LORDSINSTITUTEOFENGINEERINGANDTECHNOLOGY
(An Autonomous Institution)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION

M.E. (Civil Engineering) I– Semester
Specialization in Construction Management

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	P21MB111	MC	Research Methodology & IPR	3	-	-	3	40	60	3	3
2	P21CM101	PCC	Construction Management	3	-	-	4	40	60	3	3
3	P21CM102	PCC	Construction Project Administration	3	-	-	3	40	60	3	3
4	-	PEC	Professional Elective–I	3	-	-	3	40	60	3	3
5	-	PEC	Professional Elective–II	3	-	-	3	40	60	3	3
6	-	AD	Audit Course–I	2	-	-	2	40	60	3	0
Practical/Laboratory Course											
7	P21CM1L1	PCC	Construction Engineering Lab - I	-	-	3	3	50	-	3	1.5
8	P21CM1P1	PCC	Seminar	-	-	3	3	50	-	3	1.5
Total				**17**	**0**	**06**	**24**	**340**	**360**	**24**	**18**

L: Lecture **T**: Tutorial **P:** Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

Note:

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of Civil department.

LORDSINSTITUTEOFENGINEERINGANDTECHNOLOGY
(An Autonomous Institution)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION
(W.e.f Academic Year 2021-22)

M.E. (Civil Engineering)
II– Semester
Specialization in Construction Management

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	P21CM201	PCC	Construction Planning and Scheduling	3	-	-	3	40	60	3	3
2	P21CM202	PCC	Project Finance	3	-	-	3	40	60	3	3
3	-	PEC	Professional Elective–III	3	-	-	3	40	60	3	3
4	-	PEC	Professional Elective-IV	3	-	-	3	40	60	3	3
5	-	AD	Audit Course–II	2	1	-	3	40	60	3	0
Practical/Laboratory Course											
6	P21CM2L1	PCC	Construction Engineering Lab-II	-	-	3	3	50	-	3	1.5
7	P21CM2L2	PCC	Computing Application Lab	-	-	3	3	50	-	3	1.5
8	P21CM2P1	PROJ	Mini Project	-	-	6	3	50	-	3	3
Total				**14**	**01**	**12**	**24**	**350**	**300**	**24**	**18**

L: Lecture **T**: Tutorial **P:** Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

Note:
1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of Civil department.

LORDSINSTITUTEOFENGINEERINGANDTECHNOLOGY
(An Autonomous Institution)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION

(W.e.f Academic Year 2021-22)

M.E. (Civil Engineering)
III–Semester
Specialization in Construction Management

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	-	PEC	Professional Elective-V	3	-	-	3	40	60	3	3
2	-	OEC	Open Elective	3	-	-	3	40	60	3	3
3	P21CM3P1	PROJ	Dissertation–I	-	-	20	20	100	-	3	10
Total				**6**	**-**	**20**	**26**	**180**	**120**	**09**	**16**

L: Lecture **T**: Tutorial **P:** Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

Note:
1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of civil department.

LORDSINSTITUTEOFENGINEERINGANDTECHNOLOGY
(An Autonomous Institution)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION
(W.e.f Academic Year 2021-22)

M.E. (Civil Engineering)
IV–Semester
Specialization in Construction Management

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	P21CM4P1	PROJ	Dissertation–II	-	-	32	32	-	200	3	16
Total				**-**	**-**	**32**	**32**	**-**	**200**		**16**

L: Lecture **T**: Tutorial **P:** Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

Note:
1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a Particular laboratory.
3. **Open Elective Subject is not offered to the students of Civil department.

List of subjects of Professional Electives I to V

S.No.	Course Code	Course Title
1	P21CM103	Economic Decision Analysis in Construction
	P21CM104	Legal Issues in Construction Management
	P21CM105	Statistical Techniques
2	P21CM106	Quantitative methods in Construction Management
	P21CM107	Structural Health Monitoring
	P21CM108	Green Building Technology
3	P21CM203	Neural Fuzzy and Expert Systems
	P21CM204	Value Engineering In Construction
	P21CM205	TQM techniques in Construction
4	P21CM206	Human Resources Development for Construction
	P21CM207	Advanced Concrete Technology
	P21CM208	Construction Safety Management
5	P21CM301	Construction Planning Equipment's and Methods
	P21CM302	Management Information system
	P21CM303	Functional Planning and Building Services

List of Open Electives

S.No.	Course Code	Course Title
1	P21ME309	Industrial Safety
2	P21MB311	Business Analytics
3	P21EC301	Embedded System Design
4	P21CE301**	Cost Management of Engineering Projects
5	P21EE301	Waste to Energy

Note: **Open Elective Subject is not offered to the students of Civil department.

List of subjects of Audit Course-I

S.No.	Course Code	Course Title
1	P21CE101	Disaster Management
2	P21EE101	Sanskrit for Technical Education
3	P21EN102	Value Education
4	P21EN101	English for Research Paper Writing

List of subjects of Audit Course-II

S.No.	Course Code	Course Title
1	P21EN201	Constitution of India and Fundamental Rights
2	P21EN202	Pedagogy Studies
3	P21EN203	Stress Management by Yoga
4	P21EN204	Personality Development through Life Enlightenment Skills

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

rse Code	Course Title						Core/Elective
P21MB111	**Research Methodology and IPR**						**Mandatory Course**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

To make students to

- Motivate to choose research as career
- Formulate the research problem, prepare the research design
- Identify various sources for literature review and data collection report writing
- Equip with good methods to analyze the collected data
- Know about IPR copyrights

Course Outcomes

At the end of this course, students will be able to**:**

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyses problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT - I

Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods Verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT - II

Literature Survey and Report writing: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Need of Review, Guidelines for Review, Record of Research Review.

Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanism of writing a report. **Research Proposal Preparation**: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

UNIT - III

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT - IV

Data Collection and Analysis: Methods of data collection, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Importance of Parametric, non-parametric test, testing of variance of two normal populations, use of Chi-square, ANOVA, F-test, z-test

UNIT - V

Intellectual Property Rights: Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

Suggested Readings:

1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers,
   2004
2. R. Ganesan, Research Methodology for Engineers, MJP Publishers, 2011
3. Y.P. Agarwal, Statistical Methods: Concepts, Application and Computation, Sterling PublicationsPvt. Ltd., New Delhi, 2004
4. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 Gogia Law Agency
5. Ajit Parulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications, MacmillanIndia Ltd, 2006

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM101	**CONSTRUCTION MANAGEMENT**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

- Understand the broad principles and concepts of construction management
- To create awareness of MIS techniques in construction industry
- Represent various works measurement standards

Course Outcomes:

- Ability to take responsibilities as constructionmanager
- Application of MIS technique in the real time constructionoperation
- Knowledge of work measurement application in constructionindustry
- Application of work study measurements
- Knowledge of work measurement application in construction industry

UNIT - I

Introduction to management, science or art? history of construction management, modern management, system approach and emergence of management thought, need, nature and purpose of construction management, major problems in construction industry, firm organization, chain of command, division of work, organization charts, functions and responsibilities of construction manager, case studies, future of construction management.

UNIT – II

Principles of construction management; planning, organizing, staffing, leading, controlling. Decision making in construction industry, nature of managerial decision making, the rational model of decision making, challenges to the rational model, improving the effectiveness of decision-making tools and techniques, benefit-cost analysis, replacement analysis, break even analysis, risk management in construction industry.

UNIT – III

Site mobilization and demobilization aspects, various resource management based on funds availability, organization and monitoring of the construction work with respect to cost-time schedules, coordinating, communicating and reporting techniques, Application of MIS to construction, Training of Construction Managers.

UNIT – IV

Work Study: Definition, Objectives, basic procedure, method study and work measurement, work study applications in Civil Engineering.

Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.

UNIT - V

Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time - lapse photography technique, Analytical production studies.

Suggested reading:

1. Tenah, K.A. (1985). "The Construction Management Process" RestonPublishing Company, Inc. Virginia, USA.
2. Roy Pilcher (1985) “Project Cost Control in Construction,” CollinsProfessional and technical books, London.
3. Raina, C.M. “Construction Management and Practice.” Tata McGraw-Hill, New Delhi, 1980.
4. Construction Planning & management By P S Gahlot & B M Dhir ,New Age International Limited Publishers
5. Construction Project planning & Scheduling By Charles Patrick,Pearson, 2012
6. Construction Project Management Theory & practice --- KumarNeeraj Jha, Pearson,2012
7. Construction management Fundamantals by Knutson, Schexnayder,Fiori, Mayo, Tata McGraw Hill, 2nd Edition, 201

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM102	**CONSTRUCTION PROJECT ADMINISTRATION**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

To know the students about the construction administration and Quality aspects.

- To understand the lines of authority in construction projects
- To have the idea of different risks associated with construction industry and remedial measures
- To properly understand the IS specifications and drawings in construction projects.
- To visualize and understand pre-construction operations and its limitations.

Course outcomes:

1. To be able to gain the knowledge of construction administration issues and quality related problems in construction projects.
2. To be able to have an idea of hierarchy, work responsibility and work progress.
3. To be able to understand risks and uncertainty related issues in constructions.
4. To be able to understand the IS specifications and drawings for the Civil Engineering Construction projects.
5. To be able to understand the pre-construction operations and techniques.

UNIT – I

Introduction to Construction Administration, Control of Quality in Construction, Organizational Structure, Design Build Contracts Responsibility for Coordination of the trades Role of owner, Contractor, Engineer, and Construction Manager.

UNIT - II

Introduction to authority, Lines of Authority in Construction administration on Construction Projects, Responsibility and Familiarization with construction documents, Staffing responsibilities, Limitations of their duties/functions.

UNIT - III

Reasons for the risks, Certainty, Risk, and Uncertainty, Risk Management, Identification and Nature of Construction Risks, Contractual allocation of Risk, Types of Risks, Minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis and their applications.

UNIT - IV

Specifications and drawings - Role of Engineers and Architects, Specifications, Conflicts due to drawings and specifications, unenforceable phrases; content of the specifications, CSI specifications format, allowances and tolerances in specifications, problems. Municipal regulations and construction drawings

UNIT - V

Preconstruction Operations-Need for the preconstruction operations, Equipment's, material and manpower, Constructability Analysis, Issuance of Bidding Documents, Prequalification of Bidders, Bonds, Opening Acceptance and Documentation of Bids, Limitations and advantages of preconstruction operations.

Suggested reading:

1. Fisk, E.R. (2000) "Construction Project Administration," Prentice Hall International, London.
2. Kwakye, A.A. (1997), "Construction Project Administration", AdissonWesley Longman, London.

Professional Elective I

Course Code	Course Title						Core/Elective
P21CM103	**ECONOMIC DECISION ANALYSIS IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To cover the principles engineering economy followed by basic methods for carrying out economic studies considering the time value of money
- To demonstrate various interest formula methods namely present, future, annual worth method, rate of return method and break-even analysis for the comparison of alternatives.
- To understand various methods of depreciation, tax and cost analysis of construction equipment's followed by cost estimating.
- To manage and control the inventory and cost of production.
- To estimate the economic life of an assert with inflation effect.
- To study the growth of MNC's in relation to construction industry.

Course Outcomes

1. Highlight the basic principles of economics and its concepts.
2. To prepare various interest formula for the comparison of alternatives.
3. Use updated techniques, skills and tolls of industrial engineering throughout their professional careers.
4. To acquire fundamental knowledge and understanding of production and industrial engineering.
5. Able to estimate the Economic life of an Asset with Inflation effect

UNIT-I

Introduction to engineering economics, basic economic concepts related to construction industry- marginal cost, marginal revenue, opportunity cost contribution, time perspective, elementary economic analysis-material selection for a product, design selection, building material and process planning.

UNIT-II

Interest formulae's and their applications- time value of money, present worth method, future worth method, annual equivalent method, rate of return method.

UNIT-III

Replacement and maintenance analysis, determination of economic life of an asset, depreciation-straight line method of depreciation, declining balance method of depreciation, sum of the year's digits methods depreciation, sinking funds method of depreciation etc.

UNIT-IV

Production and function, cost of production, inventory cost management, optimum rise of construction, input-output analysis in the construction industry.

UNIT-V

Inflation, procedure to adjust inflation, economic life determination without inflation effect, economic life determination with inflation effect, measurement of inflation, impact of inflation on economic evaluations, growth of multinational construction companies.

Suggested reading:

1. Shutt R.C. (1995), "Economics for the construction industry,"Longman Scientific and Technical, England.
2. Panneerselvam, R. (2001), "Engineering Economics," Prentice Hall ofIndia, India.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM104	**LEGAL ISSUES IN CONSTRUCTION MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To study the various types of construction contracts and their legal aspects and provisions
- To study the tenders, arbitration, legal requirements, labor and human rights regulations

Course Outcomes

1. Student shall able to know basics on construction related contracts.
2. Students shall be able to carry out the tendering process
3. Overview of construction management, administration and present
4. Status of construction industry. Students shall be aware of labor law related legislations
5. Students shall be able to know dispute resolution mechanism

UNIT-1

Introduction to Construction Law: Need for legal issues in Construction in the Indian Judicial System – Context of Construction Industry, Principles of a Contract, Indian Contract Act 1872 – Provisions for Construction Industry, Essentials of a Valid Contract, Types of Contracts, Alternate Contract Methods, Concept of Completion of a Contract, IT Law 2000 and its Influence on construction Contracts

UNIT-2

Construction Tendering Process: Introduction to Construction Process, Need for tendering, process of Tendering in Construction, Importance of Specifications and Estimates in Construction, Concept of completion of the contract, Sub-Contracts and requirements, Tendering Models and Strategies, Prequalification of Bidders, Documents forming a BID and a Contract, Agreements and Bonds in Tendering Process

UNIT-3

Construction Administration: Duties and Responsibilities – Project Manager, Owner, Engineers and Contractors, Important Site Documents, Process of Building Permissions, Provision for Scheduling delays and accelerations, Environmental Provisions for Construction Contracts.

