

		K.S.R. COLLEGE OF ENGINEERING (Autonomous) (Approved by AICTE & Affiliated to Anna University) K.S.R. Kalvi Nagar, Tiruchengode – 637 215					CURRICULUM PG R - 2018			
Department		Civil Engineering								
Programme		M.E – Construction Engineering and Management								
SEMESTER – I										
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks			
			L	T	P		C	CA	ES	Total
THEORY										
1.	MA18131	Statistical Methods and Queuing Theory	3	0	0	3	30	70	100	
2.	CN18112	Modern Construction Materials	3	0	0	3	30	70	100	
3.	CN18113	Construction Equipment	3	0	0	3	30	70	100	
4.	CN18114	Contract Laws and Regulations	3	0	0	3	30	70	100	
5.		Professional Elective - I	3	0	0	3	30	70	100	
6.		Professional Elective - II	3	0	0	3	30	70	100	
PRACTICAL										
7.	CN18121	Construction Engineering Laboratory	0	0	3	2	50	50	100	
8.	CN18122	Technical Presentation - I	0	2	0	1	50	50	100	
Total			18	02	03	21	800			

SEMESTER - II										
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks			
			L	T	P		C	CA	ES	Total
THEORY										
1.	CN18211	Advanced Construction Techniques	3	0	0	3	30	70	100	
2.	CN18212	Project Formulation and Appraisal	3	0	0	3	30	70	100	
3.	CN18213	Construction Planning, Scheduling and Control	3	0	0	3	30	70	100	
4.	CN18214	Safety Practices and Management	3	0	0	3	30	70	100	
5.		Professional Elective - III	3	0	0	3	30	70	100	
6.		Professional Elective - IV	3	0	0	3	30	70	100	
PRACTICAL										
7.	CN18221	Advanced Computing Techniques Laboratory	0	0	3	2	50	50	100	
8.	CN18222	Technical Presentation - II	0	2	0	1	50	50	100	
Total			18	02	03	21	800			

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Department		Civil Engineering								
Programme		M.E – Construction Engineering and Management								
SEMESTER – III										
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks			
			L	T	P		C	CA	ES	Total
THEORY										
1.		Professional Elective -V	3	0	0	3	30	70	100	
2.		Professional Elective -VI	3	0	0	3	30	70	100	
3.		Open Elective	3	0	0	3	30	70	100	
4.	ST183A1	Audit Course	2	0	0	0	50	50	100	
PRACTICAL										
5.	CN18321	Project Work – Phase I	0	0	12	6	50	50	100	
6.	CN18322	Practical Training*	0	0	20	1	50	50	100	
Total			9	0	32	16	600			

(* Four Weeks during vacation)

SEMESTER - IV										
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks			
			L	T	P		C	CA	ES	Total
PRACTICAL										
1.	CN18421	Project Work – Phase II	0	0	30	12	50	50	100	
Total			0	0	30	12	100			

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Department	Civil Engineering						
Programme	M.E – Construction Engineering and Management						
List of Electives							

ELECTIVES (SEMESTER – I)									
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P		C	CA	ES
1.	CN18191	Advanced Concrete Technology (Common to ST & CN)	3	0	0	3	30	70	100
2.	ST18192	Maintenance and Rehabilitation of Structures (Common to ST & CN)	3	0	0	3	30	70	100
3.	CN18193	Research Methodology and Intellectual Property Rights (Common to ST & CN)	3	0	0	3	30	70	100
4.	CN18164	Business Economics and Finance Management	3	0	0	3	30	70	100
5.	CN18165	Pavement Engineering	3	0	0	3	30	70	100
6.	CN18166	Quantitative Techniques in Management	3	0	0	3	30	70	100

ELECTIVES (SEMESTER – II)									
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P		C	CA	ES
1.	CN18291	Chemistry of cement and concrete (Common to ST & CN)	3	0	0	3	30	70	100
2.	ST18292	Special Concrete (Common to ST & CN)	3	0	0	3	30	70	100
3.	CN18263	Personnel Management in Construction	3	0	0	3	30	70	100
4.	CN18264	Construction Project Management	3	0	0	3	30	70	100
5.	CN18265	Energy Conservation Techniques in Building Construction and Maintenance	3	0	0	3	30	70	100
6.	CN18266	System Integration in Construction	3	0	0	3	30	70	100

ELECTIVES (SEMESTER – III)									
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
1.	CN18361	Prefabricated Structures	3	0	0	3	30	70	100
2.	CN18362	Computer Application in Construction Engineering and Planning	3	0	0	3	30	70	100
3.	CN18363	Quality Control and Assurance in Construction	3	0	0	3	30	70	100
4.	CN18364	Resource Management and Control in Construction	3	0	0	3	30	70	100
5.	CN18365	Shoring, Scaffolding and Formwork	3	0	0	3	30	70	100
6.	CN18366	Building Management Systems	3	0	0	3	30	70	100

LIST OF OPEN ELECTIVES (SEMESTER – III)									
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
1.	CN18OE1	Energy Efficient Buildings	3	0	0	3	30	70	100
2.	CN18OE2	Economics and Finance management in construction	3	0	0	3	30	70	100
3.	CN18OE3	Stress Management	3	0	0	3	30	70	100
4.	CN18OE4	Materials Management	3	0	0	3	30	70	100
5.	CN18OE5	Building Acoustics and Noise control	3	0	0	3	30	70	100

AUDIT COURSE (SEMESTER – III)									
Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
1.	ST183A1	English for Research paper writing (Common to ST & CN)	3	0	0	3	50	50	100

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SEMESTER - I

MA18131	STATISTICAL METHODS AND QUEUEING THEORY	L	T	P	C
		3	0	0	3

Objectives:

- To know one dimensional random variable and Distributions.
- To extend their knowledge in the concepts of Estimation theory and also to acquire knowledge in testing of hypothesis.
- To study the basics of design of Experiments and to understand the concepts of queuing models.

UNIT - I ONE DIMENSIONAL RANDOM VARIABLE [9]

Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Uniform and Normal distributions – Function of a Random Variable.

UNIT - II ESTIMATION THEORY [9]

Estimation of parameters – Unbiased Estimator - Maximum Likelihood Estimation – Curve fitting by Principle of least squares - linear trend $y = ax + b$ and second degree parabola $y = ax^2 + bx + c$ – Regression equations.

UNIT - III TESTING OF HYPOTHESIS [9]

Sampling distributions - Type I and Type II errors – Test of significance for attributes: test for difference between two proportions – Test of significance for small sample (Student's t- test) - Test of significance for large samples (z-test) - Test of significance of variance (F- test) – Chi-Square test for Independence and attributes.

UNIT - IV DESIGN OF EXPERIMENTS [9]

Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT - V QUEUEING MODELS [9]

Poisson Process – Applications of Queuing Models – characteristics of Queuing Models – Kendall's notation - Markovian queues – Model I – (M/M/1) : (∞ / FIFO) Single Server with infinite capacity – Little's formula - Model II – (M/M/C) : (∞ / FIFO) Multi Server with infinite capacity - Model III – (M/M/1) : (N / FIFO) Single Server with finite capacity - Model IV – (M/M/C) : (N / FIFO) Multi Server with finite capacity Models.

Total = 45 Periods**Course Outcomes: On Completion of this course, the student will be able to**

- Study the concept of one dimensional random variable and Distributions.
- Explain and estimate the values in Estimation theory.
- Find the inference of the samples by using various methods in testing of hypothesis.
- Interpret variances by design of experiments to obtain inferences.
- Apply the concepts of queuing models in engineering fields.

Reference Books:

1. Dr. S.P. Gupta, "Statistical Methods", Sultan Chand and Sons, New Delhi, 2015.
2. S. Palaniammal, "Probability and Queueing Theory", PHI Learning, P (Ltd), New Delhi.2014.
3. Gupta, S. C. and Kapoor, V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 2013.
4. P.K.Gupta & Man Mohan, "Operations Research" Sultan Chand & Sons, 12th edition, 2015.
5. Vohra, N.D. "Quantitative Techniques in Management", Tata McGraw – Hill Company Limited, 2014.

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SEMESTER - I

CN18112	MODERN CONSTRUCTION MATERIALS	L	T	P	C
		3	0	0	3
Objectives:					
<ul style="list-style-type: none"> • To know about the exceptional behaviors of various concrete in practice. • To know about the properties of high volume fly ash concrete and applications of polymers and mix proportions of polymers. • To give knowledge about special types of concrete. 					
UNIT - I SPECIAL CONCRETE					[9]
Behaviour of concrete - High Strength and High Performance Concrete – SIMCON, SIFCON, Geopolymer Concrete- Nanoconcrete- Self Healing Concrete – Self-cleaning concrete - Controlled Low Strength Materials					
UNIT - II METALS					[9]
Steels - New Alloy Steels – Aluminium and its Products –Coatings to reinforcement – Applications.					
UNIT - III COMPOSITES					[9]
Plastics –Reinforced Polymers – FRP – Applications					
UNIT - IV OTHER MATERIALS					[9]
Water Proofing Compounds – Non-weathering Materials – Flooring and Façade Materials – Thermal insulation & acoustics absorption materials – Lightweight blocks - Aerocon					
UNIT - V SMART AND INTELLIGENT MATERIALS					[9]
Smart and Intelligent Materials for intelligent buildings - Special features					

Total (L: 45 T: 0) =45Periods**Course Outcomes: On Completion of this course the students will be able to**

- Know about the special concrete usage in field.
- Gain knowledge about different types of metals and alloys in construction field.
- Illustrate various techniques for polymers inclusion in concrete.
- Illustrate various materials in construction field.
- Give knowledge about smart materials for intelligent buildings.

