Professional Book Publishers, Edition- 2006
3. "*The Arbitration and Conciliation Act, (1996), 1996 (26 of 1996)*"; Professional Book Publisher, Edition- 2006
4. "*The Workmen 's Compensation Act, 1923 (8 of 1923) Bare Act*"; Professional Book Publishers, Edition- 2005
5. "*Standard General Conditions for Domestic Contracts*"; by Ministry of Statistics and Program Implementation, Government of India; Edition- 2001
6. "*Dispute Resolution Board foundation manual*"; www.drbf.org.

MOOC / NPTEL Courses:

1. NPTEL Course "*Introduction to Accounting and Finance for Civil Engineers*", IIT Kanpur, Dr. Sudhir Misra, Dr. K.N. Jha
   https://onlinecourses.nptel.ac.in/noc23_ce08/preview

JSPM University Pune F.Y. M. Tech "Construction Management" Semester II		
Course Type: PCC	**Course Title:** Construction Techniques	
Course Code: 230GCMM04_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2.5	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 2	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Building Construction
2. Construction Management

Course Objectives:

- To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- To study different methods of construction to successfully achieve the structural design with recommended specifications for substructures.
- To study of construction equipment's, and temporary works required to facilitate the strengthening process.
- To present the new technology of civil Engineering and concepts related to ground water in excavations.
- To involve the application of scientific and technological principle to design the earthquake resistant buildings.
- To provide a coherent development process foe repair & rehabilitation of the structures.

Course Outcomes: On completion of the course, learner will be able to

CO1: Evaluate advanced construction technologies and their field applications.
CO2: Analyze construction methods to achieve structural design specifications for substructures
CO3: Assess the role of construction equipment and temporary works in strengthening processes
CO4: Examine advanced civil engineering technologies for groundwater control in excavations.
CO5: Design earthquake-resistant buildings using scientific and technological principles
CO6: Develop effective processes for the repair and rehabilitation of structures

Course Contents

Unit I	**Formwork and Temporary structures**	**(5 Hrs)**

Scaffolding – Definition, Component, parts, Types of scaffolding, Shoring – Definition, Types, Raking, flying and dead shores, Underpinning: definition, Purpose, Types, Pit Methods, Pile Method. Form work: Definition – Materials used Requirements of a good formwork, Formwork for column, RC beams and RC slab.		
Unit II	**Sub Structure Construction**	**(5 Hrs)**
Box Jacking -pipe jacking - diaphragm walls types and methods – piling techniques - driving well and caisson – sheet piles – construction procedures and applications- cofferdam - methods -cable anchoring and grouting - laying operations for built up offshore system - shoring for deep cutting - well points - dewatering and stand by plant equipment for underground open excavation		
Unit III	**Common Strengthening Techniques**	**(5 Hrs)**
Mud Jacking grout through slab foundation - micro piling for strengthening floor and shallow profile pipeline laying - protecting sheet plies, screw anchors - sub grade water proofing -under pinning, crack stabilizing techniques, advanced techniques. Explosives and its classification. Sequence in demolition and dismantling.		
Unit IV	**Control of Ground Water in Excavations**	**(5 Hrs)**
Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation		
Unit V	**Construction of Earthquake Resistant Building**	**(5 Hrs)**
Planning of earthquake resistant building, Construction of walls – provision of corner reinforcement, construction of beams and columns, Base isolation. Expansion and construction, joints in buildings		
Unit VI	**Repair And Rehabilitation of Structures**	**(5 Hrs)**
Diagnosing the cause and damage- identification of different types of structural and non-structural cracks – repair and rehabilitation methods for Masonry Concrete and Steel Structures. Guniting and grouting, use of epoxy and crack fills. Settlement- causes and remedial measures, plinth protection – necessity and materials used.		

Learning Resources

Text Books:

1. S.C. Rangwala; "*Building Construction*"; by, Charotar Publishing House Pvt. Ltd., Edition- 34- 2022.
2. Sushil Kumar; "*Building Construction";* by, Standard Publishers, Edition- 20
3. B.C. Punmia; "*Building Construction*"; by, Laxmi Publications, Edition- 11.

Reference Books:

1. Roy Chudley, Roger Geeno, *"Advanced Construction Technology*"; by, Prentice Hall, Edition- 2005
2. Gahlot. P.S & Sanjay Sharma, *"Building repair and maintenance management";* by, CBS Publications, Edition- 2006
3. Mahesh Varma, "*Construction Equipment and its Planning and Applications";* by, Metropolitan Book Co.(P) Ltd., New Delhi. India, Edition- 2.
4. *"Construction Review";* Published by Civil Engineering and Construction Review, New Delhi, 1991.

MOOC / NPTEL Courses:

1. NPTEL Course "*Construction methods and equipment management*", IIT Guwahati By Prof. Indu Siva Ranjani Gandhi
   https://onlinecourses.nptel.ac.in/noc21_ce21/preview

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: PCC	**Course Title:** Construction Equipment and Machinery	
Course Code: 230GCMM05_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses:

1. Construction Site Management

Course Objectives:

- To demonstrate proficiency in operating and controlling different earthmoving equipment safely and effectively.
- To adapt mechanical excavation methods to suit different strata conditions, both hard and soft.
- To stay updated with technological advancements in construction plants and integrate innovative methods for improved productivity
- To gain a comprehensive understanding of trenchless technology methods and their applications in construction.
- To understand and proficiently apply various methods of dewatering in construction projects.
- To gain expertise in the construction methodologies specific to floating docks.

Course Outcomes: On completion of the course, learner will be able to-

CO1: Analyze the operational principles and functionalities of various earthmoving equipment.

CO2: Manage excavation operations, considering geological conditions, drilling techniques, and blast design.

CO3: Enhance resource utilization and management within construction plants for improved efficiency.

CO4: Develop problem-solving strategies to address challenges in trenchless construction operations.

CO5: Implement risk mitigation measures for dewatering activities to maintain a safe working environment.

CO6: Establish stringent safety protocols for offshore construction activities to ensure worker protection.

Course Contents

Unit I	**Earthwork Equipment**	**(7 Hrs)**

Fundamentals of Earth Work Operations-Earth Moving Operations-Types of Earth Work Equipment-Dozers, Rippers, Excavators, dragline and clamshell, Trucks and hauling equipment, Scrappers, Earthwork finishing equipment, Compaction equipment.		
Unit II	**Rock Excavation**	**(7 Hrs)**
Introduction, Planning, Drilling: process and equipment, Blast design, Special blasting techniques, blasting procedure. Mechanical excavation for tunneling in hard and soft strata.		
Unit III	**Construction Plants and Applications**	**(7 Hrs)**
Ready mix concrete plants, Hot mix asphalt plants, Aggregate production plants. Operations and production planning.		
Unit IV	**Trenchless Technology**	**(7 Hrs)**
Introduction to Trenchless Technology, Concept, Methods used in Trenchless technology, equipment and applications of trenchless technology.		
Unit V	**Construction Dewatering**	**(7 Hrs)**
Introduction, Various methods of dewatering, Pumps for dewatering, Design of dewatering system, cost of dewatering. Vacuum dewatering in concrete slab construction, its process and Equipment.		
Unit VI	**Offshore Construction: Dredging operation**	**(7 Hrs)**
Methods and equipment, Piles and Pile driving: Method and equipment, Construction of Docks and Harbor, Floating docks		

Learning Resources

Text Books:

1. C. Peurifoy, R. L. Ledbetter, W. B. and Schexnayder "*Construction Planning, Equipment and Methods*", Tata McGraw Hill, Singapore,2006.

2. Sharma S. C. "*Construction Equipment and Management*", Khanna Publishers, New Delhi,1988.

3. Deodhar, S. V. "*Construction Equipment and Job Planning*", Khanna Publishers, New Delhi,1988

4. Sankar, S. K. and Saraswati, S. "*Construction Technology*", Oxford University Press, NewDelhi,2008.

Reference Books:

1. James J. O'Brien, John A. Havers and Frank W. Stubbs "*Standard hand book of Heavy construction*", Third edition, McGraw-Hill Publication, 1996

2. Patrick Powers. J. "*Construction Dewatering: New Methods and Applications*", John Wiley & Sons, 1992.

3. Jerry Irvine "*Advanced Construction Techniques*", CARocketr,1984

MOOC / NPTEL Courses:

1. Construction methods and equipment management- By Prof. Indu Siva Ranjani Gandhi, IIT Guwahati.

Link for the course: https://onlinecourses.nptel.ac.in/noc21_ce21/preview

Additional Web Resources:

https://www.udemy.com/course/the-construction-machine/

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: MMC	**Course Title**: IOT Basics and Applications	
Course Code: 230GETM16_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 Marks **Oral (OR):** 50 Marks

Prerequisite Courses, if any:

1. Basic Electronics
2. Basic Electrical engineering

Course Objectives:

To provide students with

- The knowledge and understanding of Internet of Things
- Provide a strong foundation of fundamentals of Internet of Things and need of IoT Security
- Get acquainted with various communication protocols of Internet of Things
- Detailed understanding of present scope of Internet of Things with case studies

Course Outcomes: On completion of the course, learner will be able to

CO1: Understand various terms related to IOT.
CO2: Understand the working of IOT devices.
CO3: Identify different types of Sensors and actuators for IOT.
CO4: Understand working of sensors and actuators
CO5: Understand the concept of various IOT Protocols
CO6: Select sensors and actuators for industrial applications

Course Contents

Unit I	**IoT**	**(2 Hrs)**

Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications

Unit II	**IoT Physical Devices and Endpoints**:	**(2 Hrs)**

Basic building blocks of and IoT device, Exemplary device: NodeMCU, Aurduino, and Other IoT Devices.

Unit III	**Sensors**	**(2 Hrs)**
Roles of Sensors & Actuators, Types of sensors, Active and passive, analog and digital, Contact and no-contact, Absolute and relative		
Unit IV	**Working of Sensors**	**(3 Hrs)**
Position, occupancy and motion, velocity and acceleration, force, pressure, flow, Acoustic, Humidity, light, radiation, temperature, chemical, biosensor, camera. Development boards		
Unit V	**IoT Protocols**	**(2 Hrs)**
MQTT, CoAP, XMPP and AMQT, IoT communication models, IoT Communication technologies: Bluetooth, BLE, Zigbee, Zwave, NFC, RFID, LiFi, Wi-Fi, Interfacing of wifi, RFID, Zigbee,NFC with development board		
Unit VI	**Applications of IOT**	**(3 Hrs)**
Smart Home: Characteristics of Smart Home - Smart Home Energy Management, Smart Appliances, Communication Technologies for Smart Homes, maintenance, security, challenges. Smart Agricultural: characteristics and applications -Scarecrow, Smart Irrigation System, Crop Water Management, Integrated Pest Management, Sensor-based field and resource mapping, Remote equipment monitoring)		

Learning Resources

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515 2. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012. ISBN : 9781439892992
2. Raj Kamal, Internet of Things: Architecture and Design Principle” , ISBN-13: 978-93-5260- 522-4, McGraw Hill Education (India) 2017

Reference Books:

1. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning.
2. Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally HakimaChouchi, “The Internet of Things Connecting Objects to the Web”, ISBN 078 -1- 84821-140-7, Wiley Publications Asoke K Talukder and Roopa R Yavagal, “Mobile Computing,” Tata McGraw Hill, 2010.

MOOC / NPTEL Courses:

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://nptel.ac.in/courses/106105166

JSPM University Pune F.Y. M. Tech "Construction Management" Semester II		
Course Type: MMC	**Lab Course Title**: IOT Basics and Applications	
Course Code: 230GETM16_02	**Teaching Scheme: (**Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 Marks **Oral (OR):** 50 Marks
Prerequisite Courses, if any: -		

List of Laboratory Experiments	
Group A	
1.	Controlling GPIO pins in NodeMCU.
2.	LED blinking using Node MCU(Digital Write)
3.	Controlling LED using push button with NodeMCU (Digital Read)
4.	Temperature measurement using thermistor and NodeMCU Communication between Two NodeMCU using
5.	Smart lighting system using LDR and NodeMCU Study of smart material actuators.
Group B	
6.	Motion Detection using PIR Sensor and NodeMCU
7.	Gas detection using MQ135 and NodeMCU Experimental characterization of any one sensor.
8.	Servo motor (SG-90) control using NodeMCU Experimental characterization of DC motor
9.	Harmful gas monitoring using NodeMCU and ThingSpeak
Group C	
10.	Designing Weather station by HTTP GET REQUEST-RESPONSE using NodeMCU
11.	Design based experiment aiming selection of sensors for industrial application.

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: SEC	**Course Title:** Building Information Modelling	
Course Code: 230GSEM19_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (OR):** 50 marks

Prerequisite Courses, if any:

1. Basic AutoCAD

Course Objectives:

- Familiarize students with the basic principles of Building Information Modeling (BIM) and the BIM cycle.
- Develop the skills to draw and modify fundamental building elements such as walls, windows, doors, and floors.
- Enable students to utilize advanced modification tools for efficient design adjustments.
- Provide in-depth knowledge of annotations, dimensions, and openings in architectural designs.
- Introduce students to visualization and rendering techniques for both interior and exterior.
- Guide students in developing a complete architectural project using all the learned tools and commands.

Course Outcomes: On completion of the course, learner will be able to…

CO1: Demonstrate proficiency in navigating the user interface, creating building elements, defining project units, and understanding file types within the BIM context.

CO2: Create detailed building plans, manipulate wall structures, and efficiently use commands for elements like windows, doors, and roofs.

CO3: Demonstrate proficiency in using tools like array, mirror, split, and align, facilitating precise modifications and enhancements in architectural designs.

CO4: Create and manage annotations effectively, including dimensions, and various types of openings in walls.

CO5: Create realistic 3D images of a building/ structure.

CO6: Demonstrate comprehensive knowledge and application of Revit Architecture software.