UNIT-4

Disputes and Liabilities in Construction: Major sources of disputes in construction, Delays – Types, Claims and solutions, Labor Laws in India, Worker Compensation and Insurance laws, Construction Liabilities and Litigations, Disputes in Land Development,

UNIT-5

Dispute Resolution in Construction: Dispute Resolution in Construction, Judicial Process in Dispute Resolution, Alternate Dispute resolution methods, Arbitration and Conciliation Act 1996, Importance of Arbitration in Construction, Arbitration Process, Arbitration Clause in Contracts

Suggested Readings:

1. Indian Contract Act 1892
2. Indian Arbitration and Conciliation Act,1996

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM105	**STATISTICAL TECHNIQUES**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To introduce fundamental knowledge of samplingtechnique
- To describe basic statistical techniques such as statistical distributions and correlation methods
- To impart knowledge on exact sampling distributions and the tests of significance

Outcomes:

1. Students who successfully complete this course will be able to:
2. Use sampling techniques for conducting various surveys related to transportation engineering
3. Decide best fit and develop the regression equations for the given variables
4. Applications of sampling distributions in Highway and Traffic Engineering problems.
5. Applications of sampling distributions to construction Engineering problems

•

UNIT-I

Introduction: Frequency distribution; Measures of central tendency; Measures of dispersion; Standard error, Moments (about mean, arbitrary numbers and orgin); Skewness; Kurtosis; Sampling-Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample size determination; Applications in Highway and Traffic Engineering

UNIT-II

Statistical Distribution; Probability, Bayes' Theorem; Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Mean and variance; Chi-square test of goodness-of-fit; Applications in Highway and traffic Engineering. Mathematical expectation.

UNIT-III

Regression and Correlation: Linear regression and correlation; Multiple correlation; Multiple correlation coefficient; Standard error of estimate; Analysis of variance; Curvilinear regression; Applications in Transportation Engineering.

UNIT-IV

Multi Variate Data Distributions; Types of data; Basic vectors and matrices; Simple estimate of centroid, Standard deviation Variance and covariance; Correlation matrices; Principal component analysis;. Time series analysis. Estimation-Point Estimation, Interval Estimation, Box Plot, Maximum likelihood estimation, Biased & Non-Biased Estimation.

UNIT - V

Exact Sampling Distributions and Tests of Significance; Chi-square distribution; students t-distribution; Snedectors F-distribution. Large sample and small sample tests; Tests for single mean. Means of two samples, Proportions, two variances, two observed correlation coefficients, paired T-tests, Applications. Intervals for mean, variance and regression coefficients;

Applications in Highway and Traffic Engineering Problems.

Suggested Reading

1. Basic Statistics - Simpson and Kafks; Oxford and IBH Calcutta,1969.
2 . Fundamentals of Mathematical Statistics - Gupta, S.C. and Kapoor, K.V. Sultanchand
3 . Multivariate Data Analysis – Cootey W.W &Cochens P.R; John Wiley & Sons

Professional Elective II

Course Code	Course Title						Core/Elective
P21CM106	**QUANTITATIVE METHODS IN CONSTRUCTION MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To study the various quantitative methods applied to the elements of management.
- To gain knowledge of formulation of optimization models using various methods.
- To understand transportation model utility in construction industry
- To modify and improve network flow problems to optimize the resources.

Course Outcomes

1. Able to understand transportation model utility and its application in construction industry
2. Understand modification of network flow problems to optimize the usage of resources.
3. Understand the concept of simulation, decision theory, sequencing and queuing theory.
4. Understand modification of network flow problems to optimize the usage of resources.
5. Understand the concept of simulation, decision theory, sequencing and queuing theory

UNIT-I

Introduction, phases of operations research (or), models and scope of or in construction management, concept of probability and statistics - classical methods such as monte-carlo and lagrangian multiplier methods.

UNIT-II

Standard formulation of linear programming, graphical solutions of linear programming, simplex method, linear programming and their computer solutions, characteristics of linear optimization problems.

UNIT-III

Transportation problems: introduction, terminology, minimization and maximization problems – formulation of mathematical models – methods of solution of transportation models using north west corner and least cost method and vogel's approximation method. Assignment problems, formulation and solution of assignment problems.

UNIT-IV

Dynamic programming: introduction, terminology, need for dynamic programming, characteristics of dynamic programming, application of dynamic programming in construction industry - waiting line models.

UNIT-V

Decision theory, game theory, simulation and its applications toconstruction, Modifications

and improvements on CPM/PERT techniques.

Suggested reading:

1. Adrian, J. “Quantitative Methods in Construction Management.” American Elsevier Publishing Co., Inc., Amsterdam, Netherlands, 1973.
2. Moder, J.J., Phillips, C.R., and Davis, E.W., “Project Management with CPM and PERT and precedence diagramming.” C.B.S. Publishers & Distributors, New Delhi, 1986.
3. Stark, R.M., and Mayer, J.H. “Quantitative Construction Management.” John Wiley and Sons, NY, 1983.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM107	**STRUCTURAL HEALTH MONITORING**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Learn the fundamentals of structural healthmonitoring.
- Study the various vibration-based techniques for structural health monitoring.
- Learn the structural health monitoring using fiber-optic and piezoelectric sensors.
- Study the structural health monitoring using electrical resistance and electromagnetic techniques.

Course Outcomes:

1. Understand the fundamentals of maintenanceand repair strategies.
2. Diagnose for serviceability and durability aspects ofconcrete.
3. Know the materials and techniques used for repair of structures.
4. Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
5. Use an appropriate health monitoring technique and demolition technique.

UNIT-I

Introduction to SHM: An Overview of Structural Health Monitoring and Smart Materials

UNIT-II

Vibration Control for SHM: Vibration Control using SHM – Introduction to FE formulation, Constitutive Relationship, Element Stiffness Matrix for

High Precision Finite Element, Element Mass Matrix for High Precision Finite Element, Developing Actuator and Sensor Influence Matrix, Estimating Sensor Voltage, Active Control of Damping, A Case study of Performance Estimation for Different Patches, SHM of Ribbon Reinforced Composite Laminate

UNIT-III

SHM using Piezo and Magnteostrictive Layers: Delamination Sensing using Piezo Sensory Layer, Voltage Response from Piezopatch, Electrical Impedance Method basic theory, A Case Study: Results and Discussions, SHM using Magnetostrictive Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer, Constitutive relationship with composite relationship, MS Layer insymmetric Laminate, MS Layer Away from the Midplane in Asymmetric Laminate, Case Studies related to MS Layer based SHM

UNIT-IV

SHM using LDV: Experimental Modal Analysis using LDV – Introduction, What is LDV?, Velocity and Displacement Measurement using LDV, Case Study for Symmetric Laminate, Case Study for Cross-ply

Suggested Reading:

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, John Wiley and Sons, 2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
3. J.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006.
4. Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.
5. Smart Materials and Structures, Gandhi and Thompson
6. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM108	**GREEN BUILDING TECHNOLOGY**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Exposure to the green building technologies and their significance.
- Understand the judicial use of energy and its management.
- Educate about the Sun-earth relationship and its effect on climate.
- Enhance awareness of end-use energy requirements in the society.
- Develop suitable technologies for energy management.

Course Outcomes:

1. Understand the fundamentals of energy use and energy processes in building.
2. Identify the energy requirement and its management.
3. Know the Sun-earth relationship vis-a-vis its effect onclimate.
4. Be acquainted with the end-use energy requirements.
5. Be familiar with the audit procedures of energy.

UNIT I

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT II

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT III

Climate, solar radiation and their influences - Sun-earth relationship and theenergy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT IV

End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT V

Energy management options - Energy audit and energy targeting - Technological options for energy management

Suggested Reading:

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press,U.K.
2. Carter, W. Nick, 1991: Disaster Management, Asian DevelopmentBank, Manila.
3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences andReflections, Prentice Hall of India, New Delhi

Audit Course-I

Course Code	Course Title						Core/Elective
P21CE101	**DISASTER MANAGEMENT**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
- To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
- To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.

Course Outcomes

At the end of this course, students will be able to**:**

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and Practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in
5. Advanced understanding of flood plain adjustment issues and the other technologies employed for flood management.

UNIT-I

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT-II

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.

Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III

Disasters Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-IV

Disaster Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-V

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading:

1. Barry A. Richardson, "Defects and Deterioration in Buildings", E &FNSpon Press, London, 1991.
2. J. H. Bungey, "Testing of Concrete in Structures", Chapman andHall,New York, 1989.
3. A.R. Santakumar, "Concrete Technology", Oxford University Press,NewDelhi, 2006.
4. Pankaj Agarwal and Manish Shrihkande (2006). "EarthquakeResistance Design of Structures." Prentice Hall of India
5. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring,Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EE101	**Sanskrit for Technical Knowledge**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- To make the novice Learn the Sanskrit to develop the logic in mathematics, science & other subjects
- To explore the huge knowledge from ancient Indian literature

Course Outcomes

At the end of this course, students will be able to**:**

1. Develop passion towards Sanskrit language
2. Decipher the latent engineering principles from Sanskrit literature
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress
5. Understand the role of Sanskrit in Engineering

UNIT-I

Introduction to Sanskrit Language: Sanskrit Alphabets-vowels-consonants- significance of Amarakosa- parts of Speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive Voice-Past/Present/Future Tense-Syntax-Simple Sentences (elementary treatment only)

UNIT-II

Role of Sanskrit in Basic Sciences: Brahmagupthas lemmas (second degree indeterminate equations), sum of squares of n-terms of AP- sulba, sutram or baudhayana theorem (origination of Pythagoras theorem)-valueof pie-Madhava's sine and cosine theory (origination of Taylor's series).

The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of Michaelson and Morley theory).

UNIT-III

Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering):

Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower- Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingala chandasutram (origination of digital logic system)

UNIT-IV

Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology):

Computer languages and the Sanskrit languages-computer command words and the vedic command

words- analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequenceand logical sequence, programming.

UNIT-V

Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants- plants, the living-plants have senses-classification of living creatures, Chemical laboratory location and layout- equipment-distillation vessel-kosthi yanthram

Suggested Readings:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. M.R. Kale, A Higher Sanskrit Grammar: For the Use of School and College Students, MotilalBanarsidass Publishers, 2015.
3. Kapail Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN- 10: 8171880649, 1994.
4. Pride of India, Samskrita Bharati Publisher, ISBN: 81-87276 27-4, 2007.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN102	**VALUE EDUCATION**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- Understand the need and importance of Values for self-development and for National development.
- Imbibe good human values and Morals
- Cultivate individual and National character.

Course Outcomes

After completion of the course, students will be able to:

1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day-to-day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all- round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT-I

Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT-II

Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III

Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV

Values in Holy Books: Self-management and good health; internal & external cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V

Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish;

Satwic, Rajasic and Tamasic gunas.

Suggested Readings:

1. Chakroborty, S.K., Values & Ethics for organizations Theory and practice, Oxford University Press,New Delhi, 1998.
2. Jaya Dayal Goyandaka, Srimad Bhagavad Gita with Sanskrit Text, Word Meaning and Prose Meaning, Gita Press, Gorakhpur, 2017.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN101	**ENGLISH FOR RESEARCH PAPER WRITING**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course objectives:

- To understand the nuances of language and vocabulary in writing a Research Paper.
- To develop the content, structure and format of writing a research paper.
- To enable the students to produce original research papers without plagiarism.

Course Outcomes:

1. Understand that howto improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.
4. Avoid plagiarism and be able to develop their writing skills in presenting the research work.
5. Create a research paper and acquire the knowledge of how and where to publish their original research papers

Unit I

Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit V:

skills are needed when writing the Methods, skills needed when writingthe Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions -Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

References:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Day R (2006) How to Write and Publish a Scientific Paper,Cambridge University Press
2. Highman N (1998), Handbook of Writing for the MathematicalSciences, SIAM. Highman'sbook.
3. Adrian Wallwork, English for Writing Research Papers, SpringerNew York Dordrecht Heidelberg London, 2011

PRACTICAL/LABORATORY COURSE

Course Code	Course Title						Core/Elective
P21CM1L1	**Construction Engineering Laboratory-I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**1.5**

Course Objectives:

- To evaluate the properties of constituents of concrete.
- To evaluate the properties of various building materials.
- To evaluate the properties of concrete with variable workability and variable parameters.

Course Outcomes:

1. Learn the properties of constituents ofconcrete.
2. Assess the properties of various building materials.
3. Correlate the properties of concrete with variable workability.
4. Correlate the properties of concrete with variable parameters.
5. Influence of various parameters on strength characteristics of concrete.

1. Evaluation of properties of cement, fine aggregates and coarse aggregates.
2. Evaluation of properties of reinforcing steel, timber, building block and tile.

3. Variation of workability with time for different grades of concrete – experimental observations.

4. Experimental observation on influence of following parameters on strength characteristics of concrete (Some of these parameters may be considered depending up on time)

   i. Size, Shape and grade of coarseaggregate
   ii. Grading of fine aggregate
   iii. Hand Mixing / Machine Mixing
   iv. Aggregate – Cement Ratio
   v. Coarse Aggregate – Fine Aggregate Ratio
   vi. Size and Shape of Test Specimen
   vii. Admixtures

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM1P1	**SEMINAR**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**50**		**1.5**

Course Objectives:

- To work on a specific technical topic in Construction Engineering and Management in order to acquire the skills of oral presentation.
- To acquire technical writing abilities for seminars and conferences.

Course Outcomes:

- Identify appropriate topic of relevance.
- Update literature on technical articles of selected topic and develop comprehension.
- Prepare a technical report.
- Deliver presentation on specified technicaltopic

Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured, and the power point presentation shall include followingaspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
2. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by theDepartment.

Guidelines for awarding marks		
S. No.	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Note:

1. The seminar presentation should be a gist of at least five research papers from **Peer-reviewed** or **UGC recognized** journals.
2. **The seminar report should be in the following order:** Background of work, literature review, techniques used, prospective deliverables, discussion on results, conclusions, critical appraisal and reference.
3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.
4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

Course Code	Course Title						Core/Elective
P21CM201	**CONSTRUCTION PLANNING AND SCHEDULING**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Understand the concept of planning and scheduling techniques in the Construction Industry
- Discuss the various methods of time estimates and network techniques in the construction projects
- Evaluate the construction cost, duration and computer applications on network problems related toconstruction industry

Course Outcomes

After completing this course, the student will be able to:

1. Able to gain the knowledge of project planning, scheduling and design related problems inconstruction projects.
2. Ability to develop the planning and scheduling and control of the projects in the construction industry.
3. Able to evaluate the construction cost, duration and quality of the construction projects.
4. Apply the computer applications on network related problems to construction industry
5. Ability to develop the working knowledge on various network techniques and software's useful in the construction industry.