Reference Books :

- 1 R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.
- 2 M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003.
- 3 Workshop on Steel Concrete Composite Structures, Conducted at Anna University, (2000).
- 4 IS 11384 -1985, Code of Practice for Steel concrete Composite structures.
- 5 <http://nptel.ac.in/downloads/105106053>

SEMESTER - I

CN18113	CONSTRUCTION EQUIPMENT	L	T	P	C
		3	0	0	3

Objectives:

- To study the equipment used for different construction works.
- To gain knowledge in handling of equipment in site.
- To study the equipment productivity and its management.

UNIT - I EQUIPMENT FOR EARTHWORK [9]

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of EarthWork Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers

UNIT - II OTHER CONSTRUCTION EQUIPMENTS [9]

Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment –Equipment for Demolition.

UNIT - III MATERIALS HANDLING EQUIPMENT [9]

Forklifts and related equipment - Portable Material Bins – Conveyors - Hauling Equipment

UNIT - IV EQUIPMENT FOR PRODUCTION OF AGGREGATE AND CONCRETING [9]

Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters

UNIT - V CONSTRUCTION EQUIPMENT MANAGEMENT [9]

Identification – Resource Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management

Total (L: 45 T: 0) =45Periods

Course Outcomes: On Completion of this course the students will be able to

- Explain the principles of effective utilization of equipment.
- Explain the basics of construction equipment.
- Know about the materials handling in construction site.
- Recognize the productivity of equipment management.
- Know about the management of equipment and their utilization.

Reference Books :

- 1 Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, NewDelhi, (2010).
- 2 Dr.Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi. (1988).
- 3 Robert L. Peurifoy, Clifford J. Schexnayder, Aviad Shapira, Robert Schmitt. "Construction Planning, Equipment, and Methods", McGraw-Hill, (2010)

SEMESTER - I

CN18114	CONTRACT LAWS AND REGULATIONS	L	T	P	C
		3	0	0	3

Objectives:

- To study the various types of construction contracts and their legal aspects and provisions.
- To study contract laws and regulations so that adequate knowledge on formulating and managing construction contracts is gained.
- To know about tendering and legal requirements.

UNIT - I CONSTRUCTION CONTRACTS [9]

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

UNIT - II TENDERS [9]

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tamilnadu Tenders Act.

UNIT - III ARBITRATION [9]

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

UNIT - IV LEGAL REQUIREMENTS [9]

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

UNIT - V LABOUR REGULATIONS [9]

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Study the elements of concluding, and administering contracts
- Know about the procedure for tendering and documentation.
- Achieve awareness on arbitrations and legal procedures
- Know about the labor requirements in terms of tax and cost analysis.
- Study labor regulations and their impact on managing of contracts

Reference Books :

- 1 Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", M.M.Tripathi Private Ltd., Bombay, 4th edition, (2000).
- 2 Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., "Fundamentals of Construction Management and Organisation", Printice Hall, (1985).
- 3 Jimmie Hinze, "Construction Contracts", McGraw Hill, (2001)
- 4 <http://nptel.ac.in/courses/105103093>

SEMESTER - I

CN18121	CONSTRUCTION ENGINEERING LABORATORY	L	T	P	C
		0	0	3	2

Objectives:

- To provide a thorough knowledge of material selection through the material testing based on specification
- To understand about fresh and hardened properties of concrete using admixtures
- To learn the quality of control of concrete.

List of Experiments:

1. Mix Design of Concrete as per IS, ACI ,BS Method for high performance concrete
2. Mix Design of self-compacting concrete as per EFNARC guidelines.
3. Flow characteristics of self-compacting concrete
4. Effect of minerals in concrete at fresh and hardened state with relevance to workability, strength and durability.
5. Effect of chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.
6. Permeability tests on hardened concrete
7. Determination of in-situ strength and quality of concrete using
 - Rebound hammer and
 - Ultrasonic pulse velocity tester

Total : 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Explain the high performance Concrete mix design procedure as per ACI IS and BS method
- Know about the method of testing of workability of concrete using admixtures by Slump test.
- Learn about the method of testing mechanical properties of concrete using admixtures.
- Explain the self-compacting concrete mix design procedure as per EFNARC guidelines.
- Learn about the method of testing of simply supported reinforced concrete beam for strength and deflection behavior.

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SEMESTER - I

CN18122

TECHNICAL PRESENTATION - I

L	T	P	C
0	2	0	1

Objective: To prepare students to gain confidence in technical presentation and report preparation.

- The students have to refer the journals and conference proceedings and collect the literature.
- The student can select a course oriented topic.
- The students have to collect at least 30 research papers published in the last decades.
- Using OHP / Power Point, the student has to make presentation for 20 minutes followed by 10 minutes discussion.
- The student has to make five presentations in the semester.
- The student has to write a technical report for about 30 - 50 pages (Title page, One page Abstract, Review of Research paper under various sub - headings, concluding remarks and list of references).
- The technical report has to be submitted to the course coordinator one week before the final presentation.

Total : 30 Periods

Course Outcomes: On Completion of this course, the student will be able to

- Recognize the area of interest of the student.
- Identify the thrust areas by referring journals, conference proceedings etc.
- Familiarize with literature collection.
- Gain knowledge in the current topic.
- Know about report writing and presentation.

SEMESTER - II

CN18211	ADVANCED CONSTRUCTION TECHNIQUES	L	T	P	C
		3	0	0	3

Objectives:

- To know about advanced techniques in sub structure and super structure.
- To gain knowledge in erection of special structures in construction field.
- To learn about the demolition and rehabilitation techniques for existing structures.

UNIT - I SUB STRUCTURE CONSTRUCTION [15]

Box jacking - pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - piling techniques - driving well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - laying operations for built up offshore system - shoring for deep cutting - large reservoir construction - well points - dewatering and stand by plant equipment for underground open excavation.

UNIT - II SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS [10]

Vacuum dewatering of concrete flooring – concrete paving technology – techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – launching techniques – suspended form work – erection techniques of tall structures, large span structures – launching techniques for heavy decks – insitu prestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures

UNIT - III CONSTRUCTION OF SPECIAL STRUCTURES [10]

Erection of lattice towers and rigging of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – launching and pushing of box decks – Advanced construction techniques for offshore structures – construction sequence and methods in domes and pre stressed domes – support structure for heavy equipment and conveyor and machinery in heavy industries – erection of articulated structures, braced domes and space decks.

UNIT - IV REHABILITATION TECHNIQUES [5]

Mud jacking grout through slab foundation - micropiling for strengthening floor and shallow profile - pipeline laying - protecting sheet piles, screw anchors - sub grade water proofing, underpinning, crack stabilization techniques.

UNIT - V DEMOLITION [5]

Types of demolition-Advanced techniques and sequence in demolition and dismantling- Equipment for demolition- Precaution measures of demolition.

Total (L: 45 T: 0) =45Periods

Course Outcomes: On Completion of this course the students will be able to

- Explain the various processes involved in sub-structure construction.
- Study the various processes involved in super-structure construction.
- Know the construction process of special structures and offshore structures.
- Know about the rehabilitation techniques carried out for a structure.
- Know about the demolition techniques carried out for a structure.

Reference Books :

- 1 Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, (2008).
- 2 Peter.H.Emmons, "Concrete Repair and Maintenance Illustrated", Galgotia Publications Pvt. Ltd., (2001).
- 3 Jerry Irvine, Advanced Construction Techniques, CA Rocketr, (1984)

SEMESTER - II

CN18212	PROJECT FORMULATION AND APPRAISAL	L	T	P	C
		3	0	0	3

Objectives:

- To study and understand the formulation of projects.
- To know about the costing of construction projects.
- To gain knowledge about the need of project appraisal.

UNIT - I PROJECT FORMULATION [10]

Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno- Economic Feasibility Report, Detailed Project Report – Different Project Clearances required

UNIT - II PROJECT COSTING [10]

Project Cash Flows-Type of cash flow – Time Value of Money – Cost of Capital-Problems.