Course Contents

Unit I	**Introduction to BIM and Building commands**	**(6 Hrs)**
Introduction to BIM: Explaining basics about the (BIM) cycle and the basic information, Exploring User Interface, Building Elements, Project Units, Visual Styles, File types Creating Levels & Level Family, Grid creation, modifications for level and grid. **Building Command:** Draw walls - Location line, draw wall shapes Drawing a plan as per Dimension Creating wall Structure Modify wall- Split Region, Sweep and Reveals Walls shapes and Openings Draw Windows & Doors, Family and edit type Create Floor & Floor Properties, Slab Edges, Place Components-Furniture Roof-by Footprint, by Extrusion, soffit, fascia, gutter Join/Unjoin Roof.		
Unit II	**Building architectural drawing**	**(5 Hrs)**
Creating Curtain Wall, Curtain Grid, Mullions, Adding Curtain Door Panel, Embedded walls Practice with project. Dimensions, Temporary Dimensions, Dimension settings by edit type Permanent Dimensions, creating ceiling, Opening-wall, face and vertical opening, Shaft and Dormer.		
Unit III	**Modify commands & View**	**(6 Hrs)**
Modify Tools: Join and cut geometry. Move, Copy, Paste, Rotate, Mirror, Array, Scale, Split Element, Trim, Align, Offset, Delete, Match Type, Tape Measure, filter, paint, match properties, keyboard shortcuts for all. **View:** Elevation view, Section view,3D views, view range, section box, visibility graphics hatching Area, Colour Schemes, Keynotes, Text, Model text, Tag, Callout Views, Drafting Views.		
Unit IV	**Circulation, Massing and Site**	**(5 Hrs)**
Circulation: Stairs-Creating Stairs, creating stair by Sketching Runs. Creating stair by sketching Boundary and Riser, Spiral Staircase. Annotations for all related tools. Ramp, Railings and Rail Family, Modifying Rail Structure, Custom baluster, Staircase joints. Complete one project using all tools. **Massing and Site:** Create Mass Family using forms, Introduction Extrusion, Loft, Sweep blend, sweep Creating Building Elements from Mass Instance, Model-in-place, Mass Floors, creating wall, Floors, Roof and curtain system, Building pad, Graded Region, Parking, Topo surface Components, sub region, split surface, contour labels.		
Unit V	**Sheet Composition and Rendering**	**(5 Hrs)**
Sheet Composition: Schedule/Quantities Material Take Off Legend Creation Sheets-Title Blocks, Views on sheet, Print settings. **Rendering and Walkthrough:** Lights-Adding Light Fixtures, Exterior Lighting-Solar Studies, sun setting, Camera and Walkthrough, Decal images, Exporting Walkthrough, Rendering, settings, customization, adjust exposure, Create realistic images for exterior and interior.		
Unit VI	**Design and Insert Option and Family creation**	**(3 Hrs)**
Design option, Export to CAD format, Family Creation- Door, Window, Project of interior view		

Learning Resources
Text Books: 1. ASCENT, "*Autodesk Revit 2024 Architecture Fundamental*", SDC Publication. 2. Daniel John Stine AIA, "*Interior Design Using Autodesk Revit 2014*", SDC Publication.
Reference Books: 1. Autodesk, "Autodesk Revit User Manual", Autodesk
MOOC / NPTEL Courses: 1. https://nptel.ac.in/courses/112102101 2. https://www.youtube.com/playlist?list=PLMtzJAOD3B7YpZpVB17IFAFQG6Nqij-mY

JSPM University Pune F.Y. M. Tech "Construction Management" Semester II		
Course Type: SEC	**Course Title:** Building Information Modelling	
Course Code: 230GSEM19_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 marks **Oral (OR):** 50 marks
Prerequisite Courses, if any: -		

List of Laboratory Experiments	
Group A	
1.	Hands on practice on Revit Architecture user interface
2.	Practicing for creating walls, doors, and windows
3.	Creating curtain walls and opening in the walls
4.	Creating floors and roofs.
5.	Modifying objects
Group B	
6.	Creating dormer windows and stairs.
7.	Hands on practice on View and Area command
8.	Creating mass family
9.	Sheet compositions
Group C	
10.	Rendering and Walkthrough

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: VSC	**Course Title:** Innovation	
Course Code: 230IINB02_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 1.5	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 2	**Oral (OR):** 50 Marks

Prerequisite Courses, if any: -

Course Objectives:

- To understand the concept of innovation and creativity
- To familiarize with the tools for innovation
- To understand fundamentals of innovation management
- To get overview of real-world implementation of innovation and creativity

Course Outcomes: On completion of the course, learner will be able to…
CO1: apply the concepts of creativity and innovation in all walks of life.
CO2: inculcate and incorporate individual creativity and innovative skill set at conceptual, product design and management level.
CO3: solve real time problems with enhanced ability in respective sectors of work for increased productivity and improved organizational behaviour.
CO4: perform with improved skill set in entrepreneurship and start up ecosystem.
CO5: to find solutions to social, corporate and personal problems with de novo approach.

Course Contents

Unit I	**Innovation & Creativity**	**(3 Hrs)**

Innovation: Meaning, Concept, Characteristics, Importance, Principles of Innovation, Process of Innovation.
Creativity: Meaning, Concept, Importance, Creativity Process, Components of creative performance, Hurdles to Creativity

Unit II	**Tools for Innovation**	**(5 Hrs)**

Creative Thinking: Traditional V/S Creative Thinking,
Individual Creativity Techniques: Meditation, Self-Awareness, & Creative Focus
Group Creative Techniques: Brainstorming, Off The Wall Thinking &Thinking Hats Method.
Dimensions of Innovation:
Innovation Eco-system in India and abroad, Social Innovation, Grass root Innovation, Frugal Innovation, Global Innovation- Global Innovation Index framework, GII, Case studies in India and abroad.

Unit III	**Innovation Management**	**(3 Hrs)**

Concept, Scope, Characteristics, Evolution of Innovation Management, Significance, Factors Influencing Innovation, Commercialization of Innovation, Innovation and Start up ecosystem

Unit IV	**Areas of Innovation**	**(2 Hrs)**

Innovation in Entrepreneurship, Product innovation, Process Innovation, Social Innovation, Case studies highlighting types, implementation imperatives and sector specific impact.

Unit V	**Group innovation study**	**(1 Hrs)**

Each student group will prepare a case study on one innovation topic either from their area of work or through participation in the exposition, symposia, workshop of any relevant forum. The project report will be submitted for the study.

Unit VI	**Presentation and Closure**	**(1 Hrs)**

The student group will give the presentation of the project in the chosen area. The report will highlight the process of exploring executing and exploiting the innovation. It will also mention methodology to manage the innovation.

Learning Resources

Text Books:

1.Wagner, Tony. Creating Innovators: The Making of Young People Who Will Change the World. New York: Scribner, 2012.

2. “Managing Creativity and Innovation” Harvard Business School Press

Reference Books:

1. “Organizational Innovation”, SAGE Publication, London, 2001.

2. “Jugaad Innovations, Navi Radjou and Jaideep Prabhu, Random House India

3. “Kelley, Tom, Jonathan Littman, and Tom Peters. The Art of Innovation: Lessons in Creativity from IDEO, America’s Leading Design Firm. New York: Doubleday, 2001.

4. “Innovation Management & New Product Development”, Paul Trott, published by Pitman, 2000.

MOOC / NPTEL Courses:

1. NPTEL Course "*Innovation, Business Models and Entrepreneurship",* Prof Rajat Agrawal, Prof Vinay Sharma, IIT Roorkee.

   Link of the Course: https://onlinecourses.nptel.ac.in/noc23_mg116/preview

Additional Web Resources:

https://youtu.be/FXJUDyqobbM
https://youtu.be/FF_38_ZuRbQ
https://youtu.be/33JjV_NDbpY
https://youtu.be/DNUwZctwwhw
https://youtu.be/_PC1qbAhKz0
https://youtu.be/wbFVNBNl7Bk
https://youtu.be/kfpERveB8kM
https://youtu.be/Y6R9ps2E1oM
https://youtu.be/66N5SM73AEc
https://youtu.be/1YLtkc6U3Rs

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: AEC	**Course Title:** Business Communication	
Course Code: 231UENM02_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (P):** 50 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- Remember the theoretical basics of Communication.
- Understand skills required for efficient interpersonal communication and leadership abilities.
- Apply Presentation Techniques in the Professional Environment.
- Analyze trends in the respective market to accommodate accordingly.
- Evaluate the skills related to production & presentation of messages in multiple formats.
- Create placement ready personalities.

Course Outcomes: On completion of the course, learner will be able to

CO1: Apply Verbal and Non-Verbal Communication Techniques in the Professional Environment

CO2: write impressive official correspondence and learn to make and give effective presentations in a professional environment.

CO 3: Write an impressive resume and face the interview confidently.

CO 4: Present themselves well in front of large audience on a variety of situations related to group communication and presentation in a relevant scenario.

CO5: Socialize with ease and comfort.

CO6: Develop Corporate Communication Skills

Course Contents

Unit I	**Employment Communication**	**(2 Hrs)**

Introduction and objectives of Report Writing, Types of Business Reports-Informational Reports, Analytical Report, Research Report, Progress Report, Explanatory Report, Structure of Reports- Title page, table of content, summary, the main body, conclusion, and recommendations, Writing Abstracts and Summaries

Unit II	**Resume Writing**	**(2 Hrs)**
Introduction to Resume Writing- Concept and Details, Types of Resume Writing- chronological and functional, Key components of effective Resume Writing, Structure and contents of Cover Letter		
Unit III	**Interview Skills / Techniques**	**(3 Hrs)**
Interview Skills / Techniques – Concept and Process, Peer Interview/Mock Interview- Pre-interview planning and performance, Opening Strategies and Answering Strategies, Interview through tele and video- conferencing		
Unit IV	**Group Discussion**	**(3 Hrs)**
Group Discussion – Concept and important points, Roles and Phases in Structured Group Discussion, Expectations of the Panel, Do's and Don'ts in Group Discussion		
Unit V	**Presentation Skills**	**(2 Hrs)**
Elements of Presentation- Content, Organization, Delivery, Design of Presentation- Typography, colour, layout, images and animation, Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs, Written Presentations through Posters/Projects/Reports/ E-mails/Assignments		
Unit VI	**Essential Soft Skills**	**(3 Hrs)**
Soft Skills development- Grooming Etiquettes and Manners, Stress and Conflict Management- Coping styles and symptoms, Time Management- Pomodoro Technique, Pareto Technique, Leadership Skills- Definition, Strategies, and Styles		

Learning Resources

Textbooks:

1. Bovee, Courtland L, John V. Thill & Barbara E. Schatzman. *Business Communication Today*: Tenth Edition. New Jersey: Prentice Hall, 2010.

Reference Books:

1. Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
2. Barun, Mitra. Personality Development and Soft Skills, Barun K Mitra, Oxford Press, 2011.

MOOC / NPTEL Courses:

1. NPTEL Course "Soft skill Development" Prof. Priyadarshi Patnayak, Prof. V.N, Giri, Prof. D. Suar, IIT Kharagpur

Link of the course: https://youtu.be/Af9RoDvhTLE?si=cqQim2DX2Cepi0eX

Additional Web Resources:

http://www.englishdaily626.com/c-errors.php

https://www.stressdirections.com/personal/about_stress/stress_statistics.html

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: AEC	**Course Title:** Business Communication	
Course Code: 231UENM02_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (P):** 50 Marks

Prerequisite Courses, if any: -

List of Laboratory Experiments

Group A

1.	Report Writing
2.	Resume Writing
3.	Interview technique
4.	Group Discussion
5.	Presentation Skills

Group B

6.	Soft Skills: Grooming, Etiquettes and Manners
7.	Stress Management
8.	Time Management
9.	Leadership Skill
10.	PowerPoint Presentation

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: RMC	**Course Title:** Research Design and Techniques	
Course Code: 230IRMM02_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 50 Marks

Prerequisite Courses, if any: -

Course Objectives:

- To develop the ability to create visual representations of data using appropriate tools
- To equip with various statistical techniques to draw meaningful conclusions from data
- To enable the students with the principles of experimental design, the formulation and execution of experiments
- To enable students to comprehend the concept of Analysis of Variance, and different types of ANOVA
- To develop proficiency in selecting and applying appropriate measures of association
- To acquaint students with the process of crafting research proposals

Course Outcomes: On completion of the course, learner will be able to

CO1: Demonstrate Proficiency in Data Visualization Techniques
CO2: Perform data analysis using statistical methods
CO3: Apply of Experimental Design Principles in various research contexts
CO4: Interpret research data using Analysis of Variance (ANOVA)
CO5: Demonstrate Proficiency in Measuring Associations
CO6: Develop Comprehensive Research Proposal

Course Contents

Unit I	**Data Visualization**	**(5 Hrs)**
Data preparation process, data presentation, data visualization techniques, effective communication of complex findings		
Unit II	**Data Analysis**	**(5 Hrs)**
Basic statistical concepts, measure of central tendency and variation, univariate statistics, sampling distribution, hypothesis testing		
Unit III	**Design of Experiments**	**(5 Hrs)**
Basics of experimental design, principles of randomization, factorial experiments, fractional factorial designs, Design of Experiments (DOE)		

Unit IV	**ANOVA**	**(5 Hrs)**
Introduction to ANOVA, One-way ANOVA, Two – way ANOVA, Analysis of Covariance (ANCOVA)		
Unit V	**Measures of Association**	**(5 Hrs)**
Simple regression, Multiple Regression, Chi square tests, Equality of proportion test		
Unit VI	**Research Proposal Development**	**(5 Hrs)**
Importance of research proposals in academic and professional contexts, Components of a research proposal, creating a realistic research timeline, Submitting the research proposal for funding or approval, Research proposal drafts and peer reviews		

Learning Resources

Text Books:

1. Wayne Goddard, Stuart Melville, "*Research Methodology: An Introduction*", Juta, Lansdowne, Second Edition.
2. Ranjit Kumar "*Research Methodology*: A Step-by-Step Guide for Beginners", SAGE Publications Pvt. Ltd Fourth Edition.
3. Dr. C. R. Kothari, "*Research Methodology: Methods and Trends*", New Age International (P) Limited, Publishers, Second Edition.

Reference Books:

1. Nicholas Walliman, *"Research Methods: The Basics",* Routledge – Taylor and Francis Group, Third Edition.
2. Vinod Chandra, Anand, Hareendran "Research Methodology", Pearson 1st Edition
3. Dr. Prabhat Pandey, Dr. Meenu Mishra Pandey, "Research Methodology: Tools and Techniques", Bridge Center, 2015.
4. Alan Bryman & Emma Bell, "*Business Research Methods*", Oxford University Press, Third Edition.

MOOC / NPTEL Courses:

1. "*Research Methodology*", Prof. Edamana Prasad, Prof. Prathap Haridoss, IIT Madras.
   Link of the Course: https://onlinecourses.nptel.ac.in/noc23_ge36/preview
2. "*Research Methodology*", Prof. Soumitra Banerjee, IISER Kolkata.
   Link of the Course: https://archive.nptel.ac.in/courses/127/106/127106227/

Additional Web Resources:

1. https://www.coursera.org/specializations/data-collection
2. https://www.coursera.org/learn/anova-and-experimental-design
3. https://www.coursera.org/learn/research-proposal-initiating-research

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: LC	**Lab Course Title:** Project Management Lab	
Course Code: 230GCMM17_02	**Teaching Scheme:** (Hrs. / Week)	**Examination Scheme:**
Credits: 1	**Lecture (L):** 0 **Tutorial (T):** 0 **Practical (P):** 2 **Experiential Learning (EL):** 0	**Practical (PR):** 50 Marks
Prerequisite Courses: - Microsoft Project Basics.		

List of Laboratory Experiments	
1.	Generate a detail report for the construction of residential building- Villa Type.
2.	Generate a detail report for the construction of residential building- Apartment Type.
3.	Create a project for a commercial building having multiple activities and tasks.
4.	Plan and Schedule the construction phases for industrial buildings.
5.	Create a detail plan for construction of a highway and road projects.
6.	Create a detail plan for the maintenance of highway and road projects.
7.	Plan and Schedule the construction phases of bridges, considering dependencies and critical paths.
8.	Utilize the WBS feature to organize project components for dam and reservoir construction.
9.	Create a detailed project plan for pipeline construction activities.
10.	Develop a comprehensive project plan for farm house construction, including site preparation and infrastructure development.