UNIT-I

Historical background and introduction to project planning, bar charts, limitations of bar charts, milestone charts, and work breakdown structure, events and activities numbering of networks, PERT and CPM.

UNIT-II

Time estimates, float, slack, probability of completion time, application of PERT/CPM to construction industry problems.

UNIT-III

Cost analysis - direct cost, indirect costs, and slope of the project activities, optimization of cost and schedule through network contraction – applications in construction industry.

UNIT-IV

Cost control in construction projects, importance of cost control and its objectives, resource analysis - smoothing and leveling of various construction projects.

UNIT-V

Precedence network, advantages of precedence network, logic of precedence network diagram, and computer applications on network problems related to construction industry.

Suggested reading:

1. Moder, J.J., Phillips, C.R., and Davis, E.W., "Project Management with CPM and PERT and precedence diagramming." C.B.S. Publishers & Distributors, New Delhi, 1986.
2. Pilcher, R. "Project Cost Control in Construction." Collins, London, 1992
3. Brien. J.J. "CPM in Construction Management." McGraw Hill Book Company Inc., NY,1971.

Course Code	Course Title						Core/Elective
P21CM202	**PROJECT FINANCE**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To train the students with the latest and the best in the rapidly changing field ofconstruction engineering, technology and management.
- To prepare the students to be industry leaders how implement the best engineering andmanagement practices and technologies in the construction industry.
- To manage the working capital required on construction projects.
- To employ capital budgeting methods to arrive at the best investment options.
- To apply various types of budgets required for civil works.

Course Outcomes

After completing this course, the student will be able to:

1. Estimate the working capital required on a construction project.
2. Perform capital budgeting techniques for investment analysis.
3. Prepare various types of budgets required in civil works.
4. Apply knowledge and skills of modern construction practices and techniques.
5. Ability to estimate the Working Capital requirements on a Construction Projects

UNIT-I

Introduction to investments-types of investments problems, stages in an economic appraisal, risk and uncertainty in investments decisions, cost of capital, time values of money, cash flows, equivalence for comparison and selection, effect of rate of return, and capital ratio.

UNIT-II

Investment analysis- capital budgeting- methods of evaluation of capital budgeting- payback period methods, rate of return method, Net present value method, interval rate of return method, profitability index method.

UNIT-III

Cost concepts, break even analysis, Budgeting and budgeting control system, classification and types of budgets, fixed and flexible budgets, sales budget, production budget, cost of production budget, materials budget, direct labor budget, overhead cost budget, selling and distribution overhead budget.

UNIT-IV

Standard costing and variance analysis in relation to construct, direct material variance, direct labor variance, overhead variances, job, batch and contract costing- procedures, determination of economic batch, Network analysis as a basis for cost control.

UNIT-V

Working capital, working capital at project level management of cash, Receivable management, Inventory management, price level accounting (Inflation Accounting), project management network techniques- program evaluation review techniques and critical path method.

Suggested reading:

1. Roy Pilcher (1985) "Project Cost Control in Construction," CollinsProfessional and technical books, London.
2. Humphreys, K.K., and Wellman, P. (1996) "Basic Cost Engineering,"Marcel Dekker, Inc. New York.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Professional Elective - III

Course Code	Course Title						Core/Elective
P21CM203	**NEURAL FUZZY AND EXPERT SYSTEM**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.
- Solve problems that are appropriately solved by neural networks, fuzzy logic, and geneticalgorithms.
- Understand the structure of expert systems.
- Get exposure to software packages in practice.

Course Outcomes

After completing this course, the student will be able to:

1. Learn the mathematical theory behind the intelligent problem-solving approaches and applythem to write the code to solve a particular design problem.
2. Carry out three design projects in the course in neural networks, fuzzy logic, and geneticalgorithms.
3. Covers intelligent approaches to solving engineering problems that are appropriate forpattern matching, control, optimization, and other areas.
4. Solve the problems pertaining to artificial neural networks, fuzzi logic and expert systemsusing standard software packages.
5. Exposure to Matlab and tools pertaining to artificial neural networks, fuzzy logic using standard methods.

UNIT-I

Introduction: Brief introduction to the study of artificial intelligence. An Insight to the concept of natural intelligence followed by the development of artificial neural networks, fuzzy logic systems and expert systems tool

Demonstration of the importance of artificial neural networks, fuzzy logic and expert systems with the help of at least two practical examples civil engineering for each study. Importance of nuero-fuzzy systems

UNIT-II

Neural Networks: Components of artificial neural networks - neurons, inputs, outputs, error, error propagation, hidden layers, threshold logic, weights, bias, noise, momentum, rate of learning, training and testing - Hebb's rule, Delta rule - Supervised learning - Generalized Delta rule - unsupervised learning.

Types of Neural Networks - Perceptions - feed forward back propagation networks - Hop field networks

UNIT-III

Fuzzy sets: Crispness, vagueness, uncertainty, and fuzzy sets. Basic. Definitions and

operations of Fuzzy sets, approximate reasoning, and membership function. Fuzzy Relations: Fuzzy relation and fuzzy composition, fuzzy aggregation procedures, Dominance Matrix, Weightages, applications of Fuzzy sets to civil engineering problems, and pattern recognition.

UNIT-IV

Expert systems: Structure of expert systems, Knowledge acquisition, Knowledge organization, methods of representing. Knowledge, types of inference engines, reasoning under uncertainty, various types of expert system tools, heuristics, search mechanism, expert system development and hybrid expert systems.

UNIT-V

Exposure to Software Packages: Neural networks (Mat lab tool kit) — fuzzy logic — expert systems (L5 object). Applications of Artificial Neural Networks, Fuzzy logic and expert systems in civil engineering — Case studies with at least one problem on each aspect of ANN, FL and Expert systems.

Suggested Readings:

1. Fuzzy Sets, Decision Making, and Expert Systems, Zimmerman, H. J.,Kluwer Academic Publications, Boston, 1987.
2. "Artificial Intelligence and Expert System", Elaine Rich, Juda Pearl,Heuristics.
3. "Expert Systems in Construction and Structural Engineering" AdeliH., Chapman, 1988.
4. "Neural Networks Algorithms, Applications and Programming"Freeman, J.A., and Skapura, D.M. Addition-Wesley, Reading

Course Code	Course Title						Core/Elective
P21CM204	**VALUE ENGINEERING IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Define Value engineering and its objectives
- Estimation of project budget using capitalized income approach
- Analyse a building using LCC methodology

.

Course Outcomes

After completing this course, the student will be able to:

1. Establish value engineering techniques and methodology
2. Draw value engineering job plan and work plan phases
3. Concept of Delphi techniques and rules for brainstorming
4. Comprehensive understanding about the various phases of Job and work plans
5. Knack for the application of FAST and Delphi techniques for various project

UNIT - I

Introduction to value engineering (VE), definition, objectives of value engineering, reasons for unnecessary costs, VE techniques and methodology, interface with the other programs.

UNIT - II

Elements of the project budget need for cost control, meaning of capitalization, capitalization process, and capitalized income approach to construction project budgeting.

UNIT - III

Life cycle cost (LCC) and building costs, LCC technology and examples, LCC methodology, LCC formats and analysis and weighted evaluation – application of LCC to buildings.

UNIT - IV

Value engineering and total project management, level of effort, team selection, value engineering job plan, and work plan phases.

UNIT - V

Classifying function, defining function, project level function system technique (fast) diagram, creativity and fixation, interpersonal skills, generation of ideas, brainstorming, rules for brainstorming, Delphi technique, application of Delphi technique to civil engineering projects.

Suggested Reading:

1. Tenah, K.A. (1985). "The Construction Management Process", RestonPublishing Company, Inc. Virginia
2. Dell'Isola, Alphonse (1997). "Value Engineering: PracticalApplications." R.S. Means Company, Inc: Kingston, MA.
3. Oberiender, G. D. (1993). "Project Management for Engineering andConstruction".

Course Code	Course Title						Core/Elective
P21CM205	**TQM TECHNIQUES IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To familiarize with quality management in construction industry.
- To familiarize with clauses for quality management in construction industry.
- To understand the leadership and teamwork for total quality management in construction organization.
- To understand the production and management and its application to construction industry.
- To study the senior management and total quality management in construction industry.

Course Outcomes

After completing this course, the student will be able to:

1. Able to know new approaches on quality and its implementation in constructionIndustry
2. To assess quality assurance resorting to International codal practices
3. To understand the roles and responsibility of leader adhering TQM
4. To analyze organizational hierarchical for lean production and management
5. To study research objectives in view of TQM towards innovation in constructionindustry

UNIT-1

Quality management in construction industry, new approach to quality management, and road to quality management.

UNIT-II

Formal QA, quality assurance, ISO 9000, clauses of ISO 9000, third party assessment for construction works.

UNIT-III

Leadership and total quality management, tools for total quality management, teamwork for total quality management, stages in team development, and role within a team.

UNIT-IV

Learning organization, lean production and management applied to construction industry.

UNIT-V

Quality management in the construction industry, research objectives, senior management and total quality management, cultural change in construction.

Suggested reading:

1. Steven McCabe. (1998). "Quality Improvement Techniques in Construction."LONGMAN.
2. Kwakye, A.A. (1997), "Construction Project Administration", AdissonWesley Longman, London.

Professional Elective IV

Course Code	Course Title						Core/Elective
P21CM206	**HUMAN RESOURSES DEVELOPMENT FOR CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To study the management and control of human resources in constructionindustry.
- To understand the concepts of organization and management theory.

Course Outcomes

After completing this course, the student will be able to:

1. Able to understand the job analysis, selection, recruitment in construction industry
2. Ability to understand and apply the management theories and human behavior theories.
3. Able to understand the human resource approaches and apply in the construction management.
4. Able to understand the changing role of trade unions and collective bargaining.
5. Ability to solve employee problems and promote industrial counseling

UNIT-I

The Human resource Management an Introduction: - Human resource, Nature and scope of HRM, The human resource in the environment, Human resource activities, Diversity of work and Strategies- Human resource hiring: -Job analysis, selection, recruitment, orientation, placement, socialization-

Maintenance and development of the Human Resource: Work motivation and performance, Employee welfare, Compensation, Welfare schemes, Career enlargement and enrichment, Leadership and Effective communication.

UNIT-II

Organization and management theory: Challenges of managing people in construction, Contemporary management Theory, Production efficiency: the Classical Approach, Human Behavior theory, Manager's attitude towards people in construction, Expectations of the employment relationship.

UNIT-III

Strategic HRM approaches and operational HRM approaches: Models of HRM, Employee resourcing, Recruitment & Selection, Case Study Discussion, Training & Development, Appraisal Systems, Reward management, Case Study Discussion, Mentoring, Career in Construction Management.

UNIT-IV

Employee relations and empowerment: Employee's relations, The changing role of trade unions, The effect of unions, Collective bargaining, Case Study Discussion, The evolution of empowerment within HRM.

UNIT-V

Work for Analysis: -Trade Unions and Management relationships, Ethical Issues, Employee problems, Industrial Counseling. Employee empowerment- salient features- diversity and work life balance. Employee welfare -strategic Human resource development - employment legislation -legal aspects.

Suggested reading:

1. Langfor D.A. Human Resource management in construction, Longman,1995.
2. Martin Loosemore, Andrew Dainty, Helen Lingard, Human Resource Management in construction projects: strategic and operational approaches, Taylor and Francis, 2010.

Course Code	Course Title						Core/Elective
P21CM207	**ADVANCED CONCRETE TECHNOLOGY**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Learn the characterization of constituents of concrete.
- Design concrete mix by various methods as per different codes.
- Study the different types of admixtures; mix design, properties and applications ofspecial concretes.

Course Outcomes

After completing this course, the student will be able to:

1. Learn hydration of cement and tests on properties of cement and aggregates.
2. Comprehend the properties and testing of concrete in fresh and hardened state.
3. Understand the shrinkage and creep mechanisms, curing and durability of concrete.
4. Design concrete mixes by various methods.
5. Familiarize with the types of admixtures, and applications of special concretes.

UNIT - I

Constituents of Concrete:

a) **Cement:** Types of cement and their composition, manufacture of Portland cement, hydration of cement and hydration product, structure of hydrated cement, heat of hydration, gel theories, review of tests on properties of cement.

b) **Aggregate:** Classification of aggregates, particle shape and texture, bond and strength of aggregate and its influence on strength of concrete, porosity, absorption and moisture content and their influence, soundness of aggregate, alkali aggregate reaction, sieve analysis and grading of aggregate, review of tests on properties of aggregate.

UNIT - II

Properties of Concrete: Mixing and batching, workability, factors affecting workability, measurements of workability, various tests and procedures, segregation and bleeding, vibration of concrete, types of vibrators and their influence on composition, analysis of fresh concrete, strength of concrete, water-cement ratio, gel space ratio, effective water in the mix, mechanical properties of concrete, tests and procedure, influence of various parameters on strength of concrete, relationship between various mechanical strengths of concrete.

UNIT - III

Shrinkage and Creep of Concrete: Types of shrinkage, mechanism of shrinkage, factors affecting shrinkage, creep mechanism, factors influencing creep, rheological model, effects of creep.

Curing of Concrete: Methods of curing, maturity concept, and influence of temperature on strength of concrete.

Durability of Concrete: Permeability of concrete, chemical attack of concrete, tests on sulphate resistance, effect of frost, concreting in cold weather, hot weather concreting, and air entrained concrete.

UNIT - IV

Mix Design of Concrete: Basic considerations, process of mix design, factors in the choice of mix proportions and their influence, quality control, various methods of mix design, I.S. Code method, British and ACI methods.

UNIT - V

Admixtures: Classification of admixtures, chemical and mineral admixtures, influence of various admixtures on properties of concrete, their applications.