UNIT - III PROJECT APPRAISAL [10]

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice

UNIT - IV PROJECT FINANCING [5]

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios

UNIT - V PRIVATE SECTOR PARTICIPATION [10]

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Study elements of project formulation and appraisal
- Know how to prepare the report on the project.
- Study about the risk analysis in practice.
- Study the costing and financial aspects of projects
- Study the implications of private sector participation in construction projects

Reference Books :

- 1 United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, (2005)
- 2 Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill New York, (1995).
- 3 Frank Harrison, E., "The Managerial Decision Making Process ", Houghton Mifflin Co.Boston, 2005.
- 4 <http://www.nptel.ac.in/courses/112102107/4>

SEMESTER - II

CN18213	CONSTRUCTION PLANNING, SCHEDULING AND CONTROL	L	T	P	C
		3	0	0	3

Objectives:

- To understand the basics of Construction Planning.
- To know about the Scheduling Techniques and monitoring of Cost Control.
- To learn about management of Quality, Safety and Organization.

UNIT - I CONSTRUCTION PLANNING [10]

Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems.

UNIT - II SCHEDULING PROCEDURES AND TECHNIQUES [10]

Construction Schedules - Critical Path Method – Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Node and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedence - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process.

UNIT - III COST CONTROL, MONITORING AND ACCOUNTING [15]

The Cost Control Problem - The Project Budget - Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts - Control of Project Cash Flows - Schedule Control - Schedule and Budget Updates - Relating Cost and Schedule Information.

UNIT - IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION [5]

Quality and Safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality Control - Quality Control by Statistical Methods - Statistical Quality Control with Sampling by Attributes - Statistical Quality Control with Sampling by Variables - Safety

UNIT - V ORGANIZATION AND USE OF PROJECT INFORMATION [5]

Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use of Information - Organizing Information in Databases - Relational Model of Databases - Other Conceptual Models of Databases - Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Identify choice of technology and construction method through construction planning.
- Know how to prepare the report on the project.
- Study about the risk analysis in practice.
- Study the costing and financial aspects of projects.
- Study the implications of private sector participation in construction projects.

Reference Books :

- 1 Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, (2002).
- 2 Calin M. Popescu, Chotchai Charoengam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, (1995).
- 3 Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, (2000).
- 4 Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, (1987).
- 5 Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, (2009).

SEMESTER - II

CN18214	SAFETY PRACTICES AND MANAGEMENT	L	T	P	C
		3	0	0	3

Objectives:

- To provide a structured management system to eliminate or control risk in operations into an acceptable level.
- To set up Safety Management System Unit to oversee the development and implementation of Safety Management
- To develop and embed a safety culture in all our activities that recognize the importance and value of effective Safety Management and acknowledge at all times that safety is paramount.

UNIT - I CONSTRUCTION ACCIDENTS [9]

Construction Accidents - Construction Safety Management: Importance – Causes of Accidents, Safety Measures – Environmental Issues in Construction – Construction Industry related laws. Human Factors in Construction Safety - Legal and Financial aspects of accident in Construction - Occupational and Safety Hazard Assessment.

UNIT - II SAFETY PROGRAMMES AND CONTRACTUAL OBLIGATIONS [9]

Safety Programmes – Construction safety – Element of effective safety programmes – job –site assessment – Safety meetings – Safety Incentives. Contractual Obligations – Safety in Construction Contracts – Substance abuse – Safety Record keeping

UNIT - III DESIGNING FOR SAFETY [9]

Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation

UNIT - IV OWNER'S AND DESIGNER'S OUTLOOK [9]

Accident Prevention – Cost of Accidents – Safety and Productivity – Safety Provision in the Factories act – Accident Reporting Investigation and Statistics – Total loss control and damage control – Safety sampling – Safety audit – Critical incidents technique – Safety equipment – Planning and Site preparation – safety system of storing construction materials – excavation – Blasting – Timbering – Scaffolding – Safe use of Ladder – Safety in Welding

UNIT - V SAFETY IN HANDLING EQUIPMENT [9]

Safety in hand tools – Safety in grinding – Hoisting Apparatus and Conveyors – Safety in the Use of Mobile Cranes – manual Handling – Safety in Demolition work – Trusses, Girders and beams – First aid - Fire hazard and Prevention Methods – Interesting experience at the construction site against the fire accident

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Clearly define for all staff their accountabilities and responsibilities for the development and delivery of safety
- Ensure that all staff is provided with adequate and appropriate safety information and training, are competent in safety matters and are only allocated tasks commensurate with their skills;
- Ensure that all staff is provided with adequate and appropriate safety information
- Provide the necessary training to build and maintain a meaningful aerodrome operational safety leadership skill.
- Ensure that the measurement of the organizational safety performance and safety targets are in place.

Reference Books :

1. Tim Howarth and Paul Watson, Construction Safety Management, Wiley-Blackwell (2008)
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., (2001)
3. Handbook On Construction Safety Practice, SP – 70, BIS, (2001)

SEMESTER – II

CN18221	ADVANCED COMPUTING TECHNIQUES LABORATORY	L	T	P	C
		0	0	3	2

Objectives:

- To acquire utilizing the sophisticated Spread sheets programs, Estimation Software and other package programs
- To understand the concept of planning, scheduling, cost and quality control,
- To learn organization and use of project information necessary for construction project.

List of Experiments:

1. Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project.
2. Design of a simple equipment information system for a construction project.
3. Scheduling of a construction project using software.
4. Scheduling of a construction project using tools like MS project scheduling systems.
5. Resource allocation for construction project and leveling of the resources.
6. Monitoring of the construction project, tracking and taking reports using tools like MS project scheduling systems.
7. Inventory management system for the given construction project.
8. Simulation models for project risk analysis.

LIST OF SOFTWARES

1. MS OFFICE
2. QE PRO
3. MS PROJECT
4. PRIMAVERA SOFTWARE

Total : 45 Periods

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SEMESTER - II

CN18222	TECHNICAL PRESENTATION - II	L	T	P	C
		0	2	0	1

Objective: *To prepare students to gain confidence in technical presentation and report preparation.*

- The students have to refer the journals and conference proceedings and collect the literature.
- The students can select a course oriented topic.
- The students have to collect at least 30 research papers published in the last decades.
- Using OHP / Power Point, the student has to make presentation for 20 minutes followed by 10 minutes discussion.
- The student has to make five presentations in the semester.
- The student has to write a technical report for about 30 - 50 pages (Title page, One page Abstract, Review of Research paper under various sub - headings, concluding remarks and list of references).
- The technical report has to be submitted to the course coordinator one week before the final presentation.

Total : 30 Periods

Course Outcomes: On Completion of this course, the student will be able to

- *Recognize the area of interest of the student.*
- *Identify the thrust area by referring journals, conference proceedings etc.*
- *Enhance the collective skills between theoretical knowledge and real time problems.*
- *Gain knowledge on the area by presentation and review.*
- *Acquire idea on report writing and presentation related to the area.*

SEMESTER - I

CN18191	ADVANCED CONCRETE TECHNOLOGY	L	T	P	C
	(ELECTIVE) (Common to ST & CN)	3	0	0	3

Objectives:

- To study the properties of materials, tests, admixtures for concrete and concreting under special circumstances.
- To gain knowledge about mix design and special types concrete and their effects on concrete properties.
- To know different applications in construction field and tests on concrete.

UNIT - I CONCRETE MAKING MATERIALS [9]

Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified grading, Testing of aggregates. Cement, Grade of cement, Chemical composition, Testing of cement, Hydration of cement, Structure of hydrated cement, special cements, Water, Chemical admixtures, Mineral admixtures.

UNIT - II PROPERTIES OF CONCRETE [9]

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and Shrinkage, Variability of concrete strength, Durability of concrete

UNIT - III MIX DESIGN [9]

Principles of concrete mix design, Methods of concrete mix design, Testing of concrete, Statistical quality control- sampling and acceptance criteria.

UNIT - IV SPECIAL CONCRETE [9]

Light weight concrete, Heavy weight concrete, Fly ash concrete, Fibre reinforced concrete, Sulphur infiltrated Concrete, Polymer Concrete, Super plasticized concrete, Hyper plasticized concrete, High performance concrete, High performance fibre reinforced concrete, self-compacting concrete.

UNIT - V MICROSTRUCTURAL ANALYSIS [9]

X- Ray Diffraction, Differential Thermal Analysis, Thermo gravimetry Analysis, Atomic Absorption Spectroscopy, Conduction Calorimetry, Potentiometric Methods, X-Ray Fluorescence Analysis, Neutron Activation Analysis, Mossbauer Spectroscopy, Nuclear UV Absorption Spectroscopy, Electron Microscopy, Surface Area, Helium Pycnometry, Microhardness, Mercury Porosimetry, other Techniques and Standards and Specifications.

Total (L : 45 T : 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Acquire knowledge on constituent materials of concrete, different types of cement, composition and properties and tests of cement and properties of aggregates.
- Gain knowledge about concrete and their effects on concrete properties and study the mineral admixtures.
- Know the principles of mix proportioning and Mix design is to be studied for different methods.
- Gain knowledge about types of special concrete.
- Identify different types of concretes and their properties and its applications in construction field.