JSPM University Pune

F.Y. M. Tech "Construction Management"

Semester II

Course Type: IITP / FE/CEP	**Lab Course Title:** Internship / Field Projects/ Community Engagement project	
Course Code: 230GCMM25_02	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 2	**Duration:** 04 to 06 Weeks	**Oral (OR):** 50 Marks

Prerequisite Courses, if any: -

Objectives:

- To expose students to the industrial environment, which cannot be simulated/experienced in the classroom and hence creating competent professionals in the industry and to understand the social, economic and administrative considerations that influence the working environment of industrial organizations.
- To provide students with an opportunity to apply theoretical knowledge from academics to the realities of the field work/training.
- To providing practical experience in a field or discipline

Course Outcomes: On completion of the course, learner will be able to

CO1: Develop professional competence through internship.
CO2: Apply academic knowledge in a personal and professional environment.
CO3: Build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: Become a responsible professional having social, economic and administrative considerations.
CO6: Decide own career goals and personal aspirations.

Duration and Evaluation:

- Internship to be completed after every even semester (2, 4 and 6) and before commencement of next odd semester (03, 05 and 07).
- Internship should be at least 4 to 6 weeks and it is to be assessed immediately after completion.

Framework of Internship/ Field Project / Community Engagement Project:

- During the vacation after even semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship / Field Project / Community Engagement Project
- Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry.

- Every student is required to prepare a file containing documentary proofs of the activities done by him.
- The evaluation of these activities will be done by Programme Coordinator/ Project Head / faculty / TPO/ mentor or Industry Supervisor.

Internship Guidelines:

Step 1: The department will issue request Letter/ Email to the respective industry/ firm/ NGO/ organization to allot various slots of 4-6 weeks as internship**/** Field Project / Community Engagement Project periods for the students.

Step 2: Industry will confirm the training slots allocated for internships via Confirmation Letter/ Email.

Step 3: Students on joining Training at the concerned Industry / Organization, submit the Joining Report/ Letters / Email.

Step 4: Students undergo industrial training/ Field Project / Community Engagement Project at the concerned Industry / Organization. In- between Faculty Member(s) can evaluate(s) the performance of students once/twice by visiting the Industry/Organization and Evaluation Report of the students is submitted in department.

Step 5: Students will submit training report after completion of internship.

Step 6: Training Certificate to be obtained from industry / Organization.

Internal Reporting Guidelines for students:

- Every intern should send weekly report to their internal guide without fail. It is mandatory for the intern to send weekly reports to their respective guide on regular basis.
- Interns should have at least fortnightly verbal communication with the internal guide without fail.
- In cases where in the company wants to secure their confidential information in the project / internship report, the internal guide should duly co-ordinate with the respective mentor/reporting manager on the method of reporting to assure that no information will be leaked outside and is purely for academic purposes.

Internship Diary / Internship Workbook:

- Students must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The students should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any.
- The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.
- Internship Diary/workbook and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and

stamped by the industry to the Institute immediately after the completion of the training.

Internship Diary / workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries.
- Adequacy & quality of information recorded
- Data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Work Evaluation:

- Every student is required to prepare and maintain documentary proofs of the activities done by him / her as internship diary or as workbook.
- The evaluation of these activities will be done by Programme Coordinator/ Project Head / faculty / TPO/ mentor or Industry Supervisor based on- overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities.

Evaluation-Seminar presentation / Oral Examination at the institute:

The student will present a seminar based on his training report, before an expert committee constituted by the concerned department as per norms.

The evaluation will be based on the following criteria:

- Depth of knowledge and skills Communication & Presentation Skills.
- Team Work
- Creativity
- Planning & Organizational skills
- Adaptability and Analytical Skills
- Attitude & behaviour at work.
- Societal Understanding
- Ethics
- Regularity and punctuality
- Attendance record
- Log book
- Student's Feedback from External Internship Supervisor

- **Internship Report:**
- The report shall be presented covering following recommended fields but limited to:
- Title/Cover Page
- Internship completion certificate.
- Internship Place Details- Company background-organization and activities/Scope and
- object of the study / personal observation.
- Index/Table of Contents
- Introduction
- Title/Problem statement/objectives
- Motivation/Scope and rationale of the study
- Methodological details

- Results / Analysis /inferences and conclusion
- Suggestions / Recommendations for improvement to industry, if any
- Attendance Record
- List of reference (Library books, magazines and other sources)

Feedback from internship supervisor (External & Internal):

Post internship, faculty coordinator should collect feedback about student with following recommended parameters:

- Technical knowledge
- Discipline
- Punctuality
- Commitment
- Willingness to do the work
- Communication skill
- Individual work
- Team work
- Leadership

JSPM University Pune
Faculty of Science and Technology
School of Civil and Environmental Sciences

NEP aligned Syllabus
for
SY M. Tech. (Construction Management)

(Effective from AY: 2025-26)

	JSPM University Pune	**COURSE STRUCTURE (NEP 2020 Aligned)**	
	FACULTY OF SCIENCE & TECHNOLOGY	**W. E. F**	**2025-2026**
	SCHOOL OF CIVIL AND ENVIRONMENTAL SCIENCES	**RELEASE DATE**	**01/07/2025**
	SECOND YEAR MASTER OF TECHNOLOGY (CONSTRUCTION MANAGEMENT)	**REVISION NO.**	**0.0 (NEP)**

SEMESTER III (LEVEL 7)

COURSE			TEACHING SCHEME				EXAMINATION SCHEME AND MARKS									
			Hours / Week				THEORY (Equal Weightage for CIE and ESE)				PRACTICAL (Equal Weightage for CIE and ESE)		ORAL (Equal Weightage for CIE and ESE)		TOTAL	CREDITS
TYPE	CODE	COURSE NAME	L	T	P	EL	CONTINUOUS INSEMESTER EVALUATION (100 Marks)			END SEMESTER EXAMINATION (100 / 50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)		
							T1 (30 Marks)	T2 (30 Marks)	Assign-ments (40 Marks)							
PEC	-	Program Elective-I / MOOCs	3	-	-	-	30	30	40	100	-	-	-	-	100	3
PEC	-	Program Elective-II / MOOCs	3	-	-	-	30	30	40	100	-	-	-	-	100	3
IOC	-	Interdisciplinary Open Course -I	2	-	-	-	30	30	40	100	-	-	-	-	100	2
IOC	-	Interdisciplinary Open Course -II	2	-	-	-	30	30	40	100	-	-	-	-	100	2
VEC	230USYB01_03	Behavioral Science and Ethics	2	-	-	-	30	30	40	50	-	-	-	-	50	2
SLC	240GCMM03_03	Seminar	-	-	4	-	-	-	-	-	-	-	50	50	50	2
PROJ	240GCMM01_03	Field Project	-	-	4	8	-	-	-	-	50	50	50	50	100	4
TOTAL			**12**	**0**	**12**	**0**									**600**	**18**
MLC#		Audit Course - I	1	-	-	-	-	-	-	50	-	-	-	-	50	1

Sem.	Interdisciplinary Open Course (IOC)		
	Specialization	**(IOC – I)**	**(IOC – II)**
III	**Course Code**	250GCSM03_03	230GCSM33_03
	Course Name	Fundamentals of Artificial Intelligence and Machine Learning	Introduction to Python Programming
III	**Course Code**	230VMSM11_03	230VBCB04_03
	Course Name	Fundamentals of Financial Management	Basics of Accounting

Sem.	Programme Elective Course (PEC)			
	Specialization	**Construction Management**		
III (PEC – I)	**Course Code**	230GCMM06_03	230GCMM07_03	230GCMM08_03
	Course Name	Construction Safety	Energy Efficient Buildings	Project Economics and Financial Management
III (PEC – II)	**Course Code**	230GCMM09_03	230GCMM10_03	230GCMM11_03
	Course Name	Quality Control in Construction	Infrastructure Development and Management	Building Services
IV (PEC – III)	**Course Code**	230GCMM12_04	230GCMM13_04	230GCMM22_04
	Course Name	Strategic Management	Project Risk Management	Airport Infrastructure Development
IV (PEC – IV)	**Course Code**	230GCMM14_04	230GCMM15_04	230GCMM23_04
	Course Name	Quality Control and Total Quality Management	Supply Chain Management	Repair, Retrofitting and Rehabilitation Techniques

Sem.	Mandatory Learning Course (MLC#)- Audit Course	
III (Audit Course - I)	**Course Code**	230GSEM29_03
	Course Name	Structural Audit
IV (Audit Course - II)	**Course Code**	230UPOB02_04
	Course Name	Introduction to Indian Constitution

JSPM UNIVERSITY PUNE

Recognized by the UGC u/s 2 (f) of UGC Act 1956 and enacted by the
State Government of Maharashtra - JSPM University Act, 2022 (Mah. IV of 2023)

	JSPM University Pune	**COURSE STRUCTURE (NEP 2020 Aligned)**	
	FACULTY OF SCIENCE & TECHNOLOGY	**W. E. F**	**2025-2026**
	SCHOOL OF CIVIL AND ENVIRONMENTAL SCIENCES	**RELEASE DATE**	**01/07/2025**
SECOND YEAR MASTER OF TECHNOLOGY (REGULAR) (CONSTRUCTION MANAGEMENT)		**REVISION NO.**	**0.0 (NEP)**

SEMESTER IV (LEVEL 7)

COURSE			TEACHING SCHEME				EXAMINATION SCHEME AND MARKS									
			Hours / Week				THEORY (Equal Weightage for CIE and ESE)				PRACTICAL (Equal Weightage for CIE and ESE)		ORAL (Equal Weightage for CIE and ESE)		TOTAL	CREDITS
TYPE	CODE	COURSE NAME	L	T	P	EL	CONTINUOUS INSEMESTER EVALUATION (100 Marks)			END SEMESTER EXAMINATION (100 / 50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)	CONTINUOUS INSEMESTER EVALUATION (50 Marks)	END SEMESTER EXAMINATION (50 Marks)		
							T1 (30 Marks)	T2 (30 Marks)	Assign-ments (40 Marks)							
PEC	-	Program Elective-III/ MOOCs	3	-	-	-	30	30	40	100	-	-	-	-	100	3
PEC	-	Program Elective-IV/ MOOCs	3	-	-	-	30	30	40	100	-	-	-	-	100	3
PROJ	240GCMM02_04	Project / Internship with Project	-	-	12	24	-	-	-	-	200	200	100	100	300	12
TOTAL			**6**	**0**	**24**	**0**									**500**	**18**
MLC#		Audit Course - II	1	-	-	-	-	-	-	50	-	-	-	-	50	1

Sem.	Interdisciplinary Open Course (IOC)		
	Specialization	**(IOC – I)**	**(IOC – II)**
III	**Course Code**	250GCSM03_03	230GCSM33_03
	Course Name	Fundamentals of Artificial Intelligence and Machine Learning	Introduction to Python Programming
III	**Course Code**	230VMSM11_03	230VBCB04_03
	Course Name	Fundamentals of Financial Management	Basics of Accounting

Sem.	Programme Elective Course (PEC)			
	Specialization	**Construction Management**		
III (PEC – I)	**Course Code**	230GCMM06_03	230GCMM07_03	230GCMM08_03
	Course Name	Construction Safety	Energy Efficient Buildings	Project Economics and Financial Management
III (PEC – II)	**Course Code**	230GCMM09_03	230GCMM10_03	230GCMM11_03
	Course Name	Quality Control in Construction	Infrastructure Development and Management	Building Services
IV (PEC – III)	**Course Code**	230GCMM12_04	230GCMM13_04	230GCMM22_04
	Course Name	Strategic Management	Project Risk Management	Airport Infrastructure Development
IV (PEC – IV)	**Course Code**	230GCMM14_04	230GCMM15_04	230GCMM23_04
	Course Name	Quality Control and Total Quality Management	Supply Chain Management	Repair, Retrofitting and Rehabilitation Techniques

Sem.	Mandatory Learning Course (MLC#)- Audit Course	
III (Audit Course - I)	**Course Code**	230GSEM29_03
	Course Name	Structural Audit
IV (Audit Course - II)	**Course Code**	230UPOB02_04
	Course Name	Introduction to Indian Constitution

JSPM University Pune

S.Y. M. Tech. "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Construction safety	
Course Code: 230GCMM06_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management

Course Objectives:

- To understand and identify safety hazards and risks in the construction industry.
- To analyze the causes of construction-related accidents and the human factors involved.
- To gain knowledge of relevant laws, codes, and standards regarding safety in construction.
- To explore safety management systems, strategies, and technologies in construction operations.
- To develop skills for implementing and monitoring safety protocols on-site.

Course Outcomes: Students completing the course will be able to:

CO1: Explain fundamental concepts of construction safety and the role of various stakeholders in maintaining safe sites.

CO2: Assess safety concerns in different types of construction activities and apply ergonomic principles.

CO3: Demonstrate knowledge in safe material handling, storage, and transportation practices.

CO4: Evaluate hazards associated with construction equipment and recommend safety measures.

CO5: Interpret key provisions from industrial safety laws and apply them in site operations.

CO6: Understand and apply construction labor laws and regulations in real-world projects.

Course Contents		
Unit I	**Introduction to Construction Safety**	**(8 Hrs)**

Introduction to Construction Industry- Safety issues in construction- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry. Framing Contract conditions on safety, and related matters. Relevance of ergonomics in construction safety.

Unit II	Safety in Construction Operations	(6 Hrs)
Safety in various construction operations- Excavation- under- water works- under- pinning & shoring Ladders & Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons confined Space Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.		
Unit III	**Safety in material**	**(8 Hrs)**
Basic principle of correct lifting and handling of materials. Maximum loads that may be carried; Lifting and carrying of objects of different shape', size and weight, safe use of accessories for manual handling; General considerations for stacking and storage- Planning for storage Layout, protection against atmospheric agencies, protection against fire and other hazards; Stacking, storage and handling with respect to materials such as cement, limes, stones, bricks, tiles, aggregates; Storing of materials with identifiable batch lot.		
Unit IV	**Safety for construction equipment**	**(6 Hrs)**
Safety in handling of construction equipment's- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pu ley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction. Temporary power supply.		
Unit V	**Industrial Safety**	**(8 Hrs)**
Factories Act- Definitions, Preliminary, inspecting staff, Health, Safety, Provisions relating to hazardous processes, Welfare, Working hours of adults, Employment of young persons, Special provisions. Dock workers (Safety, Health and Welfare) Act and Regulations. Definitions, Powers of Inspectors, Power of Govt. to direct Inquiry, Obligation of dock workers. Duties of Safety Officers, Reporting of accidents, Emergency Action Plan, Safety Committee.		
Unit VI	**Regulations & Laws**	**(8 Hrs)**
Contract Labor (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Workers (RE&CS) Act,1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Well fare provisions, Penalties.		

Learning Resources

Text Books:

1. V.J. Davies and K. Tomasin, *"Construction Safety Handbook";* by, Thomas Telford Publishing, 2020.
2. Linger L, "*Modern Methods of Material Handling";* by, McGraw Hill, 2021.
3. Grimaldi John. V. and Simonds R.H., *"Safety Management"*, All India Traveller Book Seller, Edition- Fifth.

Reference Books:

1. "*Factories Act,1948*" with amendments of 1976 & 1987
2. D. Lal, "*Construction Management & PWD Accounts*", S.K. Kataria & Sons, 2012
3. Oliver, Lianabel, "*The Cost Management Toolbox*", Tata McGraw Hill, 1999

MOOC / NPTEL Courses:

1. NPTEL Course **"***Occupational Health and Safety***"** – Prof. Debasis Sarkar, IIT Kharagpur
   Link of the course: https://onlinecourses.nptel.ac.in/noc23ch13
2. NPTEL Course *"Construction Safety"* – Prof. K.N. Jha, IIT Delhi
   Link of the course: https://nptel.ac.in/courses/105102206

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Energy Efficient Buildings	
Course Code: 230GCMM07_03	**Teaching Scheme:** (Hrs./ week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- To understand the principles of energy efficiency and their application in building design.
- To explore daylighting, artificial lighting, and their impact on human health and energy consumption.
- To analyze passive heating and cooling systems and strategies for reducing building energy demand.
- To evaluate structural design elements and materials for enhancing building energy efficiency.