Fly Ash Concrete: Mix design, properties and its applications.

High Strength Concrete: Mix design, properties and its applications. Fiber Reinforced Concrete: Mix design, properties and its applications.

Ferro cement, lightweight concrete, high-density concrete, recycled aggregate concrete and their applications.

Suggested Reading:

1. Neville. A.M, (1988), Properties of Concrete, English Language BookSociety/Longman Publications.
2. Mehta. P.K and Paulo. J.M.M, (1997), Concrete – Microstructure –Properties and Material, McGraw-Hill.
3. Krishna Raju. N., (1985), Design of Concrete Mix, CBS Publications.

Course Code	Course Title						Core/Elective
P21CM208	**CONSTRUCTION SAFETY MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To study and understand the various safety concepts and requirements applied toconstruction industry.
- To study the various construction safety problems and safety programs.
- To study the various laws related to safety in construction industry
- To study the importance of workers compensation insurance.

Course Outcomes

After completing this course, the student will be able to:

1. Ability to identify safety risks on jobsites.
2. Able to create and manage an effective safety program in Construction Company.
3. Will be aware of various laws related to construction safety
4. Understand experience modification rates (EMR) and worker's compensationinsurance premiums.
5. Understand experience modification rates (EMR) and perform safety analysis in the construction industry

UNIT-1

Safety management function, Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Safety administration.

UNIT-II

Construction safety problems, Hazards in construction projects, Accident: definition, causes, cost, measurement, investigation and prevention of accidents, Legal and financial aspects of accident, Safety Program: Need, Elements of an Effective and safety program, general safety program in construction industry.

Hazard Identifications and Control Techniques – HAZOP, FMEA, FMECA.

UNIT-III

Safety in use of construction equipment - vehicles, cranes, hoists and lifts etc., Safety of scaffolding, ladders, working platforms etc, safety while using electrical appliances, explosives, blasting etc, Fire safety

Causes and safety of accidents on various construction sites, safety measures for storage and handling of building materials. Safety equipment and gear used on construction site, First aid on site.

UNIT-IV

Laws related to construction industry, Laws related to the Industrial Safety, Safety Provisions in theFactory Act, Labour laws.

Measurement of Safety Performance, Safety Audit. Experience modification rating, workers insurance,

UNIT-V

Case based reasoning, case indexing, retrieval, accident prevention and forecasting using CBR method
Systems safety analysis, faulty tree analysis, failure modes and effects analysis in constructionindustry.

Suggested reading:

1. John V. Grimaldi. (1996). "Safety Management." AITBS Publishers &Distributors, New Delhi, India.
2. Kwakye, A.A. (1997), "Construction Project Administration", Adisson WesleyLongman, London.
3. Jimmy W.Hinze, "Construction Safety ", Prentice Hall Inc., 1997.
4. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and HealthManagement ", Prentice Hall Inc., 2001. Interna

Audit Course-II

Course Code	Course Title						Core/Elective
P21CM208	**CONSTITUTION OF INDIA AND FUNDAMENTAL RIGHTS**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- The history of Indian Constitution and its role in the Indian democracy
- Address the growth of Indian opinion regarding modern Indian intellectuals'constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies
3. Have an insight into various Organs of Governance - composition and functions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies
5. Understand Electoral Process, special provisions

UNIT-I

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions.

UNIT-IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayat raj:

Introduction, PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Code	Course Title						Core/Elective
P21EN202	**PEDAGOGY STUDIES**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To present the basic concepts of design and policies of pedagogy studies.
- To provide understanding of the abilities and dispositions with regard to teaching techniques,curriculum design and assessment practices.
- To familiarize various theories of learning and their connection to teaching practice.
- To create awareness about the practices followed by DFID, other agencies and other researchers.
- To provide understanding of critical evidence gaps that guides the professional development

Course Outcomes

After completing this course, the student will be able to:

1. Illustrate the pedagogical practices followed by teachers in developing countries both in formal andinformal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives ofresearch.
4. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions, Overview of methodology and Searching.

UNIT-II

Thematic Overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education

UNIT-III

Evidence on the Effectiveness of Pedagogical Practices: Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and Practicum) and the school curriculum and guidance material best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches – Teachers attitudes and beliefs and pedagogic strategies.

UNIT-IV

Professional Development: alignment with classroom practices and follows up support - Support from the head teacher and the community – Curriculum and assessment - Barriers to learning: Limited resources and large class sizes.

UNIT-V

Research Gaps and Future Directions: Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment – Dissemination and research impact.

Suggested Readings:

1. Ackers J, Hardman F, Classroom Interaction in Kenyan Primary Schools, Compare, 31 (2): 245 – 261, 2001.
2. Agarwal M, Curricular Reform in Schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.
3. Akyeampong K, Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER), Country Report 1. London: DFID, 2003.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J, Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count? International Journal Educational Development, 33 (3): 272- 282, 2013.

Alexander R J, Culture and Pedagogy: International Comparisons in Primary Education, Oxford and Boston: Blackwell, 2001.

Course Code	Course Title						Core/Elective
P21EN203	**STRESS MANAGEMENT BY YOGA**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Creating awareness about different types of stress and the role of yoga in the management of stress.
- Promotion of positive health and overall wellbeing (Physical, mental, emotional, social andspiritual).
- Prevention of stress related health problems by yoga practice.

Course Outcomes

After successful completion of the course, the students will be able to:

1. Understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas.Improve work performance and efficiency.
5. Improve work performance and efficiency.

UNIT - I

Meaning and Definition of Yoga - Historical perspective of Yoga - Principles of Astanga Yoga by Patanjali.

UNIT - II

Meaning and Definition of Stress - Types of stress - Eustress and Distress. Anticipatory Anxiety and Intense Anxiety and depression. Meaning of Management- Stress Management.

UNIT - III

Concept of Stress According to Yoga - Stress assessment methods - Role of Asana, Pranayama and Meditation in the management of stress

UNIT - IV

Asanas- (5 Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar.

UNIT - V

Pranayama- Anulom and Vilom Pranayama - Nadishudhi Pranayama - Kapalabhati Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama.

Meditation Techniques: Om Meditation - Cyclic meditation: Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Suggested Readings:

1. "Yogic Asanas for Group Training - Part-I", Janardhan Swami Yogabhyasi Mandal, Nagpur.
2. Swami Vivekananda, "Rajayoga or Conquering the Internal Nature", Advaita Ashrama (PublicationDepartment), Kolkata.

Nagendra H.R and Nagaratna R, "Yoga Perspective in Stress Management", SwamVivekanandaYoga

Prakashan, Bangalore

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN204	**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes

After successful completion of the course, the students will be able to:

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self regulation
4. Develop a positive approach to work and duties.
5. Develop a versatile personality

UNIT - I

Neetisatakam – Holistic Development of Personality - Verses 19, 20, 21, 22 (Wisdom) - Verses 29, 31,32(Pride and Heroism) - Verses 26,28,63,65 (Virtue)

UNIT - II

Neetisatakam – Holistic Development of Personality (cont'd) - Verses 52, 53, 59 (don'ts) - Verses71, 73,75 & 78 (do's) - Approach to day to day works and duties**.**

UNIT - III

Introduction to Bhagavadgeetha for Personality Development - Shrimad Bhagavadgeetha: Chapter 2 –Verses 41, 47, 48 - Chapter 3 – Verses 13,21,27,35 - Chapter 6 – Verses 5,13,17,23,35 - Chapter 18 –
Verses 45, 46, 48 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT - IV

Statements of Basic Knowledge - Shrimad Bhagavadgeetha: Chapter 2- Verses 56, 62,68 - Chapter 12 –Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad Bhagawat Geeta.

UNIT - V

Role of Bhagavadgeetha in the Present Scenario - Chapter 2 – Verses 17 - Chapter 3 – Verses 36, 37, 42
-Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Readings:

1. Srimad Bhagavad Gita, Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya), P.Gopinath, Rashtriya SanskritSansthanam,New Delhi

Online Resources: NTPEL: http://nptel.ac.in/downloads/109104115/

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

PRACTICAL/LABORATORY COURSE

Course Code	Course Title						Core/Elective
P21CM2L1	**CONSTRUCTION ENGINEERING LABORATORY-II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	**-**	**-**	**3**	**50**	**-**	**1.5**

Course Objectives

- To study the concrete mix design using various codes and evaluate the properties of concrete.
- To evaluate the properties of concrete and correlate them with the non-destructive testing results.
- To evaluate the effect of different parameters on non-destructive testing results.
- Evaluate the crack propagation in a beam under single-point - two-point loading.

Course Outcomes

1. Design the concrete mixes using various codes and assess the properties of concrete.
2. Correlate the properties of concrete with the non-destructive testing results.
3. Appraise the effect of different parameters on non-destructive testing results.
4. Estimate the crack propagation and crack patterns in a beam.
5. Able to estimate the crack propagation and crack patterns in a beam

1. Concrete mix design by BIS, ACI and BS method – proportioning, batching, mixing, molding of specimens for compression, modulus of elasticity and modulus of rupture – testing of specimens as per relevant codes of practice (comparative study).

2. Development of correlation between Non-Destructive and Destructive tests using Rebound Hammer & UPV instruments.

3. Influence of following parameters on NDT readings – experimental observations.
   - Aggregate Cement Ratio
   - Cement Ratio
   - Excess / Deficient Cement
   - Excess / Deficient Water
   - Aggregate type.

(Some of the above parameters may be considered depending upon time)

4. Strain and deflection measurement for a structural member under single point / two pointloading – crack propagation observation. Measurement and plotting.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM2L2	**COMPUTING APPLICATION LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	**-**	**-**	**3**	**50**	**-**	**1.5**

Course Objectives

- Understanding the concept of project planning and scheduling

Course Outcomes

1. Students are expected to have gained knowledge on PRIMAVERA software and its application toConstruction Engineering and Management
2. Students are expected to prepare construction project schedules using PRIMAVERA software
3. Ability to extract required data from PRIMAVERA software
4. Preparation of project schedules
5. Application of PRIMAVERA to project planning and scheduling

Experiments:

1. Introduction to components of PRIMAVERA, and Setting up of project in PRIMAVERA (includingcreating and modifying calendar)
2. Creating Organizational Breakdown Structure (OBS)
3. Creating Enterprise Project Structure (EPS).
4. Creating New Project, Work Breakdown Structure (WBS),
5. Creating Activities and Assigning Duration
6. Assigning resources and their cost to the Activities
7. Scheduling project and identifying Float in PRIMAVERA
8. Identification of critical path in a project in primavera
9. Generating Project Baselines.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM2P1	**Mini Project**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**6**	**50**	**-**	**3**

Course Outcomes

At the end of this course, students will be able to**:**

1. Formulate a specific problem and give solution
2. Develop model/models either theoretical/practical/numerical form
3. Solve, interpret/correlate the results and discussions
4. Conclude the results obtained
5. Write the documentation in standard format

Guidelines:

- As part of the curriculum in the II- semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
- Mini projects shall have inter-disciplinary/ industry relevance.
- The students can select a mathematical modeling based/Experimental investigations or Numerical modeling
- All the investigations should be clearly stated and documented with the reasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and reference.

Departmental committee: Supervisor and a minimum of two faculty members

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 50		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Departmental Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21MB111	**Research Methodology and IPR**						**Mandatory Course**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

To make students to

- Motivate to choose research as career
- Formulate the research problem, prepare the research design
- Identify various sources for literature review and data collection report writing
- Equip with good methods to analyse the collected data
- Know about IPR copyrights

Course Outcomes

At the end of this course, students will be able to**:**

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyses problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT - I

Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods Verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT - II

Literature Survey and Report writing: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Need of Review, Guidelines for Review, Record of Research Review.

Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanism of writing a report. **Research Proposal Preparation**: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

UNIT - III

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design, Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Steps in sample design, types of sample designs.

UNIT - IV

Data Collection and Analysis: Methods of data collection, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Importance of Parametric, non-parametric test, testing of variance of two normal populations, use of Chi-square, ANOVA, F-test, z-test

UNIT - V

Intellectual Property Rights: Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

Suggested Readings:

1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers,
   2004
2. R. Ganesan, Research Methodology for Engineers, MJP Publishers, 2011
3. Y.P. Agarwal, Statistical Methods: Concepts, Application and Computation, Sterling PublicationsPvt. Ltd., New Delhi, 2004
4. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 Gogia Law Agency
5. Ajit Parulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications, MacmillanIndia Ltd, 2006

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM101	**CONSTRUCTION MANAGEMENT**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

- Understand the broad principles and concepts of construction management
- To create awareness of MIS techniques in construction industry
- Represent various works measurement standards

Course Outcomes:

- Ability to take responsibilities as constructionmanager
- Application of MIS technique in the real time constructionoperation
- Knowledge of work measurement application in constructionindustry
- Application of work study measurements
- Knowledge of work measurement application in construction industry

UNIT - I

Introduction to management, science or art? history of construction management, modern management, system approach and emergence of management thought, need, nature and purpose of construction management, major problems in construction industry, firm organization, chain of command, division of work, organization charts, functions and responsibilities of construction manager, case studies, future of construction management.

UNIT – II

Principles of construction management; planning, organizing, staffing, leading, controlling. Decision making in construction industry, nature of managerial decision making, the rational model of decision making, challenges to the rational model, improving the effectiveness of decision-making tools and techniques, benefit-cost analysis, replacement analysis, break even analysis, risk management in construction industry.

UNIT – III

Site mobilization and demobilization aspects, various resource management based on funds availability, organization and monitoring of the construction work with respect to cost-time schedules, coordinating, communicating and reporting techniques, Application of MIS to construction, Training of Construction Managers.

UNIT – IV

Work Study: Definition, Objectives, basic procedure, method study and work measurement, work study applications in Civil Engineering.

Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.

UNIT - V

Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time - lapse photography technique, Analytical production studies.