Reference Books :

1. M.S. Shetty, "Concrete Technology", S. Chand and Company Ltd. Delhi, 2014.
2. A.R. Santhakumar, "Concrete Technology", Oxford University Press, 2006.
3. A.M. Neville, "Properties of Concrete", Prentice Hall, London, 2012,
4. M.L. Gambir, "Concrete Technology", Tata McGraw Hill, Publishing Co. Ltd, New Delhi, 2006.
5. V.S ramachandran – Hand book of analytical techniques in concrete science and technology

SEMESTER - I

ST18192	MAINTENANCE AND REHABILITATION OF STRUCTURES (ELECTIVE) (Common to ST & CN)	L	T	P	C
		3	0	0	3

Objectives:

- To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
- To emphasize the importance of maintenance and inspection of structures and to divulge fundamental knowledge on various repairing strategies
- To impart a broad knowledge in the area of repair and rehabilitation of structures.

UNIT - I INFLUENCE ON SERVICEABILITY AND DURABILITY [9]

Effects due to climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking, Methods of Corrosion Protection, Corrosion Inhibitors, Corrosion Resistant Steels, Coatings, Cathodic Protection.

UNIT - II MAINTENANCE AND REPAIR STRATEGIES [9]

Definitions: Maintenance, Repair and Rehabilitation, Facts of Maintenance - Importance of Maintenance - Preventive Measures on Various Aspects Inspection, Assessment Procedure for Evaluating a Damaged Structure Causes of Deterioration - Testing Techniques.

UNIT - III MATERIALS FOR REPAIR [9]

Special Concretes and Mortar, Concrete Chemicals, Special Elements for Accelerated Strength Gain, Expansive Cement, Polymer Concrete, Sulphur Infiltrated Concrete, Ferro Cement, Fiber Reinforced Concrete.

UNIT - IV TECHNIQUES FOR REPAIR [9]

Rust Eliminators and Polymers Coating for Rebar's During Repair Foamed Concrete, mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete, Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

UNIT - V REHABILITATION OF STRUCTURES [9]

Repairs to overcome low member strength, Deflection, Cracking, Chemical Disruption, Weathering Wear, Fire, Leakage, Marine Exposure. Engineered Demolition Techniques for Dilapidated Structures – Case Studies.

Total = 45 Periods**Course Outcomes: On Completion of this course, the student will be able to**

- Identify the effects due to climate, temperature, chemicals, wear and erosion on structures.
- Know the strategies of maintenance and repair
- Gain knowledge about the best Materials and Techniques for Repair.
- Demonstrate the various types of distress in concrete structures.
- Analyze and provide remedies for failures in structure due to design and construction errors.

Reference Books :

- 1 Shetty.M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, New Delhi, 2018.
- 2 Allen R.T. and Edwards S.C., "Repair of Concrete Structures", Blakie and Sons, UK, 2011.
- 3 Palaniappan.N., "Estate Management, Anna Institute of Management", Chennai, 1992.
- 4 Santhakumar. A.R., "Training Course Notes on Damage Assessment and Repair in Low Cost Housing", "RHDC-NBO", Anna University, July, 1992.
- 5 Denison Campbell-Allen and Harold Roper., "Concrete Structures", Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.

SEMESTER - I

CN18193	RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS (Common to ST & CN)	L	T	P	C
		3	0	0	3

Objectives:

- To impart scientific, statistical and analytical knowledge for carrying out research work effectively.
- To gain essential knowledge to do innovations in engineering.
- To understand olden days inventions and discoveries.

UNIT - I RESEARCH CONCEPTS [9]

Concepts, meaning, objectives, motivation, types of research, approaches, research (Descriptive research, Conceptual, Theoretical, Applied & Experimental). **Formulation of Research Task** – Literature Review, Importance & Methods, Sources, quantification of Cause Effect Relations, Discussions, Field Study, Critical Analysis of Generated Facts, Hypothetical proposals for future development and testing, selection of Research task

UNIT - II MATHEMATICAL MODELING AND SIMULATION [9]

Concepts of modeling, Classification of Mathematical Models, Modeling with Ordinary differential Equations, Difference Equations, Partial Differential equations, Graphs, Simulation, Process of formulation of Model based on Simulation

UNIT - III EXPERIMENTAL MODELING [9]

Definition of Experimental Design, Examples and Single factor Experiments, Guidelines for designing experiments. Process Optimization and Designed experiments, Methods for study of response surface, determining optimum combination of factors, Taguchi approach to parameter design

UNIT - IV ANALYSIS OF RESULTS AND REPORT WRITING [9]

Parametric and Non-parametric, descriptive and Inferential data, types of data, collection of data (normal distribution, calculation of correlation coefficient), processing, analysis, error analysis, different methods, analysis of variance, significance of variance, analysis of covariance, multiple regression, testing linearity and non-linearity of model.

Report Writing: Types of reports, layout of research report, interpretation of results, style manual, layout and format, style of writing, typing, references, tables, figures, conclusion, appendices.

UNIT - V INTELLECTUAL PROPERTY RIGHTS [9]

Administration of patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge case Studies, IPR and IITs.

Total (L : 45 T : 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Acquire a sound and fundamental understanding of the scientific, mathematical, and engineering principles underlying surveying.
- Analyze, interpret, and apply research and research-related data.
- Recognize, analyze, and solve society problems and environment problems.
- Acquire an understanding of the responsibilities and ethics of research professionals.
- Recognize the need to prepare for life-long study and learning.

Reference Books :

1. C.R. Kothari, Research Methodology Methods and Techniques, 2/e, Vishwa Prakashan, 2004.
2. Panneerselvam R, Research Methodology, PHI Learning Private Limited, 2014.
3. Douglas Montgomery, Design of Experiments, Statistical Consulting Services, 2004.
4. S.S.Rao, Optimization Theory and Application Wiley Eastern Ltd, New Delhi, 1996.

SEMESTER - I

CN18164	BUSINESS ECONOMICS AND FINANCE MANAGEMENT (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study the role and methods of economics and finance concepts applied to construction business.
- To study the need for financial management and means of achieving the same.
- To study the elements of construction economics.

UNIT - I ECONOMICS**[10]**

Role of Civil Engineering in Industrial Development – Advances in Civil Engineering - Engineering Economics – Support Matters of Economy related to Engineering – Market demand and supply – Choice of Technology – Quality Audit in economic law of returns governing production.

UNIT - II CONSTRUCTION ECONOMICS**[10]**

Construction development in Housing, transport energy and other infrastructures – Economics of ecology, environment, energy resources – Local material selection – Form and functional designs – Construction workers – Urban Problems – Poverty – Migration– Unemployment – Pollution.

UNIT - III FINANCING**[13]**

The need for financial management - Types of financing – Financing instruments– short term borrowing – Long term borrowing – Leasing – Equity financing – Internal generation of funds – External commercial borrowings – Assistance from government budgeting support and international finance corporations – Analysis of financial statements – Balance Sheet - Profit and Loss account – Cash flow and Fund flow analysis – Ratio analysis – Investment and financing decision – Financial Control - centralized management.

UNIT - IV ACCOUNTING METHOD**[6]**

General Overview – Cash basis of accounting – Accrual basis of accounting – Percentage completion method – Completed contract method – Accounting for tax reporting purposes and financial reporting purposes – Accounting Standards

UNIT - V LENDING TO CONTRACTORS**[6]**

Loans to Contractors – Interim construction financing – Security and risk aspects.

Total (L: 45 T: 0) = 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Study the elements of lending to the contractors.
- Bring about an exposure to construction economics
- Know about the financing of construction project
- Know about the accounting methods and their usefulness in controlling construction projects.
- Create a complete understanding on quality assurance.

Reference Books :

- 1 Kwaku.A, Tenah and Jose M.Guevara., “Fundamental of Construction Management and Organisation”, Prentice – Hall of India, (1995)
- 2 Madura.J and Veit.E.T., “Introduction to Financial Management”, West Publishing Co., St. Paul, (1988).
- 3 Halpin, D.W., “Financial and Cost Concepts for Construction Management”, John Wiley & Sons, New York, (1985)
- 4 <http://www.nptel.ac.in/syllabus/105102014/>

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SEMESTER - I

CN18165	PAVEMENT ENGINEERING (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study the properties of flexible and rigid pavement
- To gain essential knowledge to do repairs and rehabilitations
- To get innovative ideas for sustainable development in highways

UNIT - I ROAD MAKING MATERIALS FOR FLEXIBLE AND RIGID PAVEMENTS [9]

Classification, testing, applications of road making materials – aggregates-Road binders – Bitumen – Cement-Selection of Cement.