Course Outcomes: On completion of the course, learner will be able to

CO1: Analyze energy use and HVAC loads in buildings using building physics principles.

CO2: Design daylighting and artificial lighting systems considering key parameters and benefits.

CO3: Apply passive heating/cooling strategies based on thermal responses and heat exchange.

CO4: Optimize building envelope design using materials, orientations, and ventilation techniques.

CO5: Conduct building performance analysis using daylight, thermal, and ventilation models.

CO6: Perform energy audits and ensure compliance with energy conservation codes.

Course Contents

Unit I	**Introduction to Energy Efficient Buildings**	**(8 Hrs)**

Introduction to energy efficiency, energy efficient buildings; Building physics; heat gains in the building; Psychometric analysis; Weather analysis; Energy use in buildings; Energy Supply in Buildings: Heating, Ventilating, and Air Conditioning (HVAC) Systems; Heating and cooling loads;

Unit II	**Daylighting and artificial lighting**	**(8 Hrs)**

Daylighting and artificial lighting, relationship between daylight and human health, benefits of daylighting, Sky condition models and their characteristics, Parameters for daylighting design (critical indoor and outdoor illuminance level, daylight factor distribution and glare), Parameters affecting daylighting factor (room depth, height of the window head, shading devices, glazing type, reflectance of room surfaces), Daylighting components (intermediate light spaces, interior light spaces, lateral, zenithal, and global pass-through components), Control elements		
Unit III	**Passive/ Low Energy Heating and Cooling Systems**	**(9 Hrs)**
Response of building to thermal environment: Processes of heat exchange of building with environment; Effect of solar radiation; Thermal properties of material and sections and their influence, Principle of passive heating, Types of passive heating systems. Building design strategies to reduce cooling demand, Types of passive cooling systems (evaporative cooling, indirect evaporative cooling and earth cooling systems), Steady and periodic heat transfer in buildings, Heat flow computations: Transmission matrix, Admittance method. HVAC Optimization Strategies		
Unit IV	**Structural control and Design for Energy Efficiency**	**(8 Hrs)**
Structural control and design for energy efficiency: Understanding the Building Envelope, Selection of envelope elements, Orientations, shape, Glasses and shading devices, Energy Efficient Roofing & Wall Systems, Fenestrations & Glazing Technology, Low Embodied Energy Materials & Technology, Insulation Materials and Techniques, Insulation Materials and Techniques. Natural ventilation: Purpose and Mechanisms, Fenestration Design for natural ventilation		
Unit V	**Building Performance Analysis and Modelling**	**(6 Hrs)**
Daylight analysis, Thermal modelling, ventilation modelling, heat flow analysis, Weather simulation and analysis tool (Climate Analysis, Solar Exposure analysis, Passive strategies through psychometric chart.		
Unit VI	**Building Energy Auditing**	**(6 Hrs)**
Introduction to Energy Auditing, Energy Audit of Buildings, Overview of Building Energy Codes, Guidelines and Standards. Energy Conservation Building Code (ECBC), International Energy Conservation Code (IECC), Compliance Requirements for Energy-Efficient Buildings, Case Studies in Code Compliance		

Learning Resources

Text Books:

1. Majumdar, M. (Ed.), "*Energy efficient Buildings in India*", The Energy and Resources Institute, TERI, 2009. ISBN-10-8185419825
2. Zhai Z. J., "*Energy Efficient Buildings: Fundamentals of Building Science and Thermal Systems*". John Wiley & Sons Inc. 2022. 1st Edition. ISBN-10-1119881935
3. Shaumarov S., Shhipacheva E., "*Energy Efficient Building Design*", Our Knowledge Publishing. 2024, ISBN-10 : 6207672550
4. Givoni, B., "*Passive and Low Energy Cooling of Buildings*", John Wiley & Sons Inc., New York. 1994

Reference Books:

1. Crosbie, M.J. "The Passive Solar Design and Construction Hand Book", John Wiley & Sons Inc., New York. 1998.
2. Ed. Baker, N., Fanchiotti, A. And Steemers, K. "Daylighting in Architecture: A European Reference Book", James & James (Science Publishers) Ltd., London. 1993.
3. Tyagi, A. K.(Ed), "Handbook on energy audits and management", Tata Energy Research.
4. Brown, G.Z. and DeKay, M., "Sun, Wind and Light Architectural Design Strategies", John Wiley and Sons Inc, 2001.

Website Links:

Energy Efficient Buildings NPTEL Course:
https://onlinecourses.swayam2.ac.in/nou24_ge85/preview

JSPM University Pune

S.Y. M. Tech. "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Project Economics & Financial Management	
Course Code: 230GCMM08_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management
2. Project Management

Course Objectives:

- To understand the economic principles influencing business decisions.
- To evaluate cost implications across different construction phases.
- To identify various sources of finance and their suitability for construction projects.
- To examine corporate tax planning strategies in the construction sector.
- To demonstrate proficiency in construction accounting processes.
- To analyze case studies related to PPP projects, dams, canals, and government-funded projects.

Course Outcomes: Students completing the course will be able to:

CO1: Demonstrate a comprehensive understanding of economic principles, financial management techniques, and regulatory frameworks relevant to the construction sector.
CO2: Apply analytical and decision-making skills to evaluate project costs, financial feasibility, and risk management strategies.
CO3: Effectively communicate financial insights and recommendations through project commentary and case study analysis.
CO4: Apply accounting principles to prepare accurate financial statements and conduct ratio analysis for performance evaluation.
CO5: Evaluate real-world construction projects using case studies, applying theoretical knowledge to practical scenarios in project appraisal, fund raising, and cost analysis.
CO6: Learn the fundamentals of legal systems in construction.

Course Contents		
Unit I	**Principles of Economics & Capital**	**(6 Hrs)**
Importance of the economic background to measurement, objectives of business firm. Factors bearing on size of firms. Motives to growth. Obstacles to growth of firms, Study of present economy.		

Capital: Analysis of need for working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Corpus Fund		
Unit II	**Economic Analysis**	**(8 Hrs)**
Cost implication to different forms of construction and maintenance 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		
Unit III	**Financial Planning & Budget**	**(8 Hrs)**
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. Accounting Information System, Project Commentary, project Running Commentary		
Unit IV	**Corporate Sector**	**(6 Hrs)**
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		
Unit V	**Construction Accounts**	**(8 Hrs)**
Accounting process, preparation of profit and loss account and balance sheet as per the companies Act2013, 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.		
Unit VI	**Case Studies**	**(6 Hrs)**
Case studies for 1) PPP projects, 2) Dams and Canals, 3) Government Funded Projects with respect to a) Project Appraisal; b) Raising of funds; c) Cost to complete analysis		

Learning Resources

Text Books:

1. Brealey R.A*; “Principles of Corporate Finance”;* by, Tata McGraw Hill, New Delhi, 2003
2. Bruggeman. Fishr; *“Real Estate, Finance and investment”;* by, McGraw Hill, 2010
3. Prasanna Chandra; *“Projects planning, Analysis Selection, Implementation and Review”;* by, Tata McGraw Hill, New Delhi, 2005
4. Block Hirt; *“Foundations of Financial Management”;* by, McGraw Hill, 2009

Reference Books:

1. D Lal, S. K. Kataria & Sons; *“Construction Management & PWD Accounts”;* 2012
2. Oliver, Lianabel; *“The cost management toolbox; A Managers guide to controlling costs and boosting profits”*; by, Tata McGraw Hill, 1999.
3. Burner; “*Case studies in finance*”; by, McGraw Hill, 2009.
4. DeMello; *“Cases in Finance*”; by, McGraw Hill, 2003.

MOOC / NPTEL Courses:

1. NPTEL Course "*Introduction to Accounting and Finance for Civil Engineers*", Dr. Sudhir Misra, Dr. K.N. Jha, IIT Kanpur
   Link of the course: https://onlinecourses.nptel.ac.in/noc23_ce08/preview
2. NPTEL Course "*Construction Economics & Finance*", Dr. Bulu Pradhan, IIT Guwahati
   Link of the course: https://nptel.ac.in/courses/105103023

-

JSPM University Pune

S.Y. M. Tech. "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Quality Control in Construction	
Course Code: 230GCMM09_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management

Course Objectives:

- To introduce students to the fundamental concepts and importance of quality management in construction projects.
- To familiarize students with international quality system standards and their application in construction management.
- To differentiate between quality assurance and quality control methods and their roles in ensuring construction quality.
- To improve construction quality through material selection, design optimization, and value engineering.
- To educate the importance of safety management and its integration into construction operations.
- To provide knowledge of safety measures specific to various construction sites and stages of construction.

Course Outcomes: Students completing the course will be able to:

CO1: Develop a comprehensive quality plan and guidelines to ensure adherence to quality standards throughout construction projects.

CO2: Implement ISO 9000 standards effectively, prepare quality system documents, and conduct benchmarking to enhance quality performance.

CO3: Demonstrate proficiency in applying appropriate quality assurance and quality control techniques to achieve project objectives and stakeholder satisfaction.

CO4: Analyze environmental and social factors, apply life cycle costing and value analysis, and implement effective quality improvement techniques in construction projects.

CO5: Create and implement safety protocols, conduct safety training, and establish safety committees to ensure a safe working environment on construction sites.

CO6: Demonstrate competency in identifying and mitigating construction site hazards, implementing accident prevention strategies, and promoting safety awareness among construction personnel.

Course Contents		
Unit I	**Quality Management**	**(8 Hrs)**
Introduction, Definitions and objectives, Factor influencing construction quality, Responsibilities and authority, Quality plan, Quality Management Guidelines & Quality circles, Concept of Quality Audit, Importance of Quality Control in Construction, Measure taken for Improving Quality of Construction		
Unit II	**Quality Systems**	**(8 Hrs)**
Introduction, Quality system standard, ISO 9000 family of standards & requirements, Preparing Quality System Documents, Quality related training, Implementing a Quality system, Bench-marking quality, Design of Quality manuals, checklist and inspection reports.		
Unit III	**Quality Assurance and Control**	**(6 Hrs)**
Objectives, Difference between Quality Control and Quality assurance, Regularity agent, owner, design, contract and construction-oriented objectives & methods, Techniques and needs of QA/QC, Different aspects of quality, Appraisals, Factors influencing construction quality.		
Unit IV	**Quality Improvement Techniques**	**(8 Hrs)**
Selection of new materials, Influence of drawing, detailing, specifications & standardization, Bid Preparation, Construction activity, environmental safety, social and environmental factors, Natural causes and speed of construction, Life cycle costing, Value engineering and value analysis.		
Unit V	**Construction Safety Management**	**(6 Hrs)**
Role of top management, Duties & responsibilities of various officers on site, Responsibilities of general employees, Safety committee, Safety training, Safety campaign.		
Unit VI	**Safety in construction operations**	**(6 Hrs)**
Safety on various construction sites viz. buildings, dams, Tunnels, bridges, roads, Safety at various stages of construction, Prevention of accidents. Safety measures.		

Learning Resources

Text Books:

1. Clarkson H. Oglesby; *"Productivity Improvement in Construction*"; by, McGraw-Hill, 1989.
2. John L. Ashford; "*The Management of Quality in Construction*"; by, E & F. N. Spon, New York, 1989.
3. Steven McCabe; "*Quality Improvement Techniques in Construction"*; by, Addison Wesley Longman Ltd, England. 1998.
4. Jimmy W. Hinze*; "Construction Safety";* by, Prentice Hall Inc., 1997.

Reference Books:

1. James, J.O' Brian, *"Construction Inspection Handbook – Quality Assurance and Quality Control",* by, Van No strand, New York, 1989.
2. Hutchins. G*, "ISO 9000",* Viva Books, New Delhi, 2000

3. Rumane, Abdul Razzak *"Quality Management in Construction Projects",* ISBN: 9781439838723 464p- (2011)

MOOC / NPTEL Courses:

1. NPTEL Course "*Safety in Construction*", Prof. J. Uma Maheswari, IIT Delhi
   Link of the course: https://nptel.ac.in/courses/105102206

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Infrastructure Development and Management	
Course Code: 230GCMM10_03	**Teaching Scheme: (Hrs./Week)**	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Project Management
2. Urban Planning

Course Objectives:

- To analyze the role and current status of key infrastructure sectors in India.
- To evaluate methods for measuring capacity and forecasting demand in infrastructure.
- To apply financial planning and PPP models for infrastructure development.
- To examine the benefits and issues of infrastructure privatization through case studies.
- To identify and manage major risks in infrastructure projects.
- To design sustainable and smart solutions for effective infrastructure management.

Course Outcomes: On completion of the course, learner will be able to

CO1: Analyze the role and condition of major infrastructure sectors in India.
CO2: Evaluate methods to measure capacity and forecast demand.
CO3: Apply funding models and PPP concepts in infrastructure projects.
CO4: Assess the impact of infrastructure privatization using case studies.
CO5: Identify and manage key risks in infrastructure development.
CO6: Design smart and sustainable solutions for infrastructure management.

Course Contents		
Unit I	**Introduction to Infrastructure and Indian Scenario**	**(7 Hrs)**

Basic terminologies, role of infrastructure in economic development, types of infrastructure, Indian scenario in respect of adequacy and quality. an overview of the Power Sector, Water Supply and Sanitation Sector, Transportation Sectors (Road, Rail, Air and Port), Telecommunications Sector in India, Urban Infrastructure and Rural Infrastructure in India. Special Economic Zones, Organizations and layers in the field of Infrastructure.

Unit II	Infrastructure Planning and Demand Forecasting	(9 Hrs)
Goals and objectives of infrastructure development; measurement of infrastructure capacity, bases for quantification of demand and supply of various types of infrastructure, identification and quantification of the casual factors influencing the demand for infrastructure; review and application of techniques to estimate supply and demand for infrastructure; use of econometric, social and land use indicators and models to forecast the demand and level of service of infrastructure and its impact on land use; critical review of the relevant forecasting techniques; The Stages of an Infrastructure Project Lifecycle.		
Unit III	**Infrastructure Economics and Financing**	**(8 Hrs)**
The economics of construction, and financing of infrastructure projects. Background behind investment and funding required for the financial planning of the infrastructure. Various forms of funding available for infrastructure (public, private and combined). Public Private Partnership (PPP) in Infrastructure: Concept, definition, benefits; Processes, Modules of PPP, Draft Concession Agreement for PPP projects, Escrow Agreement.		
Unit IV	**Privatization of Infrastructure**	**(6 Hrs)**
A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Case studies on privatization of Infrastructure in India.		
Unit V	**Risk Management in Infrastructure Projects**	**(7 Hrs)**
Mapping and Facing the Landscape of Risks in Infrastructure Projects. Economic and demand risks, political risks, socio-environmental risks, legal and contractual issues in infrastructure, and challenges in the construction and maintenance of infrastructure.		
Unit VI	**Infrastructure Management and Sustainable Development**	**(8 Hrs)**
Definition and importance of infrastructure management, Prioritization techniques for infrastructure projects, Sustainable contracts, introduction to fair process and negotiation, negotiation with multiple stakeholders on infrastructure projects, sustainable infrastructure development, innovative design, and maintenance of infrastructure facilities. Smart Infrastructure		

Learning Resources

Text Books:

1. Louis F. Cohn and Joan G. Manley, "*Infrastructure Planning Handbook: Planning, Engineering, and Economics*," McGraw-Hill Education, 1st Edition.
2. Paul A. Samuelson and William D. Nordhaus, "*Economics of Infrastructure*," McGraw-Hill Education, 19th Edition.
3. R. N. Joshi, "*Urban Infrastructure and Governance*," New Century Publications, 1st Edition.
4. Patricia D. Galloway and Kris R. Nielsen, "*Infrastructure Planning Handbook*," ASCE Press, 1st Edition.