Suggested reading:

1. Tenah, K.A. (1985). "The Construction Management Process" RestonPublishing Company, Inc. Virginia, USA.
2. Roy Pilcher (1985) “Project Cost Control in Construction,” CollinsProfessional and technical books, London.
3. Raina, C.M. “Construction Management and Practice.” Tata McGraw-Hill, New Delhi, 1980.
4. Construction Planning & management By P S Gahlot & B M Dhir ,New Age International Limited Publishers
5. Construction Project planning & Scheduling By Charles Patrick,Pearson, 2012
6. Construction Project Management Theory & practice --- KumarNeeraj Jha, Pearson,2012
7. Construction management Fundamantals by Knutson, Schexnayder,Fiori, Mayo, Tata McGraw Hill, 2nd Edition, 201

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM102	**CONSTRUCTION PROJECT ADMINISTRATION**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

To know the students about the construction administration and Quality aspects.

- To understand the lines of authority in construction projects
- To have the idea of different risks associated with construction industry and remedial measures
- To properly understand the IS specifications and drawings in construction projects.
- To visualize and understand pre-construction operations and its limitations.

Course outcomes:

1. To be able to gain the knowledge of construction administration issues and quality related problems in construction projects.
2. To be able to have an idea of hierarchy, work responsibility and work progress.
3. To be able to understand risks and uncertainty related issues in constructions.
4. To be able to understand the IS specifications and drawings for the Civil Engineering Construction projects.
5. To be able to understand the pre-construction operations and techniques.

UNIT – I

Introduction to Construction Administration, Control of Quality in Construction, Organizational Structure, Design Build Contracts Responsibility for Coordination of the trades Role of owner, Contractor, Engineer, and Construction Manager.

UNIT - II

Introduction to authority, Lines of Authority in Construction administration on Construction Projects, Responsibility and Familiarization with construction documents, Staffing responsibilities, Limitations of their duties/functions.

UNIT - III

Reasons for the risks, Certainty, Risk, and Uncertainty, Risk Management, Identification and Nature of Construction Risks, Contractual allocation of Risk, Types of Risks, Minimizing risks and mitigating losses, use of expected values, utility in investment decisions, decision trees, sensitivity analysis and their applications.

UNIT - IV

Specifications and drawings - Role of Engineers and Architects, Specifications, Conflicts due to drawings and specifications, unenforceable phrases; content of the specifications, CSI specifications format, allowances and tolerances in specifications, problems. Municipal regulations and construction drawings

UNIT - V

Preconstruction Operations-Need for the preconstruction operations, Equipment's, material and manpower, Constructability Analysis, Issuance of Bidding Documents, Prequalification of Bidders, Bonds, Opening Acceptance and Documentation of Bids, Limitations and advantages of preconstruction operations.

Suggested reading:

1. Fisk, E.R. (2000) "Construction Project Administration," Prentice Hall International, London.
2. Kwakye, A.A. (1997), "Construction Project Administration", AdissonWesley Longman, London.

Professional Elective I

Course Code	Course Title						Core/Elective
P21CM103	**ECONOMIC DECISION ANALYSIS IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To cover the principles engineering economy followed by basic methods for carrying out economic studies considering the time value of money
- To demonstrate various interest formula methods namely present, future, annual worth method, rate of return method and break-even analysis for the comparison of alternatives.
- To understand various methods of depreciation, tax and cost analysis of construction equipment's followed by cost estimating.
- To manage and control the inventory and cost of production.
- To estimate the economic life of an assert with inflation effect.
- To study the growth of MNC's in relation to construction industry.

Course Outcomes

1. Highlight the basic principles of economics and its concepts.
2. To prepare various interest formula for the comparison of alternatives.
3. Use updated techniques, skills and tolls of industrial engineering throughout their professional careers.
4. To acquire fundamental knowledge and understanding of production and industrial engineering.
5. Able to estimate the Economic life of an Asset with Inflation effect

UNIT-I

Introduction to engineering economics, basic economic concepts related to construction industry- marginal cost, marginal revenue, opportunity cost contribution, time perspective, elementary economic analysis-material selection for a product, design selection, building material and process planning.

UNIT-II

Interest formulae's and their applications- time value of money, present worth method, future worth method, annual equivalent method, rate of return method.

UNIT-III

Replacement and maintenance analysis, determination of economic life of an asset, depreciation-straight line method of depreciation, declining balance method of depreciation, sum of the year's digits methods depreciation, sinking funds method of depreciation etc.

UNIT-IV

Production and function, cost of production, inventory cost management, optimum rise of construction, input-output analysis in the construction industry.

UNIT-V

Inflation, procedure to adjust inflation, economic life determination without inflation effect, economic life determination with inflation effect, measurement of inflation, impact of inflation on economic evaluations, growth of multinational construction companies.

Suggested reading:

1. Shutt R.C. (1995), "Economics for the construction industry,"Longman Scientific and Technical, England.
2. Panneerselvam, R. (2001), "Engineering Economics," Prentice Hall ofIndia, India.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM104	**LEGAL ISSUES IN CONSTRUCTION MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To study the various types of construction contracts and their legal aspects and provisions
- To study the tenders, arbitration, legal requirements, labor and human rights regulations

Course Outcomes

1. Student shall able to know basics on construction related contracts.
2. Students shall be able to carry out the tendering process
3. Overview of construction management, administration and present
4. Status of construction industry. Students shall be aware of labor law related legislations
5. Students shall be able to know dispute resolution mechanism

UNIT-1

Introduction to Construction Law: Need for legal issues in Construction in the Indian Judicial System – Context of Construction Industry, Principles of a Contract, Indian Contract Act 1872 – Provisions for Construction Industry, Essentials of a Valid Contract, Types of Contracts, Alternate Contract Methods, Concept of Completion of a Contract, IT Law 2000 and its Influence on construction Contracts

UNIT-2

Construction Tendering Process: Introduction to Construction Process, Need for tendering, process of Tendering in Construction, Importance of Specifications and Estimates in Construction, Concept of completion of the contract, Sub-Contracts and requirements, Tendering Models and Strategies, Prequalification of Bidders, Documents forming a BID and a Contract, Agreements and Bonds in Tendering Process

UNIT-3

Construction Administration: Duties and Responsibilities – Project Manager, Owner, Engineers and Contractors, Important Site Documents, Process of Building Permissions, Provision for Scheduling delays and accelerations, Environmental Provisions for Construction Contracts.

UNIT-4

Disputes and Liabilities in Construction: Major sources of disputes in construction, Delays – Types, Claims and solutions, Labor Laws in India, Worker Compensation and Insurance laws, Construction Liabilities and Litigations, Disputes in Land Development,

UNIT-5

Dispute Resolution in Construction: Dispute Resolution in Construction, Judicial Process in Dispute Resolution, Alternate Dispute resolution methods, Arbitration and Conciliation Act 1996, Importance of Arbitration in Construction, Arbitration Process, Arbitration Clause in Contracts

Suggested Readings:

1. Indian Contract Act 1892
2. Indian Arbitration and Conciliation Act,1996

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM105	**STATISTICAL TECHNIQUES**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To introduce fundamental knowledge of samplingtechnique
- To describe basic statistical techniques such as statistical distributions and correlation methods
- To impart knowledge on exact sampling distributions and the tests of significance

Outcomes:

1. Students who successfully complete this course will be able to:
2. Use sampling techniques for conducting various surveys related to transportation engineering
3. Decide best fit and develop the regression equations for the given variables
4. Applications of sampling distributions in Highway and Traffic Engineering problems.
5. Applications of sampling distributions to construction Engineering problems

•

UNIT-I

Introduction: Frequency distribution; Measures of central tendency; Measures of dispersion; Standard error, Moments (about mean, arbitrary numbers and orgin); Skewness; Kurtosis; Sampling-Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample size determination; Applications in Highway and Traffic Engineering

UNIT-II

Statistical Distribution; Probability, Bayes' Theorem; Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Mean and variance; Chi-square test of goodness-of-fit; Applications in Highway and traffic Engineering. Mathematical expectation.

UNIT-III

Regression and Correlation: Linear regression and correlation; Multiple correlation; Multiple correlation coefficient; Standard error of estimate; Analysis of variance; Curvilinear regression; Applications in Transportation Engineering.

UNIT-IV

Multi Variate Data Distributions; Types of data; Basic vectors and matrices; Simple estimate of centroid, Standard deviation Variance and covariance; Correlation matrices; Principal component analysis;. Time series analysis. Estimation-Point Estimation, Interval Estimation, Box Plot, Maximum likelihood estimation, Biased & Non-Biased Estimation.

UNIT - V

Exact Sampling Distributions and Tests of Significance; Chi-square distribution; students t-distribution; Snedectors F-distribution. Large sample and small sample tests; Tests for single mean. Means of two samples, Proportions, two variances, two observed correlation coefficients, paired T-tests, Applications. Intervals for mean, variance and regression coefficients;

Applications in Highway and Traffic Engineering Problems.

Suggested Reading

1. Basic Statistics - Simpson and Kafks; Oxford and IBH Calcutta,1969.
2 . Fundamentals of Mathematical Statistics - Gupta, S.C. and Kapoor, K.V. Sultanchand
3 . Multivariate Data Analysis – Cootey W.W &Cochens P.R; John Wiley & Sons

Professional Elective II

Course Code	Course Title						Core/Elective
P21CM106	**QUANTITATIVE METHODS IN CONSTRUCTION MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To study the various quantitative methods applied to the elements of management.
- To gain knowledge of formulation of optimization models using various methods.
- To understand transportation model utility in construction industry
- To modify and improve network flow problems to optimize the resources.

Course Outcomes

1. Able to understand transportation model utility and its application in construction industry
2. Understand modification of network flow problems to optimize the usage of resources.
3. Understand the concept of simulation, decision theory, sequencing and queuing theory.
4. Understand modification of network flow problems to optimize the usage of resources.
5. Understand the concept of simulation, decision theory, sequencing and queuing theory

UNIT-I

Introduction, phases of operations research (or), models and scope of or in construction management, concept of probability and statistics - classical methods such as monte-carlo and lagrangian multiplier methods.

UNIT-II

Standard formulation of linear programming, graphical solutions of linear programming, simplex method, linear programming and their computer solutions, characteristics of linear optimization problems.

UNIT-III

Transportation problems: introduction, terminology, minimization and maximization problems – formulation of mathematical models – methods of solution of transportation models using north west corner and least cost method and vogel's approximation method. Assignment problems, formulation and solution of assignment problems.

UNIT-IV

Dynamic programming: introduction, terminology, need for dynamic programming, characteristics of dynamic programming, application of dynamic programming in construction industry - waiting line models.

UNIT-V

Decision theory, game theory, simulation and its applications toconstruction, Modifications

and improvements on CPM/PERT techniques.

Suggested reading:

1. Adrian, J. “Quantitative Methods in Construction Management.” American Elsevier Publishing Co., Inc., Amsterdam, Netherlands, 1973.
2. Moder, J.J., Phillips, C.R., and Davis, E.W., “Project Management with CPM and PERT and precedence diagramming.” C.B.S. Publishers & Distributors, New Delhi, 1986.
3. Stark, R.M., and Mayer, J.H. “Quantitative Construction Management.” John Wiley and Sons, NY, 1983.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM107	**STRUCTURAL HEALTH MONITORING**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Learn the fundamentals of structural healthmonitoring.
- Study the various vibration-based techniques for structural health monitoring.
- Learn the structural health monitoring using fiber-optic and piezoelectric sensors.
- Study the structural health monitoring using electrical resistance and electromagnetic techniques.

Course Outcomes:

1. Understand the fundamentals of maintenanceand repair strategies.
2. Diagnose for serviceability and durability aspects ofconcrete.
3. Know the materials and techniques used for repair of structures.
4. Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
5. Use an appropriate health monitoring technique and demolition technique.

UNIT-I

Introduction to SHM: An Overview of Structural Health Monitoring and Smart Materials

UNIT-II

Vibration Control for SHM: Vibration Control using SHM – Introduction to FE formulation, Constitutive Relationship, Element Stiffness Matrix for

High Precision Finite Element, Element Mass Matrix for High Precision Finite Element, Developing Actuator and Sensor Influence Matrix, Estimating Sensor Voltage, Active Control of Damping, A Case study of Performance Estimation for Different Patches, SHM of Ribbon Reinforced Composite Laminate

UNIT-III

SHM using Piezo and Magnteostrictive Layers: Delamination Sensing using Piezo Sensory Layer, Voltage Response from Piezopatch, Electrical Impedance Method basic theory, A Case Study: Results and Discussions, SHM using Magnetostrictive Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer, Constitutive relationship with composite relationship, MS Layer insymmetric Laminate, MS Layer Away from the Midplane in Asymmetric Laminate, Case Studies related to MS Layer based SHM

UNIT-IV

SHM using LDV: Experimental Modal Analysis using LDV – Introduction, What is LDV?, Velocity and Displacement Measurement using LDV, Case Study for Symmetric Laminate, Case Study for Cross-ply

Suggested Reading:

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, John Wiley and Sons, 2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
3. J.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006.
4. Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.
5. Smart Materials and Structures, Gandhi and Thompson
6. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM108	**GREEN BUILDING TECHNOLOGY**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Exposure to the green building technologies and their significance.
- Understand the judicial use of energy and its management.
- Educate about the Sun-earth relationship and its effect on climate.
- Enhance awareness of end-use energy requirements in the society.
- Develop suitable technologies for energy management.

Course Outcomes:

1. Understand the fundamentals of energy use and energy processes in building.
2. Identify the energy requirement and its management.
3. Know the Sun-earth relationship vis-a-vis its effect onclimate.
4. Be acquainted with the end-use energy requirements.
5. Be familiar with the audit procedures of energy.

UNIT I

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT II

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT III

Climate, solar radiation and their influences - Sun-earth relationship and theenergy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT IV

End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT V

Energy management options - Energy audit and energy targeting - Technological options for energy management

Suggested Reading:

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press,U.K.
2. Carter, W. Nick, 1991: Disaster Management, Asian DevelopmentBank, Manila.
3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences andReflections, Prentice Hall of India, New Delhi

Audit Course-I

Course Code	Course Title						Core/Elective
P21CE101	**DISASTER MANAGEMENT**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
- To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
- To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.

Course Outcomes

At the end of this course, students will be able to**:**

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and Practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in
5. Advanced understanding of flood plain adjustment issues and the other technologies employed for flood management.

UNIT-I

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT-II

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.

Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III

Disasters Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-IV

Disaster Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-V

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading:

1. Barry A. Richardson, "Defects and Deterioration in Buildings", E &FNSpon Press, London, 1991.
2. J. H. Bungey, "Testing of Concrete in Structures", Chapman andHall,New York, 1989.
3. A.R. Santakumar, "Concrete Technology", Oxford University Press,NewDelhi, 2006.
4. Pankaj Agarwal and Manish Shrihkande (2006). "EarthquakeResistance Design of Structures." Prentice Hall of India
5. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring,Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EE101	**Sanskrit for Technical Knowledge**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- To make the novice Learn the Sanskrit to develop the logic in mathematics, science & other subjects
- To explore the huge knowledge from ancient Indian literature

Course Outcomes

At the end of this course, students will be able to**:**

1. Develop passion towards Sanskrit language
2. Decipher the latent engineering principles from Sanskrit literature
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress
5. Understand the role of Sanskrit in Engineering

UNIT-I

Introduction to Sanskrit Language: Sanskrit Alphabets-vowels-consonants- significance of Amarakosa- parts of Speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive Voice-Past/Present/Future Tense-Syntax-Simple Sentences (elementary treatment only)

UNIT-II

Role of Sanskrit in Basic Sciences: Brahmagupthas lemmas (second degree indeterminate equations), sum of squares of n-terms of AP- sulba, sutram or baudhayana theorem (origination of Pythagoras theorem)-valueof pie-Madhava's sine and cosine theory (origination of Taylor's series).

The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of Michaelson and Morley theory).

UNIT-III

Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering):

Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower- Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingala chandasutram (origination of digital logic system)

UNIT-IV

Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology):

Computer languages and the Sanskrit languages-computer command words and the vedic command

words- analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequenceand logical sequence, programming.

UNIT-V

Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants- plants, the living-plants have senses-classification of living creatures, Chemical laboratory location and layout- equipment-distillation vessel-kosthi yanthram

Suggested Readings:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. M.R. Kale, A Higher Sanskrit Grammar: For the Use of School and College Students, MotilalBanarsidass Publishers, 2015.
3. Kapail Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN- 10: 8171880649, 1994.
4. Pride of India, Samskrita Bharati Publisher, ISBN: 81-87276 27-4, 2007.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN102	**VALUE EDUCATION**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- Understand the need and importance of Values for self-development and for National development.
- Imbibe good human values and Morals
- Cultivate individual and National character.

Course Outcomes

After completion of the course, students will be able to:

1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day-to-day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all- round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT-I

Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT-II

Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III

Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV

Values in Holy Books: Self-management and good health; internal & external cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V

Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish;

Satwic, Rajasic and Tamasic gunas.

Suggested Readings:

1. Chakroborty, S.K., Values & Ethics for organizations Theory and practice, Oxford University Press,New Delhi, 1998.
2. Jaya Dayal Goyandaka, Srimad Bhagavad Gita with Sanskrit Text, Word Meaning and Prose Meaning, Gita Press, Gorakhpur, 2017.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN101	**ENGLISH FOR RESEARCH PAPER WRITING**						**Audit 1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course objectives:

- To understand the nuances of language and vocabulary in writing a Research Paper.
- To develop the content, structure and format of writing a research paper.
- To enable the students to produce original research papers without plagiarism.

Course Outcomes:

1. Understand that howto improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.
4. Avoid plagiarism and be able to develop their writing skills in presenting the research work.
5. Create a research paper and acquire the knowledge of how and where to publish their original research papers

Unit I

Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Unit III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit V:

skills are needed when writing the Methods, skills needed when writingthe Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions -Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

References:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Day R (2006) How to Write and Publish a Scientific Paper,Cambridge University Press
2. Highman N (1998), Handbook of Writing for the MathematicalSciences, SIAM. Highman'sbook.
3. Adrian Wallwork, English for Writing Research Papers, SpringerNew York Dordrecht Heidelberg London, 2011

PRACTICAL/LABORATORY COURSE

Course Code	Course Title						Core/Elective
P21CM1L1	**Construction Engineering Laboratory-I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**1.5**

Course Objectives:

- To evaluate the properties of constituents of concrete.
- To evaluate the properties of various building materials.
- To evaluate the properties of concrete with variable workability and variable parameters.

Course Outcomes:

1. Learn the properties of constituents ofconcrete.
2. Assess the properties of various building materials.
3. Correlate the properties of concrete with variable workability.
4. Correlate the properties of concrete with variable parameters.
5. Influence of various parameters on strength characteristics of concrete.

1. Evaluation of properties of cement, fine aggregates and coarse aggregates.
2. Evaluation of properties of reinforcing steel, timber, building block and tile.

3. Variation of workability with time for different grades of concrete – experimental observations.

4. Experimental observation on influence of following parameters on strength characteristics of concrete (Some of these parameters may be considered depending up on time)

   i. Size, Shape and grade of coarseaggregate
   ii. Grading of fine aggregate
   iii. Hand Mixing / Machine Mixing
   iv. Aggregate – Cement Ratio
   v. Coarse Aggregate – Fine Aggregate Ratio
   vi. Size and Shape of Test Specimen
   vii. Admixtures

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM1P1	**SEMINAR**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**50**		**1.5**

Course Objectives:

- To work on a specific technical topic in Construction Engineering and Management in order to acquire the skills of oral presentation.
- To acquire technical writing abilities for seminars and conferences.

Course Outcomes:

- Identify appropriate topic of relevance.
- Update literature on technical articles of selected topic and develop comprehension.
- Prepare a technical report.
- Deliver presentation on specified technicaltopic

Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured, and the power point presentation shall include followingaspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
2. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by theDepartment.

Guidelines for awarding marks		
S. No.	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Note:

1. The seminar presentation should be a gist of at least five research papers from **Peer-reviewed** or **UGC recognized** journals.
2. **The seminar report should be in the following order:** Background of work, literature review, techniques used, prospective deliverables, discussion on results, conclusions, critical appraisal and reference.
3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.
4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

ourse Code	Course Title						Core/Elective
P21CM201	**CONSTRUCTION PLANNING AND SCHEDULING**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Understand the concept of planning and scheduling techniques in the Construction Industry
- Discuss the various methods of time estimates and network techniques in the construction projects
- Evaluate the construction cost, duration and computer applications on network problems related toconstruction industry

Course Outcomes

After completing this course, the student will be able to:

1. Able to gain the knowledge of project planning, scheduling and design related problems inconstruction projects.
2. Ability to develop the planning and scheduling and control of the projects in the construction industry.
3. Able to evaluate the construction cost, duration and quality of the construction projects.
4. Apply the computer applications on network related problems to construction industry
5. Ability to develop the working knowledge on various network techniques and software's useful in the construction industry.

UNIT-I

Historical background and introduction to project planning, bar charts, limitations of bar charts, milestone charts, and work breakdown structure, events and activities numbering of networks, PERT and CPM.

UNIT-II

Time estimates, float, slack, probability of completion time, application of PERT/CPM to construction industry problems.

UNIT-III

Cost analysis - direct cost, indirect costs, and slope of the project activities, optimization of cost and schedule through network contraction – applications in construction industry.

UNIT-IV

Cost control in construction projects, importance of cost control and its objectives, resource analysis - smoothing and leveling of various construction projects.

UNIT-V

Precedence network, advantages of precedence network, logic of precedence network diagram, and computer applications on network problems related to construction industry.

Suggested reading:

1. Moder, J.J., Phillips, C.R., and Davis, E.W., "Project Management with CPM and PERT and precedence diagramming." C.B.S. Publishers & Distributors, New Delhi, 1986.
2. Pilcher, R. "Project Cost Control in Construction." Collins, London, 1992
3. Brien. J.J. "CPM in Construction Management." McGraw Hill Book Company Inc., NY,1971.

Course Code	Course Title						Core/Elective
P21CM202	**PROJECT FINANCE**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To train the students with the latest and the best in the rapidly changing field ofconstruction engineering, technology and management.
- To prepare the students to be industry leaders how implement the best engineering andmanagement practices and technologies in the construction industry.
- To manage the working capital required on construction projects.
- To employ capital budgeting methods to arrive at the best investment options.
- To apply various types of budgets required for civil works.

Course Outcomes

After completing this course, the student will be able to:

1. Estimate the working capital required on a construction project.
2. Perform capital budgeting techniques for investment analysis.
3. Prepare various types of budgets required in civil works.
4. Apply knowledge and skills of modern construction practices and techniques.
5. Ability to estimate the Working Capital requirements on a Construction Projects

UNIT-I

Introduction to investments-types of investments problems, stages in an economic appraisal, risk and uncertainty in investments decisions, cost of capital, time values of money, cash flows, equivalence for comparison and selection, effect of rate of return, and capital ratio.

UNIT-II

Investment analysis- capital budgeting- methods of evaluation of capital budgeting- payback period methods, rate of return method, Net present value method, interval rate of return method, profitability index method.

UNIT-III

Cost concepts, break even analysis, Budgeting and budgeting control system, classification and types of budgets, fixed and flexible budgets, sales budget, production budget, cost of production budget, materials budget, direct labor budget, overhead cost budget, selling and distribution overhead budget.

UNIT-IV

Standard costing and variance analysis in relation to construct, direct material variance, direct labor variance, overhead variances, job, batch and contract costing- procedures, determination of economic batch, Network analysis as a basis for cost control.

UNIT-V

Working capital, working capital at project level management of cash, Receivable management, Inventory management, price level accounting (Inflation Accounting), project management network techniques- program evaluation review techniques and critical path method.

Suggested reading:

1. Roy Pilcher (1985) "Project Cost Control in Construction," CollinsProfessional and technical books, London.
2. Humphreys, K.K., and Wellman, P. (1996) "Basic Cost Engineering,"Marcel Dekker, Inc. New York.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Professional Elective - III

Course Code	Course Title						Core/Elective
P21CM203	**NEURAL FUZZY AND EXPERT SYSTEM**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.
- Solve problems that are appropriately solved by neural networks, fuzzy logic, and geneticalgorithms.
- Understand the structure of expert systems.
- Get exposure to software packages in practice.

Course Outcomes

After completing this course, the student will be able to:

1. Learn the mathematical theory behind the intelligent problem-solving approaches and applythem to write the code to solve a particular design problem.
2. Carry out three design projects in the course in neural networks, fuzzy logic, and geneticalgorithms.
3. Covers intelligent approaches to solving engineering problems that are appropriate forpattern matching, control, optimization, and other areas.
4. Solve the problems pertaining to artificial neural networks, fuzzi logic and expert systemsusing standard software packages.
5. Exposure to Matlab and tools pertaining to artificial neural networks, fuzzy logic using standard methods.

UNIT-I

Introduction: Brief introduction to the study of artificial intelligence. An Insight to the concept of natural intelligence followed by the development of artificial neural networks, fuzzy logic systems and expert systems tool

Demonstration of the importance of artificial neural networks, fuzzy logic and expert systems with the help of at least two practical examples civil engineering for each study. Importance of nuero-fuzzy systems

UNIT-II

Neural Networks: Components of artificial neural networks - neurons, inputs, outputs, error, error propagation, hidden layers, threshold logic, weights, bias, noise, momentum, rate of learning, training and testing - Hebb's rule, Delta rule - Supervised learning - Generalized Delta rule - unsupervised learning.

Types of Neural Networks - Perceptions - feed forward back propagation networks - Hop field networks

UNIT-III

Fuzzy sets: Crispness, vagueness, uncertainty, and fuzzy sets. Basic. Definitions and

operations of Fuzzy sets, approximate reasoning, and membership function. Fuzzy Relations: Fuzzy relation and fuzzy composition, fuzzy aggregation procedures, Dominance Matrix, Weightages, applications of Fuzzy sets to civil engineering problems, and pattern recognition.

UNIT-IV

Expert systems: Structure of expert systems, Knowledge acquisition, Knowledge organization, methods of representing. Knowledge, types of inference engines, reasoning under uncertainty, various types of expert system tools, heuristics, search mechanism, expert system development and hybrid expert systems.

UNIT-V

Exposure to Software Packages: Neural networks (Mat lab tool kit) — fuzzy logic — expert systems (L5 object). Applications of Artificial Neural Networks, Fuzzy logic and expert systems in civil engineering — Case studies with at least one problem on each aspect of ANN, FL and Expert systems.

Suggested Readings:

1. Fuzzy Sets, Decision Making, and Expert Systems, Zimmerman, H. J.,Kluwer Academic Publications, Boston, 1987.
2. "Artificial Intelligence and Expert System", Elaine Rich, Juda Pearl,Heuristics.
3. "Expert Systems in Construction and Structural Engineering" AdeliH., Chapman, 1988.
4. "Neural Networks Algorithms, Applications and Programming"Freeman, J.A., and Skapura, D.M. Addition-Wesley, Reading

Course Code	Course Title						Core/Elective
P21CM204	**VALUE ENGINEERING IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Define Value engineering and its objectives
- Estimation of project budget using capitalized income approach
- Analyse a building using LCC methodology

.

Course Outcomes

After completing this course, the student will be able to:

1. Establish value engineering techniques and methodology
2. Draw value engineering job plan and work plan phases
3. Concept of Delphi techniques and rules for brainstorming
4. Comprehensive understanding about the various phases of Job and work plans
5. Knack for the application of FAST and Delphi techniques for various project

UNIT - I

Introduction to value engineering (VE), definition, objectives of value engineering, reasons for unnecessary costs, VE techniques and methodology, interface with the other programs.

UNIT - II

Elements of the project budget need for cost control, meaning of capitalization, capitalization process, and capitalized income approach to construction project budgeting.

UNIT - III

Life cycle cost (LCC) and building costs, LCC technology and examples, LCC methodology, LCC formats and analysis and weighted evaluation – application of LCC to buildings.

UNIT - IV

Value engineering and total project management, level of effort, team selection, value engineering job plan, and work plan phases.

UNIT - V

Classifying function, defining function, project level function system technique (fast) diagram, creativity and fixation, interpersonal skills, generation of ideas, brainstorming, rules for brainstorming, Delphi technique, application of Delphi technique to civil engineering projects.