UNIT - II PROPERTIES OF BITUMINOUS MIXTURES [10]

Resistance of bituminous mixtures to permanent deformation – Flexibility and brittleness - Common mechanical tests – Permeability characteristics – Weathering of bituminous road surfacing – Adhesion of bituminous binders to road aggregates – Effect of aggregate size in bituminous courses – Temperature susceptibility of bituminous courses – Design of bituminous mixes.

UNIT - III PROPERTIES OF PAVEMENT QUALITY CONCRETE MIXTURES AND CONSTRUCTION PRACTICE [11]

Properties of fresh and hardened concrete – laboratory tests – Design of concrete mixes for Pavement Control-Construction of various layers in rigid and flexible pavements – Quality assurance during construction – sampling and analysis.

UNIT - IV MACHINERIES [8]

Road making machineries – Road formation, bituminous constructions – Road surface evaluation

UNIT - V LATEST ADVANCEMENTS [7]

Methods to improve bitumen quality – Rheological and chemical additives – Polymer modified bitumen – Super pave concepts – Recycling of bituminous courses – Smart materials for cement concrete pavement – Use of admixtures, waste materials and fibres- Pervious Concrete.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Characterize strength and durability of pavement materials
- Study the concepts of pavement
- Explain and account for climatic factors in pavement design and analysis
- Know the mechanisms of pavement deterioration and identify distress types
- Recommend pavement preservation techniques

Reference Books :

- 1 Mix Design Methods for Asphalt Concrete and other Hot mix types MS 2, Sixth Edition, The Asphalt Institute, 1997.
- 2 Edwin J.Barth, Asphalt Science and Technology, Gordon and Breach Science Publishers, New York, 1984.
- 3 <http://www.mbcet.colg.in/2mark/CIVIL%20%20MARKS%20QUESTIONS/IV%20YEAR/CE1007-PS-1&2.pdf>

SEMESTER - I

CN18166	QUANTITATIVE TECHNIQUES IN MANAGEMENT (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To review the basics of Optimization principles.
- To study the optimization techniques and simulation of models.
- To apply the concepts studied under 1 and 2 above to inventory, scheduling and other related problems.

UNIT - I OPERATIONS RESEARCH [9]

Introduction to Operations Research - Linear Programming – Graphical and Simplex Methods, Duality and Post – Optimality Analysis – Transportation and Assignment Problems.

UNIT - II PRODUCTION MANAGEMENT [9]

Inventory Control - EOQ - Quantity Discounts - Safety Stock – Replacement Theory – PERT and CPM – Simulation Models – Quality Control.

UNIT - III FINANCIAL MANAGEMENT [9]

Working Capital Management – Compound Interest and Present Value methods – Discounted Cash Flow Techniques – Capital Budgeting.

UNIT - IV DECISION THEORY [9]

Decision Theory – Decision Rules – Decision making under conditions of certainty, risk and uncertainty – Decision trees – Utility Theory.

UNIT - V MANAGERIAL ECONOMICS [9]

Cost Concepts – Break-even analysis – Pricing Techniques – Game theory Applications.

Total (L: 45T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Acquire knowledge on linear programming and graphical methods.
- Gain knowledge on EOQ, simulation models & Quality Control.
- Relate working capital cost and capital budgeting.
- Plan under critical situation by decision theory.
- Acquire knowledge on cost concepts and pricing techniques.

Reference Books :

- 1 Frank Harrison, E., The Managerial Decision Making Process, Houghton Mifflin Co., Boston, 1999.
- 2 HamdyA.Taha, Operations Research: An Introduction, Prentice Hall, 2010.
- 3 Levin, R.I, Rubin,D.S., and Stinson J., Quantitative Approaches to Management, McGraw Hill College, 1993.
- 4 Schroeder, R.G, Operations Management, McGraw Hill, 2009.

CN18291	SEMESTER - II			
	CHEMISTRY OF CEMENT AND CONCRETE			
	(ELECTIVE)			
	L	T	P	C
	3	0	0	3
(Common to ST & CN)				

Objectives:

- To learn about the chemical combination in cement.
- To acquire knowledge in hydration process of pozzolanic and portland cement.
- To gain knowledge on types of cement and their application on concrete.

UNIT - I POZZOLANA CEMENT [9]

Definition- classifications- Pozzolanic activity and its influencing factors- Lime – Pozzolana reaction and products formation- Applications.

UNIT - II PORTLAND CEMENT [9]

Definition- Raw materials and their physical – chemical characteristics- manufacturing process- cement making kilns viz, Rotary and shaft kiln- Refractory used in Rotary kiln- reactions occurred in different zones of rotary kiln- Hydration of cement- Setting and hardening of Portland cement- Heat of Hydration- Action of acid & sulphate water on cement- Flash set and False set of cement- Alkali – Aggregate reaction in Portland cement -Applications.

UNIT - III SPECIAL CEMENTS [9]

Rapid hardening Portland cement- Quick setting cement- White Portland Cement, coloured cement- Sulphate resisting cement- Low heat Portland cement- Oil – well cement- Waterproofed Portland cement- Hydrophobic cement- sored cement- Blended Cement- Macro defect Free (MDF) Cement- Refractory Cement- Cement paints.

UNIT - IV HIGH ALUMINA CEMENT [9]

Introduction to refractory cement- Raw Materials used classification and composition of HAC- manufacturing process-Mineralogical phases of HAC- Hydration of HAC on the basis of CaO-Al₂O₃-H₂O Phase diagram- Strength Development-HAC castables and uses.

UNIT - V CONCRETE [9]

Introduction- Admixture- Gap Grade concrete- continuous grade concrete- light, normal and heavy concrete-properties of concrete- installation technique of concrete- uses of various concretes.

Total (L: 45 T: 0) = 45Periods

Course Outcomes: On Completion of this course the students will be able to

- Gain knowledge on reactions due to pozzolana cement.
- Acquire knowledge to effects of Portland cement.
- Know about the special types of cement.
- Gain Knowledge about the effects of using high alumina cement.
- Acquire knowledge about the impact of cement on concrete.

Reference Books :

- 1 V.S. Ramachandran., "Concrete Admixtures Handbook", Second Edition, Standard Publishers Distributors, (17 05), Nai sarak, Delhi.
- 2 A.R.Santhakumar ;"Concrete Technology",Oxford University Press,(2007)
- 3 <http://nptel.ac.in/courses/105102012/9>

		SEMESTER - II			
		SPECIAL CONCRETE			
		(ELECTIVE)			
		(Common to ST & CN)			
ST18292		L	T	P	C
		3	0	0	3

Objectives:

- To study the special concreting techniques, quality control of concrete construction and their future trends in special concretes.
- To understand the advanced engineering knowledge and capabilities pertaining to the specification, production, properties, testing and application of concrete as a construction material.
- To know different types of concretes and their properties and its applications in construction field and special types of concrete.

UNIT - I FIBRE REINFORCED CONCRETE AND FERROCEMENT [9]

Fibre reinforced concrete - types of fibre – properties of fibres – factors affecting the properties of FRC – Workability – mixing - application. Different types of fibre reinforced concrete – current development in FRC. Ferrocement – Casting Techniques – Applications

UNIT - II LIGHT WEIGHT CONCRETE AND HIGH DENSITY CONCRETE [9]

Light weight concrete – light-weight Aggregate concrete – Structural light-weight concrete – workability – Design of light-weight Aggregate concrete Mix – mixing procedure – Aerated concrete – No-fines concrete. High density concrete – Types of radiation Hazards – Use of Concrete for radiation shielding

UNIT - III HIGH VOLUME FLY ASH AND SLAG CONCRETE [9]

Introduction – High volume fly ash & slag concrete - Mechanism of hydration – Mix proposition – properties of Fresh & Hardened Concrete. Durability Aspects of High Volume fly Ash Concrete and slag concrete

UNIT - IV POLYMER MODIFIED MORTAR AND CONCRETE [9]

Introduction – Application- General principle – Latex modification, Re dispersible polymer powders – Water Soluble Polymers – liquid Resins – Monomers. Latex Modified Systems – Materials – Mix Proportioning – Mixing – Placing & Curing - Types of polymer concrete, Durability properties – Applications

UNIT - V CONCRETE UNDER SPECIAL CIRCUMSTANCES [9]

High Strength and High Performance Concrete – Self compacting concrete, self curing concrete, Geopolymer concrete, Bacterial concrete, Nano materials in concrete

Total (L: 45, T: 0)=45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Acquire knowledge on constituent materials of concrete, different types of cement, composition and properties and tests of cement and properties of aggregates.
- Gain knowledge about chemical and admixtures of concrete and their effects on concrete properties and study the mineral admixtures.
- Knowledge of principles of mix proportioning, mix design types and Mix design is to be studied for different methods.
- Determination of compressive and flexural strength of fresh concrete and hardened concrete, Young's modulus and durability test are to be studied.
- Significant different types of concretes and their properties and its applications in construction field and special types of concrete.