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).

MOOC / NPTEL Courses:

1. NPTEL Course "*Infrastructure Planning and Management*", Prof. A. Veeraragavan, Dr. Ashwin Mahalingam, IIT Madras.
2. "*Infrastructure Economics*", Prof. Nalin Bharti, IIT Patna.

Link of the Course:

https://nptel.ac.in/courses/105106115

https://archive.nptel.ac.in/courses/105/105/105105208/

Additional Web Resources:

https://www.udemy.com/course/project-management-for-infrastructure- sector/?couponCode=OF52424

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- III

Course Type: PEC	**Course Title:** Building Services	
Course Code: 230GCMM11_03	**Teaching Scheme: (Hrs./Week)**	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**(TH):** 100 Marks

Prerequisite Courses, if any:
1. Building Construction

Course Objectives:
- To understand the concepts, classification, and applications of building services, focusing on ventilation and lighting design.
- To study electrical, mechanical, fire safety, and acoustic systems with emphasis on design principles and standards.
- To explore water supply, sanitation, and maintenance systems, highlighting sustainability and economic efficiency.

Course Outcomes: On completion of the course, learner will be able to,
CO1: Identify and explain the scope, objectives, and classification of building services.
CO2: Design efficient ventilation and lighting systems for optimal comfort and energy use.
CO3: Develop energy-efficient electrical and mechanical systems for modern buildings.
CO4: Design fire safety and acoustic systems to ensure safety and comfort in buildings.
CO5: Plan efficient, sustainable water supply and sanitation systems.
CO6: Develop maintenance strategies that ensure durability and sustainability of building services.

Course Contents

Unit I	**Introduction to Building Services**	**(7 Hrs)**

Scope, objectives, and importance of building services in modern construction; Applications of services for residential, commercial, and industrial buildings, Types of building services: Plumbing, electrical, HVAC, fire safety, and mechanical systems, Criteria for selecting appropriate services for different project types.

Unit II	**Building Ventilation and Lighting Systems**	**(7 Hrs)**

Natural and artificial lighting: Principles, factors, and design considerations, Luminary arrangements, distribution of illumination, and utilization factors, Necessity of ventilation in buildings: Natural and mechanical systems, Factors influencing ventilation design and its impact on indoor air quality.

Unit III	Electrical and Mechanical Services	(7 Hrs)
Key technical terms and symbols in electrical installations, Types of wiring systems and accessories for building projects, Energy-efficient electrical designs for modern buildings, Basics of plumbing systems in buildings: Design and installation, Air conditioning systems: Air distribution methods, cleaners, and energy-efficient solutions.		
Unit IV	**Fire Protection and Acoustics**	**(7 Hrs)**
Causes and effects of fire in buildings, Fire-resistant building design as per IS and NBC 2005 standards, Fire detection, alarm, and suppression systems, Acoustics and Sound Insulation, Fundamentals of building acoustics and requirements for good sound quality, Sound-absorbent materials and techniques for noise control in residential and commercial buildings.		
Unit V	**Water Supply and Sanitation Systems**	**(8 Hrs)**
Water quality standards and purification methods, Water supply and distribution systems, Design principles and municipal regulations, Rainwater harvesting and greywater recycling in buildings, Sewerage systems for residential and commercial projects, Sanitation arrangements for high-rise and large-scale buildings.		
Unit VI	**Building Maintenance and Sustainability**	**(8 Hrs)**
Importance of maintenance for durability and serviceability, Types of maintenance: Predictive, preventive, and corrective, Economic aspects and strategies for effective building maintenance, Integration of green building practices in services, Role of advanced technologies in sustainable building operations.		

Learning Resources

Text Books:

1. R. Udaykumar, "*Building Services*," Eswar Press, Chennai.
2. S. M. Patil, "*Building Services*, Seema Publication, Mumbai," Revised Edition.
3. Bureau of Indian Standards (BIS), "*National Building Code of India-2005*," New Delhi.

Reference Books:

1. Dr. B. C. Punmia, *"Building Construction,"* Laxmi Publications (P) Ltd., New Delhi, 16th Edition.
2. P. C. Varghese, "*Building Construction*," PHI Learning (P) Ltd., New Delhi, 2nd Edition.
3. P. S. Gahlot, "*Building Repair and Maintenance Management,"* CBS Publishers & Distribution (P) Ltd., 1st Edition.

MOOC / NPTEL Courses:

1. NPTEL Course "*Fire Protection, Services and Maintenance Management of Building*", Prof. B. Bhattacharjee, IIT Delhi.

Link of the Course:

https://archive.nptel.ac.in/courses/105/102/105102176/#

Additional Web Resources:

https://www.udemy.com/course/building-services/?couponCode=NVDIN35

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester III

Course Type: IOC	**Course Title:** Fundamentals of Financial Management	
Course Code: 230VMSM05_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

- Basics of Accounting
- Principles of Economics
- Business Mathematics

Course Objectives:

1. To provide an understanding of the core concepts of financial management and its importance in business decisions.
2. To equip students with the skills to analyze financial statements and understand the financial health of a business.
3. To develop the ability to make informed financial decisions and manage financial risks.
4. To introduce recent trends and industry practices in financial management.

Course Outcomes:

CO1: Explain the fundamental concepts of financial management (PO1, PO2).
CO2: Analyze financial statements to assess the financial performance of an organization (PO2, PO3).
CO3: Apply financial management techniques to make investment and financing decisions (PO4, PO5).
CO4: Evaluate financial risks and devise strategies to mitigate them (PO6, PO7).
CO5: Integrate knowledge of recent trends and industry practices in financial decision-making (PO8, PO9).
CO6: Demonstrate the ability to communicate financial information effectively (PO10).

Course Contents

Unit I	**Introduction to Financial Management**	**(5 Hours)**
Definition, nature, and scope of financial management; Goals of financial management; Recent trends in financial management. Basic financial calculations (e.g., profit margin, return on investment)		
Unit II	**Financial Analysis and Planning**	**(5 Hours)**
Financial statement analysis; Ratio analysis; Cash flow and fund flow analysis. Calculation of financial ratios and interpretation (e.g., liquidity ratios, profitability ratios).		

Unit III	Time Value of Money	(5 Hours)
Concept of the time value of money; Present value and future value calculations; Applications in financial decision-making. Present value and future value problems, annuity calculations, discounting cash flows.		
Unit IV	**Investment Decisions**	**(5 Hours)**
Capital budgeting techniques; Risk analysis in capital budgeting; Recent trends in investment decisions. Net present value (NPV), Profitability Index, IRR, payback period calculations.		
Unit V	**Financing Decisions**	**(5 Hours)**
Cost of capital; Capital structure theories and planning; Sources of long-term finance. Calculating the cost of equity, debt, and weighted average cost of capital (WACC).		
Unit VI	**Working Capital Management**	**(5 Hours)**
Concepts and components of working capital; Management of cash, receivables, and inventory; Financing of working capital. Working capital cycle, inventory turnover ratio, receivables turnover ratio.		

Learning Resources

Text Books:

1. I.M. Pandey "*Financial Management*"
2. Richard A. Brealey, Stewart C. Myers, and Franklin Allen "*Principles of Corporate Finance*"

Reference Books:

1. Aswath Damodaran "*Corporate Finance*: *Theory and Practice*"
2. Eugene F. Brigham and Michael C. Ehrhardt "*Financial Management: Theory & Practice*"
3. David Hillier, Mark Grinblatt, and Sheridan Titman "*Financial Markets and Corporate Strategy*"
4. R. Charles Moyer, James R. McGuigan, and Ramesh P. Rao "*Contemporary Financial Management*"

MOOC / NPTEL Course:

Coursera Course on Financial Management

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester III

Course Type: IOC	**Course Title:** Startups and Entrepreneurship Development	
Course Code: 230VMSM08_03	**Teaching Scheme:**(Hrs./Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: -

Course Objectives:

- To understand new venture creation opportunities, its resources, and requirements for Enterprise Start-up.

Course Outcomes: On completion of the course, learner will be able to –
CO1: Understand the fundamental concepts and characteristics of entrepreneurship.
CO2: Demonstrate the ability to generate innovative business ideas through creative thinking techniques.
CO3: Develop a comprehensive business plan, considering all essential components.
CO4: Evaluate and choose appropriate funding options for startups.
CO5: Formulate a targeted marketing strategy tailored to the identified audience.
CO6: Plan for sustainable growth and identify opportunities for scaling operations.

Course Contents

Unit I	**Introduction to Entrepreneurship and Startup Ecosystem**	**(3 Hrs)**

Definition and Characteristics of Entrepreneurship: Understanding the entrepreneurial mindset, identifying key traits of successful entrepreneurs, Importance of Entrepreneurship in the Global Economy: Exploring the economic impact of entrepreneurship, Analyzing the role of startups in innovation and job creation, Overview of the Startup Ecosystem, Types of Entrepreneurships.

Unit II	**Idea Generation and Opportunity Assessment**	**(5 Hrs)**

Creativity and Ideation- Techniques for generating innovative business ideas, Fostering a creative environment within a startup team. Market Research and Analysis- Conducting market research to identify opportunities and trends, analyzing customer needs and preferences, Feasibility Studies- Assessing the viability of business ideas, identifying potential challenges and risks.

Unit III	Business Planning and Model Development	(6 Hrs)
Business plan Development- Creating a comprehensive business plan, Understanding the key components of a business plan. Lean Startup Methodology- Implementing lean principles in startup development, Iterative product development and rapid prototyping. Business Model Canvas- Using the Business Model Canvas to visualize and refine business models, Identifying key value propositions and revenue streams.		
Unit IV	**Funding and Financial management**	**(6 Hrs)**
Exploring various sources of startup funding (e.g., bootstrapping, angel investors, venture capital), Understanding the pros and cons of each funding option, developing financial projections and budgets, Monitoring and managing financial performance, Methods for valuing early-stage startups, Factors influencing startup valuation.		
Unit V	**Marketing and Branding Strategies**	**(4 Hrs)**
Creating a marketing plan tailored to the target audience, utilizing digital marketing tools and social media, Importance of branding for startups, Developing a unique and compelling brand identity.		
Unit VI	**Growth, Scaling and Sustainable Business Practices**	**(6 Hrs)**
Planning for sustainable growth, identifying opportunities for scaling operations. Adapting to market changes and technological advancements. Fostering a culture of innovation within the startup, integrating sustainable practices into business operations. Examining the role of startups in social and environmental impact.		

Learning Resources

Text Books:

1. Kathleen R Allen, "*Launching New Ventures, An Entrepreneurial Approach*", Cengage Learning
2. Anjan Raichaudhuri, "*Managing New Ventures Concepts and Cases*", Prentice Hall International
3. S. R. Bhowmik& M. Bhowmik, "*Entrepreneurship"*, New Age International

Reference Books:

1. Steven Fisher, Ja-nae' Duane, "*The Startup Equation -A Visual Guidebook for Building Your Startup*", Indian Edition, Mc Graw Hill Education India Pvt. Ltd
2. Donald F Kuratko, Jeffrey S. Hornsby, "*New Venture Management: The Entrepreneur's Road Map*" Routledge

MOOC / NPTEL Courses:

NPTEL Course on "Entrepreneurship" Prof. C Bhaktavatsala Rao, IIT Madras

https://archive.nptel.ac.in/courses/110/106/110106141/

Additional Web Resources:

https://www.startupindia.gov.in/content/sih/en/learning-and-developmentv2.html

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester III

Course Type: IOC	**Course Title:** Artificial Intelligence for All	
Course Code: 230GCSM31_03	**Teaching Scheme:**(Hrs./Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 2	**(TH):** 100 Marks

Prerequisite Courses, if any:

1. Data structures
2. Basic Programming Skills

Course Objectives:

- To understand the Historical Development and Foundations of AI
- To develop practical skills in designing and implementing search-based and decomposition-based solutions.
- To compare different approach to AI
- To master Logical and Probabilistic reasoning in AI.
- To explore use of Neural Networks in AI and understand Natural Language Processing
- To apply AI Concepts to in Civil Engineering

Course Outcomes:

On completion of the course, learner will be able to,

CO1: Describe the history and evolution of AI, including the differences between strong and weak AI and analyze the logical reasoning in AI, knowledge representation systems and expert systems.