Suggested Reading:

1. Tenah, K.A. (1985). "The Construction Management Process", RestonPublishing Company, Inc. Virginia
2. Dell'Isola, Alphonse (1997). "Value Engineering: PracticalApplications." R.S. Means Company, Inc: Kingston, MA.
3. Oberiender, G. D. (1993). "Project Management for Engineering andConstruction".

Course Code	Course Title						Core/Elective
P21CM205	**TQM TECHNIQUES IN CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To familiarize with quality management in construction industry.
- To familiarize with clauses for quality management in construction industry.
- To understand the leadership and teamwork for total quality management in construction organization.
- To understand the production and management and its application to construction industry.
- To study the senior management and total quality management in construction industry.

Course Outcomes

After completing this course, the student will be able to:

1. Able to know new approaches on quality and its implementation in constructionIndustry
2. To assess quality assurance resorting to International codal practices
3. To understand the roles and responsibility of leader adhering TQM
4. To analyze organizational hierarchical for lean production and management
5. To study research objectives in view of TQM towards innovation in constructionindustry

UNIT-1

Quality management in construction industry, new approach to quality management, and road to quality management.

UNIT-II

Formal QA, quality assurance, ISO 9000, clauses of ISO 9000, third party assessment for construction works.

UNIT-III

Leadership and total quality management, tools for total quality management, teamwork for total quality management, stages in team development, and role within a team.

UNIT-IV

Learning organization, lean production and management applied to construction industry.

UNIT-V

Quality management in the construction industry, research objectives, senior management and total quality management, cultural change in construction.

Suggested reading:

1. Steven McCabe. (1998). "Quality Improvement Techniques in Construction."LONGMAN.
2. Kwakye, A.A. (1997), "Construction Project Administration", AdissonWesley Longman, London.

Professional Elective IV

Course Code	Course Title						Core/Elective
P21CM206	**HUMAN RESOURSES DEVELOPMENT FOR CONSTRUCTION**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To study the management and control of human resources in constructionindustry.
- To understand the concepts of organization and management theory.

Course Outcomes

After completing this course, the student will be able to:

1. Able to understand the job analysis, selection, recruitment in construction industry
2. Ability to understand and apply the management theories and human behavior theories.
3. Able to understand the human resource approaches and apply in the construction management.
4. Able to understand the changing role of trade unions and collective bargaining.
5. Ability to solve employee problems and promote industrial counseling

UNIT-I

The Human resource Management an Introduction: - Human resource, Nature and scope of HRM, The human resource in the environment, Human resource activities, Diversity of work and Strategies- Human resource hiring: -Job analysis, selection, recruitment, orientation, placement, socialization-

Maintenance and development of the Human Resource: Work motivation and performance, Employee welfare, Compensation, Welfare schemes, Career enlargement and enrichment, Leadership and Effective communication.

UNIT-II

Organization and management theory: Challenges of managing people in construction, Contemporary management Theory, Production efficiency: the Classical Approach, Human Behavior theory, Manager's attitude towards people in construction, Expectations of the employment relationship.

UNIT-III

Strategic HRM approaches and operational HRM approaches: Models of HRM, Employee resourcing, Recruitment & Selection, Case Study Discussion, Training & Development, Appraisal Systems, Reward management, Case Study Discussion, Mentoring, Career in Construction Management.

UNIT-IV

Employee relations and empowerment: Employee's relations, The changing role of trade unions, The effect of unions, Collective bargaining, Case Study Discussion, The evolution of empowerment within HRM.

UNIT-V

Work for Analysis: -Trade Unions and Management relationships, Ethical Issues, Employee problems, Industrial Counseling. Employee empowerment- salient features- diversity and work life balance. Employee welfare -strategic Human resource development - employment legislation -legal aspects.

Suggested reading:

1. Langfor D.A. Human Resource management in construction, Longman,1995.
2. Martin Loosemore, Andrew Dainty, Helen Lingard, Human Resource Management in construction projects: strategic and operational approaches, Taylor and Francis, 2010.

Course Code	Course Title						Core/Elective
P21CM207	**ADVANCED CONCRETE TECHNOLOGY**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Learn the characterization of constituents of concrete.
- Design concrete mix by various methods as per different codes.
- Study the different types of admixtures; mix design, properties and applications ofspecial concretes.

Course Outcomes

After completing this course, the student will be able to:

1. Learn hydration of cement and tests on properties of cement and aggregates.
2. Comprehend the properties and testing of concrete in fresh and hardened state.
3. Understand the shrinkage and creep mechanisms, curing and durability of concrete.
4. Design concrete mixes by various methods.
5. Familiarize with the types of admixtures, and applications of special concretes.

UNIT - I

Constituents of Concrete:

a) **Cement:** Types of cement and their composition, manufacture of Portland cement, hydration of cement and hydration product, structure of hydrated cement, heat of hydration, gel theories, review of tests on properties of cement.

b) **Aggregate:** Classification of aggregates, particle shape and texture, bond and strength of aggregate and its influence on strength of concrete, porosity, absorption and moisture content and their influence, soundness of aggregate, alkali aggregate reaction, sieve analysis and grading of aggregate, review of tests on properties of aggregate.

UNIT - II

Properties of Concrete: Mixing and batching, workability, factors affecting workability, measurements of workability, various tests and procedures, segregation and bleeding, vibration of concrete, types of vibrators and their influence on composition, analysis of fresh concrete, strength of concrete, water-cement ratio, gel space ratio, effective water in the mix, mechanical properties of concrete, tests and procedure, influence of various parameters on strength of concrete, relationship between various mechanical strengths of concrete.

UNIT - III

Shrinkage and Creep of Concrete: Types of shrinkage, mechanism of shrinkage, factors affecting shrinkage, creep mechanism, factors influencing creep, rheological model, effects of creep.

Curing of Concrete: Methods of curing, maturity concept, and influence of temperature on strength of concrete.

Durability of Concrete: Permeability of concrete, chemical attack of concrete, tests on sulphate resistance, effect of frost, concreting in cold weather, hot weather concreting, and air entrained concrete.

UNIT - IV

Mix Design of Concrete: Basic considerations, process of mix design, factors in the choice of mix proportions and their influence, quality control, various methods of mix design, I.S. Code method, British and ACI methods.

UNIT - V

Admixtures: Classification of admixtures, chemical and mineral admixtures, influence of various admixtures on properties of concrete, their applications.

Fly Ash Concrete: Mix design, properties and its applications.

High Strength Concrete: Mix design, properties and its applications. Fiber Reinforced Concrete: Mix design, properties and its applications.

Ferro cement, lightweight concrete, high-density concrete, recycled aggregate concrete and their applications.

Suggested Reading:

1. Neville. A.M, (1988), Properties of Concrete, English Language BookSociety/Longman Publications.
2. Mehta. P.K and Paulo. J.M.M, (1997), Concrete – Microstructure –Properties and Material, McGraw-Hill.
3. Krishna Raju. N., (1985), Design of Concrete Mix, CBS Publications.

Course Code	Course Title						Core/Elective
P21CM208	**CONSTRUCTION SAFETY MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To study and understand the various safety concepts and requirements applied toconstruction industry.
- To study the various construction safety problems and safety programs.
- To study the various laws related to safety in construction industry
- To study the importance of workers compensation insurance.

Course Outcomes

After completing this course, the student will be able to:

1. Ability to identify safety risks on jobsites.
2. Able to create and manage an effective safety program in Construction Company.
3. Will be aware of various laws related to construction safety
4. Understand experience modification rates (EMR) and worker's compensationinsurance premiums.
5. Understand experience modification rates (EMR) and perform safety analysis in the construction industry

UNIT-1

Safety management function, Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Safety administration.

UNIT-II

Construction safety problems, Hazards in construction projects, Accident: definition, causes, cost, measurement, investigation and prevention of accidents, Legal and financial aspects of accident, Safety Program: Need, Elements of an Effective and safety program, general safety program in construction industry.

Hazard Identifications and Control Techniques – HAZOP, FMEA, FMECA.

UNIT-III

Safety in use of construction equipment - vehicles, cranes, hoists and lifts etc., Safety of scaffolding, ladders, working platforms etc, safety while using electrical appliances, explosives, blasting etc, Fire safety

Causes and safety of accidents on various construction sites, safety measures for storage and handling of building materials. Safety equipment and gear used on construction site, First aid on site.

UNIT-IV

Laws related to construction industry, Laws related to the Industrial Safety, Safety Provisions in theFactory Act, Labour laws.

Measurement of Safety Performance, Safety Audit. Experience modification rating, workers insurance,

UNIT-V

Case based reasoning, case indexing, retrieval, accident prevention and forecasting using CBR method
Systems safety analysis, faulty tree analysis, failure modes and effects analysis in constructionindustry.

Suggested reading:

1. John V. Grimaldi. (1996). "Safety Management." AITBS Publishers &Distributors, New Delhi, India.
2. Kwakye, A.A. (1997), "Construction Project Administration", Adisson WesleyLongman, London.
3. Jimmy W.Hinze, "Construction Safety ", Prentice Hall Inc., 1997.
4. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and HealthManagement ", Prentice Hall Inc., 2001. Interna

Audit Course-II

Course Code	Course Title						Core/Elective
P21CM208	**CONSTITUTION OF INDIA AND FUNDAMENTAL RIGHTS**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- The history of Indian Constitution and its role in the Indian democracy
- Address the growth of Indian opinion regarding modern Indian intellectuals'constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies
3. Have an insight into various Organs of Governance - composition and functions.
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies
5. Understand Electoral Process, special provisions

UNIT-I

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions.

UNIT-IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayat raj:

Introduction, PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Code	Course Title						Core/Elective
P21EN202	**PEDAGOGY STUDIES**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To present the basic concepts of design and policies of pedagogy studies.
- To provide understanding of the abilities and dispositions with regard to teaching techniques,curriculum design and assessment practices.
- To familiarize various theories of learning and their connection to teaching practice.
- To create awareness about the practices followed by DFID, other agencies and other researchers.
- To provide understanding of critical evidence gaps that guides the professional development

Course Outcomes

After completing this course, the student will be able to:

1. Illustrate the pedagogical practices followed by teachers in developing countries both in formal andinformal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives ofresearch.
4. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions, Overview of methodology and Searching.

UNIT-II

Thematic Overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education

UNIT-III

Evidence on the Effectiveness of Pedagogical Practices: Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and Practicum) and the school curriculum and guidance material best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches – Teachers attitudes and beliefs and pedagogic strategies.

UNIT-IV

Professional Development: alignment with classroom practices and follows up support - Support from the head teacher and the community – Curriculum and assessment - Barriers to learning: Limited resources and large class sizes.

UNIT-V

Research Gaps and Future Directions: Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment – Dissemination and research impact.

Suggested Readings:

1. Ackers J, Hardman F, Classroom Interaction in Kenyan Primary Schools, Compare, 31 (2): 245 – 261, 2001.
2. Agarwal M, Curricular Reform in Schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361 – 379, 2004.
3. Akyeampong K, Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER), Country Report 1. London: DFID, 2003.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J, Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count? International Journal Educational Development, 33 (3): 272- 282, 2013.

Alexander R J, Culture and Pedagogy: International Comparisons in Primary Education, Oxford and Boston: Blackwell, 2001.

Course Code	Course Title						Core/Elective
P21EN203	**STRESS MANAGEMENT BY YOGA**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- Creating awareness about different types of stress and the role of yoga in the management of stress.
- Promotion of positive health and overall wellbeing (Physical, mental, emotional, social andspiritual).
- Prevention of stress related health problems by yoga practice.

Course Outcomes

After successful completion of the course, the students will be able to:

1. Understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas.Improve work performance and efficiency.
5. Improve work performance and efficiency.

UNIT - I

Meaning and Definition of Yoga - Historical perspective of Yoga - Principles of Astanga Yoga by Patanjali.

UNIT - II

Meaning and Definition of Stress - Types of stress - Eustress and Distress. Anticipatory Anxiety and Intense Anxiety and depression. Meaning of Management- Stress Management.

UNIT - III

Concept of Stress According to Yoga - Stress assessment methods - Role of Asana, Pranayama and Meditation in the management of stress

UNIT - IV

Asanas- (5 Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar.

UNIT - V

Pranayama- Anulom and Vilom Pranayama - Nadishudhi Pranayama - Kapalabhati Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama.

Meditation Techniques: Om Meditation - Cyclic meditation: Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Suggested Readings:

1. "Yogic Asanas for Group Training - Part-I", Janardhan Swami Yogabhyasi Mandal, Nagpur.
2. Swami Vivekananda, "Rajayoga or Conquering the Internal Nature", Advaita Ashrama (PublicationDepartment), Kolkata.

Nagendra H.R and Nagaratna R, "Yoga Perspective in Stress Management", SwamVivekanandaYoga

Prakashan, Bangalore

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21EN204	**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The objective of this course is to impart knowledge of:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes

After successful completion of the course, the students will be able to:

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. To practice emotional self regulation
4. Develop a positive approach to work and duties.
5. Develop a versatile personality

UNIT - I

Neetisatakam – Holistic Development of Personality - Verses 19, 20, 21, 22 (Wisdom) - Verses 29, 31,32(Pride and Heroism) - Verses 26,28,63,65 (Virtue)

UNIT - II

Neetisatakam – Holistic Development of Personality (cont'd) - Verses 52, 53, 59 (don'ts) - Verses71, 73,75 & 78 (do's) - Approach to day to day works and duties**.**

UNIT - III

Introduction to Bhagavadgeetha for Personality Development - Shrimad Bhagavadgeetha: Chapter 2 –Verses 41, 47, 48 - Chapter 3 – Verses 13,21,27,35 - Chapter 6 – Verses 5,13,17,23,35 - Chapter 18 –
Verses 45, 46, 48 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT - IV

Statements of Basic Knowledge - Shrimad Bhagavadgeetha: Chapter 2- Verses 56, 62,68 - Chapter 12 –Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad Bhagawat Geeta.