Reference Books :

- 1 M.S.Shetty, "Concrete Technology", S.Chand and Company Ltd. Delhi, 2011.
- 2 A.M.Neville, "Properties of Concrete", Prentice Hall, 2012, London.
- 3 IS: 456-2007: "Indian Standards Code of Practice for Plain and Reinforced Concrete".
- 4 M.L.Gambir, "Concrete Technology", Tata McGraw Hill, Publishing Co. Ltd, New Delhi, 2006.
- 5 <http://nptel.ac.in/syllabus/105102012/>

SEMESTER - II

CN18263	PERSONNEL MANAGEMENT IN CONSTRUCTION (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study the various aspects of manpower management in construction.
- To deal with organizational approach of individual and management.
- To enable the students to know various perspectives of managing and developing skills.

UNIT - I MANPOWER PLANNING [9]

Manpower Planning, Organising, Staffing directing, and controlling –Personnel Principles

UNIT - II ORGANISATION [9]

Organisation – Span of Control – Organisation Charts – Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection - Placement, Training and Development

UNIT - III HUMAN BEHAVIOUR [9]

Introduction to the field of people management - basic individual psychology; motivation - Job design and performance management - Managing groups at work - self-managing work teams - intergroup behaviour and conflict in organisations – Leadership - Behavioural aspects of decision-making; and communication for people management

UNIT - IV WELFARE MEASURES [9]

Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.

UNIT - V MANAGEMENT AND DEVELOPMENT METHODS [9]

Compensation - Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services - Safety and Health – Discipline and discharge - Special Human resource problems, Performance appraisal. - Employee hand book and personnel manual - Job descriptions and organization structure and human relations – Productivity of Human resources

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Know various processes in manpower planning, organizational and welfare measures.
- Know the need for financial management and means of achieving the same.
- Study the elements of construction economics and lending to the contractors.
- Know the working of the organization mentioned above and apply scientific principles for effectively utilizing them.
- Study the elements of management and development methods of the employee.

Reference Books :

- 1 Josy.J. Familaro, "Handbook of Human Resources Administration", McGraw-Hill International Edition, (1987)
- 2 Charles D Pringle, Justin Gooderi Longenecker, "Management", CE Merrill Publishing Co. (1981)
- 3 Carleton Counter II and Jill Justice Coutler , "The Complete Standard Handbook of Construction Personnel Management", Prentice-Hall, Inc., New Jersey, (1989)
- 4 Tyagi, A.K. (Ed). Handbook on Energy Audits and Management Tata Energy Research Institute, 2000.

SEMESTER - II

CN18264	CONSTRUCTION PROJECT MANAGEMENT (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To understand the various management techniques for successful completion of construction project
- To study the construction designs and material utilization.
- To gain knowledge in management of cost in construction project.

UNIT - I THE OWNERS' PERSPECTIVE**[9]**

Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers

UNIT - II ORGANIZING FOR PROJECT MANAGEMENT**[9]**

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants - Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team

UNIT - III DESIGN AND CONSTRUCTION PROCESS**[9]**

Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment

UNIT - IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION**[9]**

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity - Labour Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks

UNIT - V COST ESTIMATION**[9]**

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs

Total (L: 45 T: 0) = 45Periods**Course Outcomes: On Completion of this course the students will be able to**

- Explain the principles of effective leadership Qualities.
- Study the basic cost flows, Planning and project budget.
- Know about the Feasible terms relating to construction
- Recognize the proper utilization of management systems.
- Know about the cost management.

Reference Books :

- 1 Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Prentice Hall, (2003)
- 2 Choudhury. S, "Project Management", Tata McGraw-Hill Publishing Company, New Delhi, 1988.
- 3 George J.Ritz , Total Construction Project Management - McGraw-Hill Inc, 1994.

SEMESTER - II

CN18265	ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION AND MAINTENANCE (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To enable the students to learn the energy production systems and conservation.
- To study the energy efficient design methods
- To understand the principles of energy management and energy audits

UNIT - I Introduction [9]

Fundamentals of Energy – Energy production systems – Heating, Ventilating and Air-conditioning – Solar Energy and conservation – Geothermal energy - Energy economics Analysis – Energy conservation – Domestic energy consumption – savings – challenges – Primary energy use in buildings – Residential – commercial – Institutional and public buildings

UNIT - II Environmental Parameters [9]

Energy and resource conservation — Evaluation tools for building energy – Embodied and operating energy – Peak demand – Visual and acoustical quality – Land, water and materials – airborne emissions and Waste Management

UNIT - III Design [9]

Natural building design consideration – Energy efficient design strategies – Contextual factors –Longevity and process assessment – Renewable energy sources and design –Acoustic Design- Rain Water harvesting -Design of green buildings –Indian Green Building Council and LEED standards - Advanced building technologies – Smart buildings – Economics and cost analysis.

UNIT - IV Services [9]

Energy in building design – Energy efficient and environmental friendly building – thermal phenomena — climate, sun and solar radiation – Psychometrics – Passive and Active HVAC systems – Preliminary investigations – Goals and policies – Energy audit – Types of Energy Audit – Analysis of results – Energy flow diagram – Energy consumption/Unit production – Identification of wastage –Priority of conservative measures.

UNIT - V Energy Management [9]

Energy management of electrical equipment – Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – energy savings in lighting systems – Energy management in Façade systems - Air conditioning systems – Applications – Facility operation and maintenance – Facility modifications – Energy recovery dehumidifier – Water heat recovery – Steam plants and distribution systems – Improvement of boiler efficiency – Frequency of blowdown – steam leakage – Steam flash and condensate return

Total (L: 45 T: 0) = 45Periods

Course Outcomes: On Completion of this course the students will be able to

- Explain the concepts of energy efficient design
- Design Green and smart buildings
- Do energy audit of buildings
- Explain how energy used in good manner.
- Explain the exposure in the management of services.

Reference Books :

- 1 National Building Code-Part VIII Building Services- Section 4, Acoustics, Sound Insulation and Noise Control- Bureau of Indian Standards, New Delhi, 2005
- 2 IS: 2526 – 1963 (reaffirmed 1996) Code of Practice for Acoustical Design of Auditoriums and Conference Hall- Ninth reprint December 1998 (incorporating Amendment No: 1) New Delhi
- 3 IGBC Rating system Abridged Reference Guide, October 2013
- 4 LEED 2011 for India for New Construction and Core & Shell Projects, Green Building Rating systems – Detailed reference Guide

SEMESTER - II

CN18266	SYSTEM INTEGRATION IN CONSTRUCTION (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study and understand the construction system integration system.
- To know about the environmental factors, services, maintenance and safety systems.
- To know about maintenance technology and their preventive management system.

UNIT - I STRUCTURAL INTEGRATION [9]

Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification

UNIT - II ENVIRONMENTAL FACTORS [9]

Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

UNIT - III SERVICES [9]

Plumbing – Electricity – Vertical circulation and their interaction - HVAC

UNIT - IV MAINTENANCE [9]

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces

UNIT - V SAFETY [9]

Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution

Total (L: 45 T: 0) =45Periods

Course Outcomes: On Completion of this course the students will be able to

- Know about the structural integration and system
- Explain the environmental factors and its relevant structural integration.
- Know the services regarding plumbing and electricity.
- Know the maintenance techniques and the materials involved.
- Study the safety and preventive systems.

Reference Books :

- 1 A.J.Elder and Martiz Vinden Barg., "Handbook of Building Enclosure", McGraw-Hill Book company, (1983)
- 2 Jane Taylor and Gordin Cooke., "The Fire Precautions Act in Practices", (1987)
- 3 David V.Chadderton., "Building Services Engineering", Taylor and Francis, (2007)

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SEMESTER - III

CN18361	PREFABRICATED STRUCTURES (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To Learn About the Basic Prefabricated Design Principle.
- To Understand the Methods to Analyses the Prefabricated Elements.
- To Gain Knowledge in Different Prefabricated Components.

UNIT - I DESIGN PRINCIPLES [9]

General Civil Engineering Requirements, Specific Requirements for Planning and Layout of Prefabricates Plant. IS Code Specification, Modular Co-ordination, Standardization, Disuniting of Prefabricates, Production, Transportation, Erection, Stages of Loading and Codal Provisions, Safety Factors, Material Properties, Deflection Control, Lateral Load Resistance.

UNIT - II REINFORCED CONCRETE [9]

Prefabricated Structures - Long Wall and Cross-Wall Large Panel Buildings, One Way and Two Way Prefabricated Slabs, Framed Buildings with Partial and Curtain Walls - Connections – Beam to Column and Column to Column.

UNIT - III FLOORS , STAIRS AND ROOFS [9]

Types of Floor Slabs, Analysis and Design Example of Cored and Panel Types and Two-Way Systems, Staircase Slab Design, Types of Roof Slabs and Insulation Requirements, Description of Joints, their Behaviour and Reinforcement Requirements, Deflection Control for Short Term and Long Term Loads, Ultimate Strength Calculations in Shear and Flexure.