CO2: Understand searching algorithms, heuristics in search and problem decomposition-based solutions

CO3: Understand Logical approach to AI and importance of knowledge-based system

CO4: Understand probabilistic reasoning in Artificial Intelligence

CO5: Implement natural language processing techniques for text and word relations

CO6: Understand how apply AI fundamentals in Civil Engineering

Course Contents		
Unit I	**Introduction to Artificial Intelligence**	**(5 Hours)**
History of artificial intelligence, The birth of artificial intelligence, AI Winters, Todays' AI, Historical milestones in the development of AI, Great contributors, People who have influenced AI, Differences between strong AI and weak AI, Artificial Intelligence definitions,		

Emergence of AI – Technological advances, AI, Functions of AI, Characteristics of artificial intelligence		
Unit II	**Problem Solving using Search and Problem Decomposition**	**(5 Hours)**
Search Algorithms: Uninformed Search Strategies, Informed Search Strategies, Comparing different search strategies, Heuristic Methods: Understanding Heuristics, Definition and role of heuristics in search, Types of heuristics, Designing Heuristic Functions, Concepts of Problem Decomposition ,Breaking down complex problems into simpler sub-problems, Hierarchical decomposition and its benefits, Techniques for Decomposition ,Applications of Decomposition ,Case studies and practical applications ,Implementation of decomposition strategies in AI, Integrating Search and Decomposition: Combining search algorithms with problem decomposition, Hybrid approaches and their applications, Practical Implementations: Real-world problems and solutions		
Unit III	**Logical Reasoning in AI and Knowledge-based System**	**(5 Hours)**
Introduction to knowledge representation systems, Knowledge representation using logic, Propositional logic, Semantics of propositional logic, Properties of propositional logic statements, Tautologies and logical implication, Resolution, Conjunctive normal form, Resolution is valid, Resolution algorithm, Knowledgebase systems, Structure of a knowledge based system, Recap of artificial intelligence, Components of expert systems, Expert systems development, Wumpus world, Logic, A simple knowledge base, Exploring the Wumpus world, Semantic net, Inference in semantic networks, Semantic networks: Types and components, Types of relationships in semantic network, Frames, Frames: Some examples, Non-monotonic logic, Circumscription, Default logic.		
Unit IV	**Probabilistic Reasoning in Artificial Intelligence**	**(5 Hours)**
Probability, Basic concepts, Probability of an event, Example on Sample Space, counting rules, Event relations, Conditional Probabilities, Defining Independence, The Law of Total Probability, Bayes' Rule, Examples. Random Variables, Discrete Random Variable, Probability Distributions, Probability Mass Function, Probability Density Function, Expectations of Random Variables, Medians of Random Variables, variance of a Random Variable, Quantiles of Random Variables, Jointly Distributed Random Variables, Independence and Covariance.		
Unit V	**Neural networks and Natural Language Processing**	**(5 Hours)**
Introduction, Artificial Neural Network, Appropriate problems for neural network learning, Characteristics of the problems, Basic understanding of neural networks, A single neuron, Activation Functions, Architectures of neural networks, Feedforward neural network, Single-Layer feedforward architecture, Multiple-Layer feedforward architecture, Types of feedforward networks, multi-layer perceptron, Training MLP: The back-propagation algorithm.		
Unit VI	**Application of AI in Civil Engineering**	**(5 Hours)**
Structural Health Monitoring, Construction Management, Geotechnical Engineering: Soil Analysis, Groundwater Management, Traffic Management and Smart Cities: Traffic Flow Optimization, Risk Assessment and Management: Disaster Prediction, Risk Analysis, Construction Robotics and Automation: Robotic Construction, Drones, Energy Efficiency and Sustainability, Urban Planning and Development: Analysing Population Growth, Historical Data Analysis, Water Resources Management: Demand Forecasting		

Learning Resources

Textbooks:

1. Michael Negnevitsky, "*Artificial Intelligence: A Guide to Intelligent Systems*" 3rd Edition
2. David L. Poole and Alan K. Mackworth "*Artificial Intelligence: Foundations of Computational Agents*" by 3rd Edition
3. Christopher M. Bishop "*Pattern Recognition and Machine Learning*" 1st Edition
4. Charu Aggarwal "Neural Networks and Deep Learning: A Textbook", 2nd Edition

Reference Books:

1. Lane, Howard, and Hapke "*Natural Language Processing in Action*"
2. Stuart Russell and Peter Norvig "*Artificial Intelligence: A Modern Approach*"
3. Eugene Charniak and Drew McDermott "*Patterns in Artificial Intelligence: Search and Optimization*"
4. Michael J. Fischer and Dan M. Frangopol "*Artificial Intelligence in Civil Engineering: A Review*"

MOOC / NPTEL Course:

1. NPTEL Course on Artificial Intelligence: Search Methods for Problem Solving, IIT Madras, Prof. Deepak Khemani. Link: https://nptel.ac.in/courses/106106226

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- III

Course Type: VEC	**Course Title:** Behavioral Science and Ethics	
Course Code: 230USYB01_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 2 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 50 Marks

Prerequisite Courses, if any:

1. NIL

Course Objectives:

- To prepare students for their future endeavors by imparting a sense of self, understanding their surroundings and their nation.
- The course also teaches strategies to lead healthy lifestyles with a positive attitude.
- It enables students to learn the process of problem solving and creative thinking.
- In the second part of the course, the students are being prepared for their professional development by inculcating leadership skills and ethical work values.

Course Outcomes: On completion of the course, learner will be able to

CO1: Understanding sense of self, nation, and society they are living in.
CO2: Applying strategies to manage stress and understanding stress and its consequences.
CO3: Analyzing problem and Strategizing way to solve it.
CO4: Evaluating group dynamics and leadership skills.
CO5: Creating healthy and ethical workspace.
CO6: Remembering values, morality, and ethics through thick and thin of life.

Course Contents

Unit I	**Self**	**(5 Hrs)**
What is Behavioural science and its significance, Self-awareness and its importance, Components of self and self-identity, Self-concept, Self confidence, Self-image.		
Unit II	**Stress Management**	**(5 Hrs)**
What is stress? and understanding reasons for stress, What are possible consequences of the stress?, How to accept stress and share your emotions., What are strategies to manage stress?, Why seeking help is important when needed?		
Unit III	**Thinking, Perceiving and Problem Solving**	**(5 Hrs)**
How to approach and analyze a problem?, How to think?, How to strategize and plan actions?, How to implement plans of action?, What is creative thinking and how to process it?		

Unit IV	**Group Dynamics and Leadership Skills**	**(5 Hrs)**
Definition and characteristics of group, What are external and internal conditions affecting group functioning?, What are group conflict and group cohesiveness?, Meaning, nature and functions of leadership, What are characteristics of a good leader?		
Unit V	**Indian Ethics**	**(5 Hrs)**
Sources of Moral Ideals in India, Ethics: Its Meaning in Indian Tradition, Ethics in Vedic Period, Ethics in Dharmasastras and Itihasas, Way of Righteousness in the Gita, Ethical Concepts of Hindu Tradition, Ethics in Buddhism, Jaina Ethics		
Unit VI	**Western Ethics**	**(5 Hrs)**
Aristotle, Thomas Aquinas, William of Ockham, Thomas Hobbes, Jeremy Bentham, Immanuel Kant, John Stuart Mill, Emile Durkheim.		

Learning Resources

Textbook:

1. Bates. A. P and Jullian J “Sociology: Understanding social Behaviour”, Houghton Mifflin, 1975.

Reference Book:

1. J William Pfeiffer (ed) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer and company.
2. William Frankena K, Ethics, Prentice-Hall, Inc., 1973

https://dorshon.com/wp-content/uploads/2018/03/Ethics.pdf

MOOC / NPTEL Course:

1. NPTEL Course: Prof. Naveen Kashyap, IIT Guwahati

https://onlinecourses.nptel.ac.in/noc20_hs28/preview

Other online material

Ethics notes IGNOU - https://egyankosh.ac.in/handle/123456789/4774

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester III

Course Type: SLC	**Lab Course Title:** Seminar	
Course Code: 231GCMM19_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 2	**Lecture (L):** 0 **Tutorial (T):** 0 **Practical (P):** 4 **Experiential Learning (EL):** 0	**Oral (OR):** 50 Marks

Prerequisite Courses, if any: -

Objectives:

- To develop skills in literature survey, technical writing, and oral presentation.
- To enhance communication, organization, and time management skills in a professional setting.
- To encourage critical thinking, knowledge synthesis, and presentation on contemporary issues in Construction Management.
- To build confidence in presenting technical concepts and real-life project experiences to a professional audience.
- To create an opportunity to analyze and reflect on field training or internship outcomes.

Course Outcomes: On completion of the course, learner will be able to

CO1: Conduct a structured literature survey on a relevant topic or project.
CO2: Identify, define, and frame a technical problem or theme for presentation.
CO3: Prepare a comprehensive seminar report following academic standards.
CO4: Deliver an effective oral presentation with confidence and clarity.
CO5: Demonstrate analytical thinking and communication skills.
CO6: Incorporate feedback from faculty and peers to improve their work.

Seminar Guidelines:

- Each student will select a topic related to their internship/field project, or a current trend/challenge/innovation in Construction Management.
- Topics must be approved by the Seminar Coordinator.
- Students are expected to consult journal papers, industry reports, codes, standards, and project documentation.
- A seminar report (hard and soft copy) must be submitted in the prescribed format.

Seminar Report Format (Recommended):

1. Title Page
2. Certificate from Guide
3. Acknowledgement
4. Abstract (max 300 words)
5. Table of Contents
6. Introduction
7. Objectives of the Study
8. Literature Review / Background
9. Problem Statement / Case Study Description
10. Methodology / Techniques Used / Field Observations
11. Analysis, Results, and Discussion
12. Conclusions and Recommendations
13. References (APA / IEEE style)
14. Appendices (if any)

Seminar Evaluation Criteria

1. **Seminar Report**
   - Structure and formatting (Title page, index, references, etc.)
   - Clarity of objectives and problem statement
   - Quality and depth of literature review or background study
   - Methodology or approach followed
   - Analysis, observations, or findings from case studies
   - Conclusions, recommendations, and originality/innovation
2. **Oral Presentation**
   - Communication and presentation skills
   - Depth of subject knowledge
   - Use of visual aids (PowerPoint/other media)
   - Handling of questions and audience interaction
   - Confidence, fluency, and professionalism
   - Effective time management
3. **Overall Contribution and Conduct**
   - Regularity and punctuality in meetings and submissions
   - Active participation and coordination with the guide
   - Maintenance of logbook/diary
   - Feedback from seminar guide or external/internal supervisor

Instructions for Students:

- Submit the proposed seminar topic in Week 1 of the semester.
- Attend all review meetings with your assigned guide.
- Weekly progress must be recorded and presented to the guide.
- Final seminar presentations to be conducted in Weeks 14–16 before a departmental panel.
- No plagiarism; originality will be checked and penalized if found otherwise.

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester III

Course Type: IITP/FP/CEP	**Lab Course Title:** Field Project	
Course Code: 231GCMM20_03	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 4	**Lecture (L):** 0 **Tutorial (T):** 0 **Practical (P):** 4 **Experiential Learning (EL):** 8	**Oral (OR):** 100 Marks

Prerequisite Courses, if any: -

Objectives:

- To identify, investigate and work on real-world industry problems.
- To develop skills in problem formulation, literature survey, methodology design, data collection, and analysis.
- To encourage independent thinking, research aptitude, and professional project documentation.
- To apply academic learning to practical engineering and management challenges.

Course Outcomes: On completion of the course, learner will be able to

CO1: Identify and define a researchable or practical problem in construction management.
CO2: Conduct an in-depth literature survey related to the topic.
CO3: Design a suitable methodology for field/project investigation.
CO4: Initiate data collection, modeling, or analysis.
CO5: Present findings and future scope effectively through a structured report and seminar.
CO6: Demonstrate time management, documentation, and communication skills.

Field Project Scope:

- Selection of problem/topic (based on industrial challenge, societal need, or academic relevance).
- Review of literature, background study, and framing of research/problem statement.
- Defining objectives, scope, and methodology.
- Preliminary data collection or case studies (if applicable).
- Submission of Project Proposal Report and Mid-Term Review Presentation.

Evaluation Criteria (Semester III - 100 Marks):

1. Problem Identification and Relevance
2. Literature Survey and Technical Understanding
3. Project Planning, Scope, and Methodology
4. Preliminary Work / Case Study / Field Work Progress
5. Regularity, Discipline, and Interaction with Guide
6. Mid-Semester and Final Presentation Skills
7. Documentation and Project Report

Instructions for Students (Phase I):

1. Topic Selection
   - Select a relevant, practical, or innovative topic in consultation with your assigned guide.
   - The topic may be industrial, societal, research-based, or field-oriented.
2. Proposal Preparation
   - Submit a project proposal including: problem statement, objectives, scope, review of literature, and proposed methodology.
3. Weekly Progress
   - Maintain regular contact with your internal guide (at least once a week).
   - Submit progress updates in your project logbook.
4. Mid-Semester Review
   - Present your progress in a departmental review to receive constructive feedback.
5. Interim Report Submission
   - Prepare a structured report containing proposal details, literature survey, initial work, methodology, and proposed data sources.
6. Plagiarism
   - Ensure your work is original and properly referenced. Plagiarism will result in rejection of report.
7. Final Presentation
   - Present your Phase I work before an evaluation panel and receive approval to proceed to Phase II.

JSPM University Pune

F.Y. M. Tech "Structural Engineering"

Semester III

Course Type: MLC	**Course Title**: Structural Audit	
Course Code: 230GSEM29_03	**Teaching Scheme:** (Hours. / Week)	**Examination Scheme:**
Credits: 1	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):**	**Theory (TH):** 50 marks

Prerequisite Courses, if any:

1.

Course Objectives:

- To explain the concept, purpose, and legal framework of structural audits for civil infrastructure.
- To familiarize students with Non-Destructive Testing (NDT) techniques, evaluation methods, and their interpretation.
- To develop skills in detailed structural assessment, condition rating, and residual life estimation.
- To understand different components of GIS and Learning about map projection and coordinate system.
- Enhance professional competency in preparing structural audit reports, managing audits, and adhering to ethical practices.

Course Outcomes: On completion of the course, learner will be able to

CO1: Describe the need, objectives, and legal provisions related to structural audits in civil engineering.

CO2: Identify and classify different types of structural distress and their probable causes in RCC, steel, and masonry structures.

CO3: Select appropriate NDT techniques, conduct tests, and interpret results for assessing structural health.

CO4: Perform detailed structural assessments, evaluate condition ratings, and estimate the residual life of structures.

CO5: Propose suitable repair and retrofitting methods based on the nature and extent of distress. **CO6:** Prepare comprehensive structural audit reports, incorporating technical findings, recommendations, and compliance with professional ethics.

Course Contents

Unit I	**Introduction to Structural Audit**	**(5 Hours)**

Concept & Importance of Structural Audit in civil infrastructure, Legal Provisions & Guidelines – National and International codes (IS 13311, IS 456, municipal requirements). Classification of Structures Requiring Audit – Residential, commercial, industrial, heritage. Stages of Structural Audit – Preliminary and detailed audit. Case examples of failures due

to lack of timely audit.		
Unit II	**Distress in Structures: Causes & Identification**	**(5 Hours)**
Types of structural distress – Cracks, corrosion, deflection, spalling, settlement, Causes – Material degradation, environmental effects, design faults, poor workmanship, overloading, Symptoms of Distress in RCC, steel, masonry structures, Visual inspection techniques – Checklist preparation Field photographs & video demonstrations.		
Unit III	**Non-Destructive Testing (NDT) & Evaluation Methods**	**(5 Hours)**
Types of structural distress – Cracks, corrosion, deflection, spalling, settlement, Causes – Material degradation, environmental effects, design faults, poor workmanship, overloading, Symptoms of Distress in RCC, steel, masonry structures, Visual inspection techniques – Checklist preparation, Field photographs & video demonstrations.		
Unit IV	**Detailed Structural Assessment & Condition Rating**	**(5 Hours)**
Preparation of structural drawings & documentation, Load assessment & design verification, Structural health grading & condition rating systems, Evaluation of residual life of structure, Reporting formats for structural audit.		
Unit V	**Repair & Retrofitting Techniques**	**(5 Hours)**
Principles of structural repair, Material selection – High performance concrete, FRP composites, polymer-modified mortars, strengthening methods – Jacketing, steel plate bonding, FRP wrapping, section enlargement, Foundation strengthening techniques, Waterproofing & corrosion protection, Standards & guidelines for repair execution.		
Unit VI	**Case Studies, Report Preparation & Audit Management**	**(5 Hours)**
Presentation of real-life structural audit case studies (RCC buildings, industrial sheds, bridges), Preparation of structural audit report – Executive summary, methodology, findings, recommendations, cost implications, Audit documentation for legal and municipal submission, Ethical considerations & professional responsibilities, Open discussion & Q&A session.		

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Strategic Management	
Course Code: 230GCMM12_04	**Teaching Scheme:** Hrs./ week	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- To understand the fundamentals of strategy, its role, and alignment with organizational goals.
- To analyze the external environment using frameworks like Porter's five forces, PESTLE, and strategic group analysis.
- To explore the internal environment using the resource-based view, VRIO framework, and value chain analysis.
- To develop insights into competitive positioning, corporate strategies, and their financial implications.

Course Outcomes: On completion of the course, learner will be able to

CO1: Define and articulate the concept of strategy and its importance in organizational success.

CO2: Conduct comprehensive external environment analysis to identify industry opportunities and threats.