UNIT - V

Role of Bhagavadgeetha in the Present Scenario - Chapter 2 – Verses 17 - Chapter 3 – Verses 36, 37, 42
-Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Suggested Readings:

1. Srimad Bhagavad Gita, Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya), P.Gopinath, Rashtriya SanskritSansthanam,New Delhi

Online Resources: NTPEL: http://nptel.ac.in/downloads/109104115/

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

PRACTICAL/LABORATORY COURSE

Course Code	Course Title						Core/Elective
P21CM2L1	**CONSTRUCTION ENGINEERING LABORATORY-II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	**-**	**-**	**3**	**50**	**-**	**1.5**

Course Objectives

- To study the concrete mix design using various codes and evaluate the properties of concrete.
- To evaluate the properties of concrete and correlate them with the non-destructive testing results.
- To evaluate the effect of different parameters on non-destructive testing results.
- Evaluate the crack propagation in a beam under single-point - two-point loading.

Course Outcomes

1. Design the concrete mixes using various codes and assess the properties of concrete.
2. Correlate the properties of concrete with the non-destructive testing results.
3. Appraise the effect of different parameters on non-destructive testing results.
4. Estimate the crack propagation and crack patterns in a beam.
5. Able to estimate the crack propagation and crack patterns in a beam

1. Concrete mix design by BIS, ACI and BS method – proportioning, batching, mixing, molding of specimens for compression, modulus of elasticity and modulus of rupture – testing of specimens as per relevant codes of practice (comparative study).

2. Development of correlation between Non-Destructive and Destructive tests using Rebound Hammer & UPV instruments.

3. Influence of following parameters on NDT readings – experimental observations.
   - Aggregate Cement Ratio
   - Cement Ratio
   - Excess / Deficient Cement
   - Excess / Deficient Water
   - Aggregate type.

(Some of the above parameters may be considered depending upon time)

4. Strain and deflection measurement for a structural member under single point / two pointloading – crack propagation observation. Measurement and plotting.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM2L2	**COMPUTING APPLICATION LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	**-**	**-**	**3**	**50**	**-**	**1.5**

Course Objectives

- Understanding the concept of project planning and scheduling

Course Outcomes

1. Students are expected to have gained knowledge on PRIMAVERA software and its application toConstruction Engineering and Management
2. Students are expected to prepare construction project schedules using PRIMAVERA software
3. Ability to extract required data from PRIMAVERA software
4. Preparation of project schedules
5. Application of PRIMAVERA to project planning and scheduling

Experiments:

1. Introduction to components of PRIMAVERA, and Setting up of project in PRIMAVERA (includingcreating and modifying calendar)
2. Creating Organizational Breakdown Structure (OBS)
3. Creating Enterprise Project Structure (EPS).
4. Creating New Project, Work Breakdown Structure (WBS),
5. Creating Activities and Assigning Duration
6. Assigning resources and their cost to the Activities
7. Scheduling project and identifying Float in PRIMAVERA
8. Identification of critical path in a project in primavera
9. Generating Project Baselines.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)

Course Code	Course Title						Core/Elective
P21CM2P1	**Mini Project**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**6**	**50**	**-**	**3**

Course Outcomes

At the end of this course, students will be able to**:**

1. Formulate a specific problem and give solution
2. Develop model/models either theoretical/practical/numerical form
3. Solve, interpret/correlate the results and discussions
4. Conclude the results obtained
5. Write the documentation in standard format

Guidelines:

- As part of the curriculum in the II- semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
- Mini projects shall have inter-disciplinary/ industry relevance.
- The students can select a mathematical modeling based/Experimental investigations or Numerical modeling
- All the investigations should be clearly stated and documented with the reasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and reference.

Departmental committee: Supervisor and a minimum of two faculty members

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 50		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Departmental Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

Course Code	Course Title						Core / Elective
P21CM303	**FUNCTIONAL PLANNING AND BUILDING SERVICES**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	**3**	**0**	**0**	**0**	**40**	**60**	**3**

Objectives:

The objectives of this course is to impart knowledge of:

- To imply the services of Building and it's Management in Building planning.
- To understand the importance of Water Supply and Plumbing Systems.
- To apply Solid Waste, Disposal of waste and its Management.
- To understand Firefighting, Lift, Elevator and Escalator Services.
- To imply Telecommunication Network, Air Conditioning, Heating and Building Maintenance Services in Building planning.

Outcomes:

After completing this course, the student will be able to:

- Imparts knowledge on Building services and it's Management in Building planning.
- Creates awareness on importance of Water Supply and Plumbing Systems.
- Gain knowledge on Solid Waste, Disposal of waste and its Management.
- Recognize Firefighting, Lift, Elevator and Escalator Services.
- Gain knowledge on Telecommunication Network, Air Conditioning, Heating and Building Maintenance Services in Building planning.

UNIT-I

Components of urban forms and their planning, Concepts of neighborhood unit, Functional planning of buildings, Importance of building services, type of services required, planning of services, organization structures of services management, role and administrative functions of supervisors. Space requirements and relationship for typical buildings like residential, offices hospitals etc.

UNIT-II

Plumbing & Water supply system: Basics of plumbing systems, requirement of plumbing works, activity flowchart for plumbing work, Quality, checking of materials, water requirements for different types of buildings, simple method of removal of impurities, water saving practices and their potential, rainwater harvesting , type of spouts, sizes of rainwater pipes, typical detail of a water harvesting pit.

Water supply and distribution system is high-rise building, pumps and pumping mechanisms, Operation & maintenance of fittings & fixtures of water supply & sanitary. Do's& Don'ts for water pipe

UNIT–III

Solid Waste disposal: Approaches for solid waste management, Solid wastes collection and removal from buildings, On-site processing and disposal methods, guidelines for municipal solid waste management, e-waste management.

Disposal of Wastes : Sanitary land filling, composting, Vermi-compost, Incineration, Pyrolysis Treatment system, Root zone treatment system, Decentralized Wastewater Treatment Systems (DEWATS), Soil Bio technology, packaged Bio-Reactor

UNIT–IV

Firefighting: Basic requirement and various components of the fire fighting system. Maintenance, firefighting in high-rise buildings, commercial/industrial complexes, public buildings, checklist for fire safety.

Lifts/Elevators, Escalators: Legal formalities for elevators, various types of lifts, working mechanisms of lift andescalators. Indian standard codes for planning & installations of elevator, inspection &maintenance of lifts.

.

UNIT- V

Telecommunication network, computer network LAN, electrical network, basics of single phase & three phase electrification, precautions and safety measures, IS codes for electrical appliances & wiring operations & maintenance of network & appliances.

Air-Conditioning and Heating: Flowcharts, Centralized systems, monitoring and working of the equipments, checklist of inspection, performance tests.

Building maintenance: Scheduled and contingency maintenance planning, M.T.S. for building maintenance, maintenance standards, Economic maintenance decisions, applications of computer in service management

SUGGESTED READINGS:

1. Building Technology IVOR H. Seeley, Mac Millian.
2. Building Finishes, fittings and domestic service Chudley, Longman, Scientific and Technical.
3. Fred Hall,Building Services & Equipment,Longman Scientific and Technical.

Course Code	Course Title						Core / Elective
P21CM301	**CONSTRUCTION PLANNING EQUIPMENTS AND METHODS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	**3**	**0**	**0**	**0**	**40**	**60**	**3**

Objectives:

The objectives of this course is to impart knowledge of:

- To understand the importance of Pre-Fabrication Construction.
- To apply Modular Coordination using I.S. Recommendations.
- To understand Construction Equipments and Safety in Cranes operation.
- To utilize Concrete Mixtures and their Characteristics Performance in Building process.
- To understand Characteristics, Performance and Applications of Conveying Equipment.

Outcomes:

After completing this course, the student will be able to:

- Gain knowledge on importance of Pre-Fabrication Construction.
- Analyze Modular Coordination using I.S. Recommendations.
- Recognize Construction Equipments and Safety in Cranes operation.
- Able to use Concrete Mixtures and their Characteristics Performance in Building process.
- Gain knowledge on Conveying Equipments.

UNIT-I

Precast and Prefabricated construction - need for prefabrication, classification and scope. Advantages and disadvantages of prefabrication and design principles of prefabrication system.

UNIT-II

Modular coordination and its importance, I.S. Recommendations for modular planning, standardization, mass production and methods of Transportation.

UNIT-III

Construction equipment- hoisting equipment such as hoist winch, hoisting chains and hooks, slings. Various types of cranes - tower crane, mobile crane, and derrick crane, safety in crane operations, their characteristics performance and applications to building process.

UNIT-IV

Concrete mixers, truck mixers, pneumatic concrete placer and vibrators for concrete, and Scaffolding. Their characteristics performance and applications to building process

UNIT-V

Conveying equipment - package conveyor, screw conveyor, bucket conveyor and different types of belts, their Characteristics, performance and applications.

Suggested Reading:

1. Peurify, R.L. (1996). “Construction, Planning, Equipment and Methods." McGraw-Hill Book Company, Inc, NY
2 Mahesh Varma (1997) “Construction Equipment and its planning & applications." Metropolitan Book Co (P) Ltd, New Delhi, India.
3 U.K. Srivastava (1999). "Construction Planning and Management." Galgotia Publications Pvt., ltd, New Delhi, India

Course Code	Course Title						Core / Elective
P21CM302	**MANAGEMENT INFORMATION SYSTEM**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	**3**	**0**	**0**	**0**	**40**	**60**	**3**

Objectives:

The objectives of this course is to impart knowledge of:

- To understand MIS and its strategic use in IT.
- To apply MIS in Business Application.
- To make use of MIS in Database Concepts.
- To understand System Development and it's Strategical Design in Buildings.
- To impart knowledge on Cybercrime in e-business.

Outcomes:

After completing this course, the student will be able to:

- Gain knowledge on MIS and its strategic use in IT.
- Able to apply MIS in Business Application.
- Utilize MIS in Database Concepts.
- Gain knowledge on System Development and it's Strategical Design in Buildings.
- Application of Cybercrime in e-business.

UNIT-I

INTRODUCTION : MIS importance, definition, nature and scope of MIS, Structure and Classification of MIS and Information and Systems Concept, Types of Information, Information systems for competitive advantage for construction industry,Management and Decision making in construction industry, Strategic uses of information Technology, Inter Organizational Systems, Strategic Information Systems related to Construction industry.

UNIT-II

BUSINESS APPLICATIONS OF INFORMATION SYSTEMS: MIS role in Business system, Changing the role of Information System, Users of Information System, Types of Information System - Transaction Processing System,E-Commerce, ERP Systems, DSS, Business Intelligence, Business Expert System,and Knowledge Management System.

UNIT–III

MANAGEMENT OF IS AND DATA BASE CONCEPTS: Information System Planning and its Classification, Impact of construction work on Management Information System, System Acquisition, Systems Implementation, Evaluation & Maintenance of IS, IS Security and Control.File structures and Processing methods in Construction organizations, Data Base Concepts, and Data Base Management Systems.

UNIT–IV

BUILDING OF INFORMATION SYSTEMS: System Development Stages, System Development Approaches, Systems Analysis and Design-Requirement Determination, Strategies for Requirement Determination, Structured Analysis Tools, System Design – Design Objectives, Conceptual Design, Design Methods, Detailed system design.

UNIT-V

INTRODUCTION TO CYBER CRIME: Cyber space; cyber law; e-business; e - consumers; spam; phishing.Cyber crime and information security, cyber criminals , Classification of cyber criminals - IndianPerspectives - Cyber crimes and Indian IT Act 2000, Global perspective on cybercrime - Cybercrimeera.

TEXT BOOKS:

1. Effy Oz, Management Information Systems, Course Technology; 6th edition (January 23, 2008).
2. Keri E. Pearlson, Carol S. Saunders, Dennis F. Galletta, Managing and Using Information Systems: A Strategic Approach 7th Edition, Wiley; 7th edition (December 5, 2019)
3. Abhishek Chopra, Mukund Chaudhary ,Implementing an Information Security Management System, A press; 1st ed. edition (December 10, 2019)

SUGGESTED READINGS:

1. Management Information Systems, Laudon & Laudon, Pearson, 2015.
2. Management Information Systems–Managerial Perspective, D P Goyal, MacMillan, 3e Edition, 2010.
3. Management Information Systems Text and Cases, Jawadekar, Tata McGraw Hill, 2012.
4. Management Information Systems, Kelkar, Prentice Hall India, 2012.
5. Cyber Security, Nina Godbole & Sunit Belapure, Wiley India, 2012.

P21CM3P1

DISSERTATION-I

Instruction: 3 periods per week *Duration of SEE: --*
CIE: 100 marks *SEE: --*
Credits: 10

Objectives:

- *Identification of the research problem*
- *Discussion of literature survey.*

Outcomes:

- *Identification of the objectives of the Research Problem.*
- *Ability to update the latest literature in chosen area of research & establishment of the scope of work.*
- *Development of the methodology for the chosen research problem and perform basic theoretical /experiment studies.*

Each student will be attached to a faculty member/guide for project. The student will carry out the project which may be development of Software / Hardware / Simulation studies / Design analysis / Experimental related to his/her specialization. The work will be monitored regularly by the guide. At the end of the semester student will write the report on the work done and submit to the guide. Student has to present his/her work before two faculty members (one guide and other to be appointed by chairman BOS) on a fixed day during last week of the semester in which project is offered. The sessional marks will be awarded jointly by these examiners based on the report, presentation and viva voice.

SEMESTER - IV

P21CM4P1

DISSERTATION-II

Instruction: 32 periods per week *Duration of SEE: --*
CIE: -- *SEE: 200 marks*
Credits: 16

Objectives:

- *Identification of the research problem*
- *Discussion of literature survey.*

Outcomes:

- *Expand the defined Research Problem for the dissertation work.*
- *Conduct of Laboratory/analytical/ software studies*
- *Analysis of Data, development of models, offer solutions to the research problem and provide conclusions of the work.*

The student will carry out the project under allotted supervisor, which may be development of Software / Hardware / Simulation studies / Design analysis / Experimental related to his/her specialization. The work will be monitored regularly by the guide. At the end of the semester student will write the report on the work done and submit to the guide. Student has to present his/her work before two faculty members (one guide and other to be appointed by chairman BOS) on a fixed day during last week of the semester in which project is offered. The final marks will be allotted based on the report, presentation and viva voce conducted by the external examiner whose name is suggested by Chairman BOS.