UNIT - IV WALLS & JOINTS [9]

Types of Wall Panels, Blocks and Large Panels, Curtain, Partition and Load Bearing Walls, Load Transfer From Floor to Wall Panels, Vertical Loads, Eccentricity and Stability of Wall Panels, Design Curves, Types of Wall Joints, Their Behavior and Design, Leak Prevention, Joint Sealants, Location and Types of Shear Walls Sandwich Wall Panels, Approximate Design of Shear Walls.

UNIT - V INDUSTRIAL BUILDINGS AND SHELL ROOFS [9]

Components of Single- Storey Industrial Sheds with Crane Gantry Systems, R.C. Roof Trusses, Roof Panels, Corbels and Columns, Wind Bracing Design. Cylindrical, Folded Plate, Hyper-Prefabricated Shells, Erection and Jointing, Joint Design, ACI Hand Book Based Design.

Total (L: 45 T: 0) = 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Gain Knowledge to Relate the Design Principle of Prefabricated Members.
- Acquire Knowledge to Interpret the Different Types of Elements in Prefabrications.
- Design the Concept of Prefabricated Members.
- Acquire Knowledge of Load Transfer in Different Wall Panels and its Design.
- Gain Knowledge to Interpolate the Components of Industrial Buildings and Roofs Members.

Reference Books :

- 1 Hubert Bachmann & Alfred Steinle., "Precast Concrete Structures", Ernst & Sohn; 2nd edition 2019.
- 2 Wai Kwong Lau., "Building Construction with Precast Concrete Structural Elements", Lap Lambert Academic Publishing, 2010.
- 3 Structural Design Manual, "Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete", Netherland Betor Verlag, 2009.
- 4 Jolly., Colin., Elliott., Kim S., "Multi-Storey Precast Concrete Framed Structures", Wiley Publishers, 2013.
- 5 Ryan E., Smith. "Prefab Architecture: A Guide to Modular Design and Construction", Wiley Publisher, 2011.
- 6 Ganesan., R. Latha., A. "Prefabricated Structures", Sree Kamalamani Publications, 2014.

SEMESTER - III

CN18362	COMPUTER APPLICATION IN CONSTRUCTION ENGINEERING AND PLANNING (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study the Hardware Requirements of Computer, Inventory Models and Scheduling Techniques.
- To know the Software Requirements of Computer Programming and Optimization Techniques.
- To apply techniques to Construction engineering works.

UNIT - I INTRODUCTION [9]

Overview of IT Applications in Construction – Construction Process – Computerization in Construction – Computer Aided Cost Estimation – Developing Application with Database Software. BIM for Construction Engineering.

UNIT - II OPTIMIZATION TECHNIQUES [9]

Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications.

UNIT - III INVENTORY MODELS [9]

Deterministic and Probabilistic Inventory Models - Software applications.

UNIT - IV SCHEDULING APPLICATION [9]

PERT and CPM - Advanced planning and scheduling concepts – Computer applications – Case study.

UNIT - V OTHER PROBLEMS [9]

Sequencing problems – Simulation – Enterprises – Introduction to ERP systems.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Know the Computer Applications in Construction.
- Apply the Different Optimization Techniques.
- Analyse the Computer Applications in Sequencing Problems.
- Study about simulation and ERP systems.
- Solve sequencing problems in construction planning.

Reference Books :

- 1 Paulson, B.R., "Computer Applications in Construction", Mc Graw Hill, 2013.
- 2 Billy E.Gillet., "Introduction to Operations Research – A Computer Oriented Algorithmic Approach", Mc Graw Hill, 1979.
- 3 Feigenbaum,L., "Construction Scheduling with Primavera Project Planner", Prentice Hall Inc., 2001.
- 4 Ming Sun and Rob Howard, "Understanding I.T. in Construction", Spon Press, Routledge, 2003.

SEMESTER - III

CN18364	RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To Understand the Management and Control of Various Resources Involved in Construction.
- To Knowledge about the effect of Resource Planning, Labour Management, Material and Equipment, Time Management.
- To understand the Resource Allocation and Resource Leveling in Construction.

UNIT - I RESOURCE PLANNING [9]

Resource Planning, Procurement, Identification, Personnel, Planning for Material, Labour, Time Schedule and Cost Control, Types of Resources, Manpower, Equipment, Material, Money, Time

UNIT - II LABOUR MANAGEMENT [9]

Systems Approach, Characteristics of Resources, Utilization, Measurement of Actual resources required, Tools for Measurement of Resources, Labour, Classes of Labour, Cost of Labour, Labour Schedule, and Optimum Use of Labour.

UNIT - III MATERIALS AND EQUIPMENT [9]

Material: Time of Purchase, Quantity of Material, Sources, Transportation, Delivery and Distribution Equipment: Planning and Selection by Optimistic Choice with Respect to Cost, Time, Source and Handling.

UNIT - IV TIME MANAGEMENT [9]

Personnel Time, Management and Planning, Managing Time on the Project, Forecasting the Future, Critical Path Measuring the Changes and their Effects-Cash Flow and Cost Control.

UNIT - V RESOURCE ALLOCATION AND LEVELLING [9]

Time - Cost Trade off, Computer Application -Resource Leveling, Resource List, Resource Allocation, Resource Loading, Cumulative Cost - Value Management.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Identify the resources requirements of different kinds of civil engineering projects.
- Know different techniques of classification and codification of materials.
- Identify the different kinds of equipments and knowledge gained will help them to make optimum utilization of equipments on construction site.
- Acquire knowledge about the resource leveling in construction.
- Evaluate resource management in construction.

Text Books :

1. S. Keoki Sears, Glenn A. Sears, Richard H. Clough, Jerald L. Rounds, Robert O. Segner "Construction Project Management", 6th Edition January 2015.
2. Thomas Uher, Adam S. Zantis., "Programming and Scheduling Techniques", Rout ledge, 2012.
3. Andrew Whyte, "Integrated Design and Cost Management for Civil Engineers", CRC Press, 2014.
4. K. K. Chitkara., "Construction Project Management Planning, Scheduling and Controlling", Tata McGraw-Hill Education, 2014.
5. R. Oxley. J. Poskitt, "Management Techniques applied to the Construction Industry", Granda Publishing Ltd., (1986).
6. <https://nptel.ac.in/courses/105104161/5>

SEMESTER – III

CN18365	SHORING, SCAFFOLDING AND FORMWORK (ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To Study and know the Overall and Detailed Planning of Formwork, Plant and Site Equipment.
- To explain the Design and Erection of forms for Various Elements such as Slabs, Beams, Columns, Walls, Shells and Tunnels.
- To Know the Latest Methods of form Construction.

UNIT - I PLANNING, SITE EQUIPMENT & PLANT FOR FORM WORK [9]

Introduction - Forms for Foundations, Columns, and Beams Walls etc., General Objectives of Formwork Building - Planning for Safety - Development of a Basic System - Key Areas of Cost Reduction - Planning Examples. Overall Planning - Detailed Planning - Standard Units - Corner Units – Pass Units - Calculation of Labour Constants - Formwork Hours - Labour Requirement – Overall Programme - Detailed programme - Costing - Planning Crane Arrangements - Site Layout Plan - Transporting Plant - Formwork Beams - Scaffold Frames - Framed Panel Formwork – FORMWORK Accessories.

UNIT - II MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURES [9]

Lumber - Types - Finish - Sheathing Boards Working Stresses - Repetitive Member Stress - Plywood - Types and Grades - Jointing Boarding - Textured Surfaces and Strength – Reconstituted Wood - Steel - Aluminium - Hardware and Fasteners - Nails in Plywood - Allowable Withdrawal Load and Lateral Load. Pressures on Formwork - Examples - Vertical Loads for Design of Slab Forms - Uplift on Shores - Laterals Loads on Slabs and Walls.

UNIT - III DESIGN OF FORMS AND SHORES [9]

Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork – Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower – Heavy Duty props.

UNIT - IV BUILDING AND ERECTING THE FORM WORK [9]

Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex – Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures – ACI - Design deficiencies - Permitted and gradual irregularities.

UNIT - V FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS [9]

Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning –Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

Total (L: 45 T: 0) = 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Know the detailed planning of framework, design of forms and erection of form work.
- Outline the principles and requirements for materials accessories proprietary products and pressures.
- Learn the design of forms and shores.
- Gain knowledge about the building and erecting the form work.
- Know about forms for domes and tunnels, slip forms and scaffolds.

Reference Books :

- 1 Austin, C.K., "Formwork for Concrete", Cleaver -Hume Press Ltd., London, 1996.
- 2 Robert L. Peurifoy and Garold D. Oberlender, " Formwork For Concrete Structures", McGraw -Hill, 1996.
- 3 Hurd, M.K., " Formwork for Concrete", Special Publication No.4, American Concrete Institute, Detroit, 1996.