CO3: Evaluate internal organizational capabilities for sustaining competitive advantage using strategic tools.

CO4: Formulate business and corporate-level strategies tailored to multi-business firm contexts.

CO5: Analyze financial statements and ratios to support strategic managerial decisions.

CO6: Demonstrate an integrated understanding of strategy formulation and implementation across diverse business contexts.

Course Contents

Unit I	**Introduction to Strategic Management and Strategic Leadership**	**(8 Hrs)**

Definition and concept of strategy, history of strategy, Strategic Plan and Tactics, the role of strategy in project and business management, Strategic Planning, Thinking and Business Policy, Importance of Strategic Management, Strategic decisions, Aligning strategy and organization. Developing and Communicating and Strategic Vision.

Leadership, Aligning Vision, Strategy, and Action, Becoming a Strategic Leader, Managing Inter and Intra-organizational Dynamics, Extending Advantage and Leading through Transformation, Managing Strategic Change in a Disruptive VUCA World		
Unit II	**Analyzing the External Environment**	**(8 Hrs)**
Strategic context of the firm, Industry Analysis: Porter's framework, complements, strategic groups and key success factors, PESTLE Analysis, Sustainability as a Strategic Approach, Environment and Strategy.		
Unit III	**Analyzing the Internal Environment**	**(8 Hrs)**
The Resource based view of the firm, Analyzing Organizational Resources and Capabilities, VRIN/ VRIO framework for resource configuration, Sustenance of competitive advantage, Developing Core Competencies.		
Unit IV	**Competitive Positioning**	**(6 Hrs)**
Competitive positioning, Business level strategies: Cost leadership, differentiation, focus and dual advantage, Value chain analysis, Growth Strategies: Ansoff Matrix. Competition as Basis for Strategy Formulation & Red Ocean Strategy, Blue Ocean Strategy.		
Unit V	**Strategic Entrepreneurship and Business Level Strategy**	**(9 Hrs)**
Strategies for the multi-business firm. The need of corporate strategy, corporate level strategies, Strategy portfolio frameworks, Strategy implementation. Designing Business Level Strategies, Strengthening Business Strategies, Strengthening Company's Competitive Position, Mergers and Acquisitions. Strategic Entrepreneurship, Strategy for Value creation. Strategy from Different Perspectives: Fortune at the Bottom of the Pyramid, Capitalism at the Crossroads, Sustainable Value Framework, Development as Freedom		
Unit VI	**Strategy Execution, Evaluation and Impact of Financial Decisions**	**(6 Hrs)**
Corporate Governance, Managing Internal Operations, Strategy Implementation, Strategy Evaluation, The Black Swan, ESG and SDG, Stop Predicting, Financial Statement Analysis, Financial Ratios for Managerial Decisions, Working Capital Management		

Learning Resources

Text Books:

1. Frank T. Rothaermel, "*Strategic Management*", McGraw-Hill Education. 2021. ISBN:9781264103782
2. John E. Gamble, Arthur A. Thompson, "*Essentials of Strategic Management: The Quest for Competitive Advantage*", McGraw-Hill Irwin, 2009. ISBN: 0071285040.
3. N Chandrasekaran, P.S. Anathanarayanan, "*Strategic Management*", OUP India. 2012.

Reference Books:

1. Dixit A. K., Nalebuff B. J., "*The Art Of Strategy*", Viva Books Private Limited. 2010. ISBN – 9788130915449.
2. Arthur A. Thompson, Margaret Ann Peteraf, John E. Gamble. "*Crafting and Executing Strategy. The Quest for Competitive Advantage: Concepts and Cases*", McGraw-Hill. 2013. ISBN: 9780077137236

Website Links:

Strategic Management NPTEL Course:
https://onlinecourses.nptel.ac.in/noc24_mg112/preview

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Project Risk Management	
Course Code: 230GCMM13_04	**Teaching Scheme:** Hrs/ week	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management

Course Objectives:

2. To understand the various issues associated with risk.
3. To learn techniques to identify and quantify risks
4. To learn to risk containment and risk reduction policies.
5. To manage risk effectively for better decision making.

Course Outcomes: On completion of the course, learner will be able to

CO1: Classify and compute risks and risk containment and risk reduction policies.
CO2: Manage risk effectively and thus have better decision making.
CO3: Understand financial savings and better productivity due to effective use of resources and thus have enhanced success rates of ongoing as well new projects.
CO4: Manage risk effectively for better decision making.
CO5: Develop and implement effective risk management and internal control frameworks in construction projects.
CO6: Analyze real-world construction projects to identify risks and recommend actionable mitigation strategies.

Course Contents

Unit I	**Introduction to risk management**	**(8 Hrs)**

Importance of risk, development of risk management system, identifying risk events, cost of risk, types of risk and classification, Benefits of risk management, responsibilities of those involved in risk management, Risk management standards, decision making strategies effects of tax laws. Problems related to natural disasters or unusual events like earthquakes, fires, accidents

Unit II	**Risk Analysis and Management for Projects (RAMP)**	**(8 Hrs)**

Probability distribution, Stages in Investment life-cycle, Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and uncorrelated cash

Unit III	Risk Analysis Techniques	(8 Hrs)
Sensitivity analysis, Uncertainty, cost factors and benefit factors, Scenario analysis, scenario analysis simulation, Decision tree analysis, risk profile method, risk adjusted discount rate method, 3 point estimated method, Use of risk prompts, use of risk assessment tables, utility of grading of construction entities for reliable risk assessment, Entrepreneurial risks, pure risks, Contract review and legal conflicts		
Unit IV	**Risk Mitigation**	**(8 Hrs)**
By elimination, reducing, transferring, avoiding, absorbing or pooling, Residual risk, mitigation of unqualified risk, Coverage of risk through CIDC's and Actuarial Society of India programs: through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI) – Transit Insurance policy (LOPCE) – Loss of performance of construction equipment policy		
Unit V	**Risk Management and Internal Control**	**(8 Hrs)**
Internal audit works, control systems, Auditing risk management –setting up internal audit function.		
Unit VI	**Case Study**	**(8 Hrs)**
Case study of construction projects based on risk analysis and mitigation: Residential building, commercial building, dams, tunnels, roads, airport.		

Learning Resources

Text Books:

1. Kit Sadgrove; "Complete guide to business risk management"; by, Gower Publishing Ltd, Edition- 3.
2. Prasanna Chandra; "Project planning analysis selection implementation and review"; by, Tata McGraw Hill, Edition- 7.
3. Christopher Marrison; "Fundamentals of risk measurements"; by, Tata McGraw Hill, Edition- 2002

Reference Books:

1. Hans Buhlmann; "Mathematical Methods in Risk Theory"; by, Springer Verlang, Edition- 1.
2. Thomas Telford, Faculty of Actuaries (Great Britain); "RAMP - Risk Analysis and Management for Projects: A Strategic Framework for Managing Project Risk and Its Financial Implications"; by, Institute of Actuaries (Great Britain), Edition- 2005
3. Seetharaman; "Construction Engineering and Management"; by, Umesh Publications, Edition- 2017

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Airport Infrastructure Development	
Course Code: 230GCMM22_04	**Teaching Scheme:** Hrs./ week	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- To analyze air transportation fundamentals, airport planning, and ATC systems.
- To evaluate airport master planning, ICAO/FAA guidelines, and urban integration.
- To design runway and taxiway layouts considering geometric and environmental factors.
- To develop airport construction and maintenance strategies with sustainability.
- To assess airside and landside infrastructure, including lighting and utilities.
- To integrate smart technologies like BIM, Digital Twin, and ITS in airport operations.

Course Outcomes: On completion of the course, learner will be able to
CO1: Differentiate airport classifications, aircraft characteristics, and ATC systems.
CO2: Justify airport site selection and master planning as per ICAO/FAA standards.
CO3: Design runway and taxiway as per geometric standards.
CO4: Execute airport construction and maintenance with efficient resource allocation.
CO5: Examine airside and landside infrastructure for safety and operational efficiency.
CO6: Propose smart airport solutions using automation, modeling, and case studies.

Course Contents

Unit I	**Introduction to Air Transportation and Airport Planning**	**(8 Hrs)**

Overview of Air Transportation, Airport Terminology & Key Definitions, Component Parts of an Airplane & Aircraft Characteristics, Classification and Size of Airports, Need for Air Traffic Control (ATC), ATC Network, Enroute Aids, and Landing Aids, Airport Site Selection & Necessary Surveys, Airport Obstructions

Unit II	**Airport Master Planning and Layout**	**(8 Hrs)**

ICAO & FAA Guidelines for Airport Master Planning, Regional Airport Planning Considerations, Estimation of Future Air Traffic Demand, Airport Layout Planning Principles, Planning of Passenger Terminals and Cargo Terminals, Landside and Airside Facility Planning, Integration of Airport Operations with Urban Infrastructure.

Unit III	Runway and Taxiway Design	(9 Hrs)
Runway Orientation – Windrose Diagram, Runway Geometric Design Parameters, Basic Runway Length Calculation and Adjustments for Elevation, Temperature, and Gradient, Taxiway and Apron Planning, Holding Aprons and Exit Taxiways – Design and Standards, Optimal Location of Taxiways, Fillet Design, and Clearance Standards		
Unit IV	**Airport Construction and Maintenance**	**(8 Hrs)**
Pre-Construction Planning and Resource Deployment, Earthmoving, Compaction Equipment, and Site Infrastructure Setup, Flexible and Rigid Pavement Construction for Runways and Taxiways, Execution of Drainage, Ducts, and Approach Lighting Systems, Airfield Pavement Evaluation and Maintenance, Sustainability Considerations in Airport Development		
Unit V	**Airside and Landside Infrastructure**	**(6 Hrs)**
Airport Lighting Systems – Runway and Taxiway Lighting, Navigational and Meteorological Aids, Visual Airport Marking and Runway Marking Standards, Landside Facilities – Terminal Design, Passenger Conveniences, and Utility Planning, Ground Transportation and Parking Facilities, Water Supply, Fuel Storage, and Renewable Energy in Airports, Airport Fire & Rescue Systems		
Unit VI	**Operations, Scheduling, and Smart Airport Technologies**	**(6 Hrs)**
Airport Operations and Airside Management, Runway Capacity, Scheduling, and Delays, Integrated Airport Security Systems, Smart Airports – BIM, Digital Twin, and Automation in Airports, Role of ITS (Intelligent Transport Systems) in Airports, Case Studies of Major International Airports, Future Trends in Airport Infrastructure Development		

Learning Resources

Text Books:

1. Young S., Wells A. T., "*Airport Planning & Management*", McGraw Hill; 7th edition, ISBN-10-1260143325.
2. Horonjeff R., McKelvey F. X., Sproule W. J., Young S. B., "*Planning and Design of Airports",* McGraw-Hill Education, 5th Edition, 2010. ISBN: 9780071446419
3. Ashford N. J., "*Airport Engineering- Planning, Design and Development of 21st Century Airports*", John Wiley & Sons Inc; 4th edition, ISBN 978-0470398555.

Reference Books:

1. Choudhary R.N., Jadhav P. (Editors), “Infrastructure Planning and Management in India: Opportunities and Challenges”, Springer Nature Singapore, 2022, ISBN:9789811688393, 9811688397
2. Dempsey P. “*Airport Planning & Development Handbook: A Global Survey*”, McGraw-Hill Education, 1999, ISBN: 978-0071343169
3. Saxena S. C. “*Airport Engineering: Planning And Design*”, CBS publication, 2020, ISBN: 978-8123915500.

Website Links:

1. Airport Infrastructure: https://www.coursera.org/learn/airport-infrastructure
2. Airport Infrastructure Development Specialization: https://www.coursera.org/specializations/airport-infrastructure-development

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Quality Control and Total Quality Management	
Course Code: 230GCMM14_04	**Teaching Scheme:** Hrs/ Week	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Construction Management
2. Project Management

Course Objectives:

- Understand the principles, philosophies, and need for TQM in construction.
- Analyse internal and external factors influencing TQM implementation.
- Apply tools and techniques for quality management and control.
- Explore quality standards, improvement strategies, and IT-based quality systems

Course Outcomes: On completion of the course, learner will be able to
CO1: Apply TQM philosophies and principles for construction projects.
CO2: Design organizational structures and policies aligned with TQM.
CO3: Implement quality management tools and techniques effectively.
CO4: Develop improvement strategies using Kaizen, Six Sigma, and related methods.
CO5: Evaluate the cost of quality to improve quality management.
CO6: Analyze and apply quality standards in construction processes.

Course Contents

Unit I	**Introduction to TQM**	**(8 Hours)**

What is Quality? - Definition of quality as given by Deming, Juran, Crosby, difference between Quality control, Quality Assurance (QA/QC). Total Quality Management (TQM), Need for TQM in construction industry. Principles of TQM. Indian perspective of quality (value for money). Gurus of TQM- Quality Management Philosophy of Deming, Juran Crosby, etc.

Unit II	**Internal and External Dynamics of TQM**	**(6 Hours)**

Internal Components: Leadership, 7 Habits of Highly Effective People, Quality Statements, Organizational Culture, Role of HR in TQM, Role of TQM leaders. External Components: Customers' Satisfaction, Customer value evaluation, Impact on/ of Suppliers, Investors and Society, Contextual application of TQM

Unit III	Tools and Techniques for Quality Management	(8 Hours)
6 Cs of TQM, Histogram, Pareto diagram, Fish-bone diagram, Quality control chart, Scatter diagram. Statistical Quality Control-Necessity, Benchmarking. Elementary concepts related to 7 Old and 7 New Tools for quality Assurance		
Unit IV	**Continuous Improvement and Performance Measures**	**(8 Hours)**
The Juran Trilogy, Improvement Strategies, Kaizen, Reengineering, Six Sigma. Performance measures, basic concepts, objectives, typical measurements, criteria, strategy. Performance Measure Presentation.		
Unit V	**Cost of Quality and Quality Management**	**(7 Hours)**
The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.		
Unit VI	**Quality Standards and Systems in Construction**	**(8 Hours)**
Quality Standards in Construction: Related to building materials and other inputs for construction processes, methods and techniques such as standards from different countries. Managing Quality in various projects stages from concept to completion. Quality Management System – ISO. 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.		

Learning Resources

Text Books:

1. Besterfield Dale H. *"Total Quality Management"* 2018. Pearson Education.
2. Mandal S. K. *"Total Quality Management – Principles and Practice".* 2004. S. Chand Publications. Edition 1. ISBN 10- 8125916636
3. Rumane, Abdul Razzak. *"Quality management in construction projects"*, ISBN: 9781439838723.
4. Jain P. L. *"Quality Control and TQM "*- Tata McGraw Hill.

Reference Books:

5. Deming E. *"A Clients guide to Quality Assurance in Construction"*. CIRIA, London.
6. Oakland J., Marosszeky M., "*Total Quality in the Construction Supply Chain".* S&t Titles. 1st Edition
7. William Winchell. *"Getting started and achieving results with TQM"*

Website Links:

https://nptel.ac.in/courses/110104080

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Supply Chain Management	
Course Code: 230GCMM15_04	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any:

1. Project Management

Course Objectives:

- To understand the fundamentals of Supply Chain Management (SCM) in construction.
- To explore transportation, sourcing, and third-party logistics in construction.
- To study advanced topics like emerging technologies and sustainable practices in SCM.

Course Outcomes: On completion of the course, learner will be able to,

CO1: Understand core SCM principles in construction.
CO2: Design and optimize construction supply chain networks.i
CO3: Apply demand forecasting and inventory management techniques.
CO4: Evaluate transportation, sourcing, and third-party logistics options.
CO5: Improve supply chain coordination and apply CPFR methods.
CO6: Implement advanced SCM topics like risk management and emerging technologies.

Course Contents

Unit I	**Introduction to Supply Chain Management**	**(7 Hrs)**

Overview and definition of Supply Chain Management (SCM), objectives and importance of SCM in construction, decision phases in SCM: Strategic, tactical, and operational, competitive and supply chain strategies for construction projects, achieving strategic fit between construction business goals and supply chain operations, key supply chain drivers: facilities, inventory, transportation, information, sourcing, pricing, obstacles in SCM and strategies to overcome them.

Unit II	**Designing the Supply Chain Network**	**(7 Hrs)**

Role of distribution networks in construction supply chains, factors influencing the design of supply chains in the construction industry, design options for construction supply chains and distribution networks, the impact of e-business and digital tools on construction SCM, practical examples of network design in the construction sector, modeling and decision-making tools for supply chain network design

Unit III	Planning Demand and Supply	(7 Hrs)
The role of forecasting in construction SCM, approaches to demand forecasting in construction projects, the use of IT in improving demand planning and supply chain coordination, managing and planning inventories in construction supply chains, safety inventory levels and how to determine the right amount, handling supply uncertainty through aggregation and replenishment policies.		
Unit IV	**Transportation Networks and Sourcing**	**(8 Hrs)**
Transportation logistics in construction projects: importance and role, modes of transportation and their performance in construction supply chains, transportation infrastructure and policies impacting construction logistics, design options for transportation networks in construction, sourcing strategies in construction: in-house vs. outsourcing decisions, use of Third-party Logistics (3PLs) and Fourth-party Logistics (4PLs) in construction, supplier assessment and scoring techniques		
Unit V	**Coordination in a Supply Chain**	**(8 Hrs)**
The Bullwhip Effect and its impact on construction supply chains, barriers to coordination and strategies for improving communication, managerial levels in construction supply chain management, building partnerships, trust, and collaboration in construction projects, vendor-managed inventories and continuous replenishment systems in construction, collaborative Planning, Forecasting, and Replenishment (CPFR) for construction projects		
Unit VI	**Trends in Construction Supply Chain Management**	**(8 Hrs)**
Risk management in construction supply chain, sustainable and green supply chain practices in construction, use of emerging technologies (IoT, AI, blockchain) in construction SCM, lean construction and its integration with supply chain management, global supply chains and managing international suppliers in construction projects, case studies and industry best practices for supply chain optimization in construction		

Learning Resources

Text Books:

1. Sunil Chopra, Peter Meindl, "*Supply Chain Management: Strategy, Planning, and Operation*," Pearson Education, 6th Edition.
2. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, "*Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies,*" McGraw-Hill Education, 3rd Edition.
3. Donald Bowersox, David Closs, M. Bixby Cooper, "*Supply Chain Logistics Management*," McGraw-Hill Education, 5th Edition.

Reference Books:

1. Alan Harrison, Remko van Hoek, "*Logistics Management and Strategy: Competing through the Supply Chain,*" Pearson Education, 4th Edition.

2. John Mangan, Chandra Lalwani, Tim Butcher, "*Global Logistics and Supply Chain Management,*" Wiley, 3rd Edition.
3. Steven M. Leon, "*Sustainability in Supply Chain Management Casebook: Applications in SCM,*" Pearson Education, 1st Edition.
4. W. L. Mosey, M.R.K. Trew, "*Lean Construction: A Small-Group Approach,*" CRC Press, 1st Edition.

MOOC / NPTEL Courses:

1. NPTEL Course "*Operations And Supply Chain Management*", Prof. G. Srinivasan, IIT Madras.

Link of the Course:

https://archive.nptel.ac.in/courses/110/106/110106045/#

Additional Web Resources:

https://www.udemy.com/topic/supply-chain/

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester- IV

Course Type: PEC	**Course Title:** Repair, Retrofitting and Rehabilitation Techniques	
Course Code: 230GCMM23_04	**Teaching Scheme:** (Hrs/ week)	**Examination Scheme:**
Credits: 3	**Lecture (L):** 3 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 100 Marks

Prerequisite Courses, if any: Nil

Course Objectives:

- To understand the causes and mechanisms of deterioration in structural systems.
- To evaluate condition assessment and structural health monitoring techniques.
- To examine suitable materials and methods for structural repair.
- To develop strategies for retrofitting and rehabilitation using modern practices and codes.

Course Outcomes: On completion of the course, learner will be able to

CO1: Evaluate suitable repair, retrofitting, or rehabilitation methods for distressed structures.
CO2: Analyze structural data using NDT and SHM tools for condition assessment.
CO3: Select compatible repair materials and techniques based on structure requirements.
CO4: Design retrofitting systems including seismic strengthening using modern techniques.
CO5: Apply pavement maintenance and rehabilitation techniques using evaluation tools.
CO6: Develop cost-effective maintenance strategies using codes and assess new technologies in rehabilitation.

Course Contents

Unit I	**Structural Distress, Repairs, Retrofitting, and Rehabilitation**	**(8 Hrs)**

Definition and introduction to Repairs, Retrofitting, and Rehabilitation – Differences and interrelation among the three approaches with practical examples – Causes of deterioration in concrete and steel structures – Environmental, physical, chemical, and structural factors – Types of defects: Cracks, corrosion, spalling, delamination, settlement, deflection – Mechanisms of deterioration: Carbonation, chloride ingress, sulfate attack, alkali-silica reaction – Identification and classification of structural distress – Scope and need for repair, retrofitting, and rehabilitation in infrastructure systems.

Unit II	**Condition Assessment and Evaluation Techniques**	**(7 Hrs)**

Visual inspection methods – Detailed condition surveys – Destructive and Non-Destructive Testing (NDT): Rebound hammer, UPV, half-cell potential, corrosion mapping, cover meter, core sampling – Structural Health Monitoring (SHM): Basic concepts, wired and wireless instrumentation – Data interpretation and condition rating – Evaluation for rehabilitation planning.		
Unit III	**Repair Materials and Techniques**	**(8 Hrs)**
Selection criteria for repair materials – Types of materials: Cementitious materials, resins, polymers, fiber-reinforced materials, corrosion inhibitors – Repair techniques: Crack repair, injection grouting, re-profiling, surface coatings, cathodic protection – Durability and compatibility issues – Repair of water-retaining structures, facades, and architectural finishes.		
Unit IV	**Retrofitting and Structural Strengthening Techniques**	**(7 Hrs)**
Retrofitting objectives: Load enhancement, serviceability improvement, seismic performance upgrade – Structural strengthening methods: Concrete and steel jacketing, FRP wrapping, bonded overlays – Seismic retrofitting: Strategies and detailing – Use of base isolators and dampers – Retrofitting of heritage and old structures – Case studies related to retrofitting of buildings and infrastructure.		
Unit V	**Pavement Repair and Rehabilitation Techniques**	**(8 Hrs)**
Types of pavement distresses: Cracking, rutting, potholes, raveling – Evaluation methods: Benkelman Beam Deflection, Falling Weight Deflectometer (FWD), Ground Penetrating Radar (GPR), Pavement Condition Index (PCI) – Pavement maintenance types: Preventive, routine, periodic – Pavement repair techniques: Crack sealing, patching, overlays (bituminous and concrete), slab replacement – Pavement rehabilitation techniques: Milling, Cold In-place Recycling (CIR), Full Depth Reclamation (FDR), white-topping – Use of geosynthetics and stabilization in pavement rehabilitation.		
Unit VI	**Codes, Guidelines, Maintenance Strategies and Case Studies**	**(7 Hrs)**
Overview of relevant standards: IS, IRC, ACI, BS codes for repair and rehabilitation – Guidelines from CPWD, MORTH, and other statutory bodies – Life cycle cost analysis of repair and rehabilitation works – Prioritization techniques – Preventive versus curative maintenance strategies – Safety measures and quality assurance practices – Case studies of repair and rehabilitation of buildings, bridges, and pavements – Emerging trends: Smart materials, robotic repairs, and 3D printing applications in infrastructure rehabilitation.		

Learning Resources

Text Books:

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991
2. S. K. Duggal, "*Maintenance of Buildings"*, New Age International Publishers, 2007. ISBN: 8122418662.
3. Piyush Tiwari, H. W. Patil, "*Repair and Rehabilitation of Structures"*, New Age International Publishers, 2010. ISBN: 812243157.
4. B. Vidivelli, "*Rehabilitation of Concrete Structures"*, Standard Publishers Distributors, 2009. ISBN: 8180141207.
5. R. P. Brown, "*Pavement Maintenance and Rehabilitation"*, Thomas Telford Publishing, 1997. ISBN: 072772605.

Reference Books:

1. V. M. Malhotra, N. J. Carino (Eds.), *"Handbook on Nondestructive Testing of Concrete"*, CRC Press, 2004. ISBN: 0849314856.
2. R. Dodge Woodson, "*Concrete Structures: Protection, Repair and Rehabilitation"*, Butterworth-Heinemann, 2009. ISBN: 1856175493.
3. Mohammad Y. Shahin, "*Pavement Management for Airports, Roads, and Parking Lots"*, Springer, 2005. ISBN: 0387232620.

Website Links:

Retrofitting and Rehabilitation of Civil Infrastructure NPTEL Course:
https://onlinecourses.nptel.ac.in/noc22_ce20/preview

JSPM University Pune

S.Y. M. Tech "Construction Management"

Semester IV

Course Type: PROJ	**Lab Course Title:** Project	
Course Code: 230GCMM21_04	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 12	**Lecture (L):** **Tutorial (T):** **Practical (P):** 12 **Experiential Learning (EL):** 24	**Oral (OR):** 300 Marks

Prerequisite Courses, if any: -

Objectives:

- To carry out in-depth field or technical investigation leading to solutions or recommendations.
- To validate methodology and refine approach through real-time analysis.
- To prepare for professional or research roles by developing complete project execution and communication skills.

Course Outcomes: On completion of the course, learner will be able to

CO1: Implement the methodology developed in Phase I.
CO2: Perform advanced analysis, modeling, or empirical study.
CO3: Interpret data and derive meaningful conclusions or insights.
CO4: Recommend practical solutions, strategies, or innovations.
CO5: Demonstrate professional reporting and presentation skills.
CO6: Exhibit teamwork, time management, and ethical standards.

Project Scope:

- Full-scale execution of field study/project/research.
- Data analysis, model testing, simulations (if applicable).
- Derivation of results, conclusions, and recommendations.
- Report writing in dissertation format.
- Final Seminar and Viva Voce.

Evaluation Criteria (Semester IV - 200 Marks):

1. Problem Definition and Continuity from Phase I
2. Execution of Methodology / Field Work / Simulation
3. Quality of Analysis, Interpretation, and Originality
4. Use of Tools, Software, or Data Modelling (if applicable)
5. Professional Project Report / Thesis Formatting
6. Interim Review Presentations
7. Final Seminar and Viva Voce

8. Discipline, Timeliness, Guide Feedback & Logbook

Instructions for Students (Phase II):

1. Work Execution
    - Carry out planned methodology including data collection, field visits, experiments, or case studies.
    - Use relevant tools, software, or modelling techniques as required.
2. Weekly Guidance & Reporting
    - Continue weekly updates to your guide and maintain project logbook.
    - Follow timelines and meet interim milestones.
3. Project Documentation
    - Your final report should include:
        - Cover Page
        - Abstract
        - Introduction
        - Literature Review
        - Methodology
        - Data Collection & Analysis
        - Results, Inferences, and Recommendations
        - Conclusion
        - References and Appendices
        - Plagiarism Check Certificate
4. Interim Review
    - Participate in mid-semester internal review to showcase progress and receive guidance.
5. Final Viva Voce
    - Present your complete project before the evaluation committee.
    - Answer queries based on your project's technical and practical aspects.
6. Professional Conduct
    - Ensure punctuality, discipline, ethical research practices, and regular communication with your guide.

JSPM University Pune Semester- IV		
Course Type: MLC	**Course Title:** Introduction to Indian Constitution	
Course Code: 230UPOB02_04	**Teaching Scheme:** (Hrs./Week)	**Examination Scheme:**
Credits: 1	**Lecture (L):** 1 **Tutorial (T):** 0 **Practical (P):** 0 **Experiential Learning (EL):** 0	**Theory (TH):** 50 Marks
Prerequisite Courses, if any: Nil		

Course Objectives:

- To understand the historical context and constitutional development of India, including the impact of the colonial legacy and the role of the Constituent Assembly.
- To analyse the core principles of the Indian Constitution, including the Preamble, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, and their interrelationships.
- To examine the structure of the Indian government, the process of constitutional amendments, and the role of judicial review in upholding constitutional principles.

Course Outcomes: On completion of the course, learner will be able to

CO1: Remember- Recall the historical background, key events, and figures involved in the constitutional development of India.

CO2: Understand- Explain the significance of the Preamble and the fundamental principles of the Indian Constitution, such as sovereignty, secularism, socialism, and democracy.

CO3: Apply- Demonstrate an understanding of Fundamental Rights and Duties by identifying their applications and limitations in real-world scenarios.

CO4: Analyse- Analyse the relationship between Fundamental Rights and Directive Principles of State Policy, and how they interact to shape governance in India.

CO5: Evaluate- Assess the effectiveness of significant constitutional amendments and the role of judicial review in maintaining the integrity of the Indian Constitution.

CO6: Create- Develop a coherent argument or proposal for a constitutional amendment or policy change, grounded in the principles and structure of the Indian Constitution.

Course Contents		
Unit I	**Historical background**	**(3 Hrs)**
Colonial legacy, Constitutional development, The constituent assembly		
Unit II	**Preamble and fundamental principles**	**(2 Hrs)**

The Preamble, Sovereignty, Secularism, Socialism, and Democracy, Justice, Liberty, Equality, and Fraternity		
Unit III	**Fundamental Rights and Duties**	**(3 Hrs)**
Fundamental rights, Fundamental duties, Restrictions and amendments		
Unit IV	**Directive Principles of State Policy**	**(3 Hrs)**
Definition and purpose, Classification, Relationship with fundamental rights		
Unit V	**Organs of the Government**	**(2 Hrs)**
Union and state governments, The President and Prime minister, Parliamentary system		
Unit VI	**Amendments and Judicial Review**	**(2 Hrs)**
Amendment process, Significant amendments, Judicial review		

Learning Resources

Textbooks:

1. Basu, D. D., *Introduction to Constitution of India*, Prentice Hall of India, 1989
2. M. P. Jain, Indian Constitutional Law, LexisNexis, 2020

Reference Books:

1. Granville Austin The Indian Constitution: Cornerstone of a Nation, Oxford University Press, 1966
2. Mahendra Pal Singh, Shukla's Constitution of India, Eastern Book Company, 2019
3. Rajani Goyal, Modern Constitutions, RBSA Publications, 2023
4. Sukhbir Bhatnagar, Constitutional Law and the Governance, Mittal Publications, 2008

MOOC / NPTEL Courses:

1. Swayam: Constitutional Law **Link of the Course:** Constitutional Law, Aneeda Jan

Additional Web Resources: Constitution of India