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SEMESTER – III

CN18366

BUILDING MANAGEMENT SYSTEMS
(ELECTIVE)

L	T	P	C
3	0	0	3

Objectives:

- To study the Concepts of Information Systems and their General Applications.
- To ensure about Information on Managing and Marketing.
- To explain about the Securing and Control over the Risk of Information.

UNIT - I BUILDING MANAGEMENT SYSTEMS [9]

Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolution of Information Systems

UNIT - II MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURES [9]

Modern Information System - System Development Life Cycle -Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs

UNIT - III DESIGN OF FORMS AND SHORES [9]

Integrated Construction Management Information System - Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel - Levels, DSS, EIS, and ES - Comparison, Concepts and Knowledge Representation - Managing International Information System

UNIT - IV BUILDING AND ERECTING THE FORM WORK [9]

Control - Testing Security - Coding Techniques - Defection of Error - Validating – Cost Benefit Analysis - Assessing the Value and risk of Information System

UNIT - V SYSTEM AUDIT [9]

Software Engineering qualities - Design, Production, Service, Software specification, Software Metrics, Software quality assurance - Systems Methodology - Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation

Total (L: 45 T: 0) = 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Explain how information systems transform business.
- Identify the impact information systems have on an organization.
- Describe IT infrastructure and its components and its current trends.
- Identify the principal tools and technologies for accessing information from databases to improve business performance and decision making.
- Identify the types of systems used for enterprises – wide knowledge management and how they provide value of businesses.

Reference Books :

- 1 Gordon Bitter Davis, Margrethe H. Olson, "Management Information System Conceptual foundations, Structure and Development", 2nd edition, McGraw Hill, (2017).
- 2 Ralph H Sprague and Huge J Watson, "Decision Support for Management", Pearson Hall, (1995).
- 3 Kenneth C Laudon and Jane Price Laudon "Management Information Systems – Organization and Technology ", , 15th Edition, Prentice Hall, 2018.

SEMESTER - III

CN18OE1	ENERGY EFFICIENT BUILDINGS (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To Study the Design of Energy Efficient Buildings which Balances all Aspects of Energy, Lighting, Space Conditioning and Ventilation by Providing a Mix of Passive Solar Design Strategies.
- To learn the use of Materials with Low Embodied Energy.
- To learn about the Energy Efficient Building for Various Zones.

UNIT - I INTRODUCTION**[9]**

Energy Required for Building Construction - Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Psychometric Chart – Measuring Latent and Sensible Heat. Thermal Comfort – Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Protection – Types of Shading Devices – Conservation – Heating and Cooling loads.

UNIT - II PASSIVE SOLAR HEATING AND COOLING**[9]**

General Principles of Passive Solar Heating – Key Design Elements - Direct gain Trombe Walls, Water Walls, Convective Air Loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Predicting Ventilation in Buildings – Window Ventilation Calculations - Radiation – Evaporation and Dehumidification – Mass Effect – Load Control – Air Filtration and odour Removal – Heat Recovery in Large Buildings.

UNIT - III DAYLIGHTING AND ELECTRICAL LIGHTING**[9]**

Materials, Components and Details - Insulation – Optical Materials – Radiant Barriers Glazing Materials - Day Lighting – Sources and Concepts – Building Design Strategies – Case Studies – Electric Lighting –Light Distribution – Electric Lighting Control for day lighted buildings – Illumination requirement – Components of Daylight factor – Recommended Daylight Factors – Day Lighting Analysis – Supplementary Artificial Lighting Design.

UNIT - IV HEAT CONTROL AND VENTILATION**[9]**

Requirements – Heat Transmission Through Building Sections – Thermal Performance of Building Sections – Orientation of Buildings – Building Characteristics for Various Climates – Thermal Design of Buildings Influence of Design Parameters – Mechanical Controls – Examples. Ventilation – Requirements – Minimum Standards for Ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation

UNIT - V DESIGN FOR CLIMATIC ZONES**[9]**

Energy Efficiency – an Overview of Design Concepts and Architectural Interventions – Energy Efficient Buildings for Various Zones – Cold and Cloudy – Cold and Sunny – Composite – Hot and Dry – Moderate – Warm and Humid – Case Studies of Residences, Office Buildings and other Buildings in Each Zones – Energy Audit - Certification

Total (L: 45 T: 0) = 45 Periods**Course Outcomes: On Completion of this course the students will be able to**

- Know the Energy Requirement of the Building Construction.
- Explain the key Design Principles for Energy Efficient Buildings.
- Know the Concepts of day Lighting and components of Daylight Factor.
- Know the Heat Transmission, Heat Control and Ventilation.
- know about the Energy efficient Buildings for Various Zones.

Reference Books :

- 1 Moore. F, “Environmental Control Systems: Heating, Cooling, Lighting”, McGraw Hill Inc., 1992.
- 2 Mark DeKay, G. Z. Brown, “Sun, Wind and Light – Architectural Design Strategies”, John Wiley & Sons, 3rd edition, 2014.
- 3 Hossam A. Gabbar, “Energy Conservation in Residential, Commercial, and Industrial Facilities”, Wiley-Blackwell, 1st edition, 2018.
- 4 National Renewable Energy Laboratory, “Passive Solar Design Strategies: Guidelines for Home Building, Central Tennessee and Northern Alabama”, Scholar’s Choice, 2015.

SEMESTER - III

CN180E2	ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To study the concepts of Construction Economic and Finance.
- To learn about the evaluation of alternative investments, management of funds.
- To learn about basic principles in management of accounting.

UNIT - I BASIC PRINCIPLES [9]

Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest. Single Payment Compound Amount Factor (P/F, F/P) – Uniform series of Payments (F/A, A/F, F/P, A/P) – Problem time zero (PTZ) - equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient (G), Geometric Gradient (C).

UNIT - II COMPARING ALTERNATIVES PROPOSALS [9]

Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT - III EVALUATING ALTERNATIVE INVESTMENTS [9]

Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.

UNIT - IV FUNDS MANAGEMENT [9]

Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management- foreign currency management.

UNIT - V FUNDAMENTALS OF MANAGEMENT ACCOUNTING [9]

Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Know the fundamental knowledge in finance system.
- Study the concepts involved in different analysis methods.
- Study the various alternative investments and its exploration.
- Know about the system of funds management in construction.
- Introduce a System basics in accounts management.

Reference Books :

- 1 Patel, B M., " Project management- strategic Financial Planning, Evaluation and Control", Vikas Publishing House , 2000.
- 2 Shrivastava,U.K., "Construction Planning and Management",2nd Edn.,Galgotia Publications, 2000.
- 3 Steiner, H.M. .," Engineering Economic principles", 2nd Edn. Mc-Graw Hill Book,1996.
- 4 Collier C and GlaGola C, "Engineering Economics & Cost Analysis", 3rd Edn. Addison Wesley Education Publishers, 1998.

SEMESTER – III

CN18OE3	STRESS MANAGEMENT (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To provide a broad physical, social and psychological understanding of human stress.
- To focus is on presenting a broad background of stress research.
- To study on self-development and self-awareness of stress reduction

UNIT - I UNDERSTANDING STRESS [9]

Meaning – Symptoms – Works Related Stress – Individual Stress – Reducing Stress – Burnout

UNIT - II COMMON STRESS FACTORS TIME & CAREER PLATEAUIING [9]

Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No'.

UNIT - III CRISIS MANAGEMENT [9]

Implications – People issues – Environmental issues –Psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good communication – Taking advantage of crisis – Pushing new ideas – Empowerment.

UNIT - IV WORK PLACE HUMOUR [9]

Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT - V SELF DEVELOPMENT [9]

Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision Making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Explain the management of work related stress at an Individual and organizational level
- Develop and implement effective strategies to prevent and manage stress at work.
- Gather information on current stress management techniques and evaluate personal relevance
- Becoming familiar with seminal and contemporary research on stress and coping
- Increased capacity for critical thinking , self-awareness of stress reduction and self-care

References :

- 1 Argyle, "The Psychology of Happiness", Tata McGraw Hill, 2012.
- 2 Bartle, "Stress – Perspectives & Process", Tata McGraw Hill, 2012.
- 3 Cooper, "Managing Stress", Sage, 2011.
- 4 Jeff Davidson, "Managing Stress", Prentice Hall of India, New Delhi, 2012.

SEMESTER – III

CN18OE4	MATERIALS MANAGEMENT (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Objectives:

- To train the students for working as materials managers by providing them knowledge about effective and efficient purchase
- To Study about the material supply and demand
- To Study about the material storage and causes of wastage of materials

UNIT - I MATERIAL CLASSIFICATION [9]

Material Classification- Organizing for materials management – basis for forming organizations – conventional and modern approaches to organizing materials management. Materials identification – classifying of materials – codification of materials – standardization – simplification and variety reduction of materials

UNIT - II MATERIAL PURCHASING [9]

Material Purchasing– Planning Purchasing Materials – Norms Of Vendor Rating – Cei Methodology – Material Selection And Development – Purchasing Procedures And Methods – Legal Aspects – Insurance Of Materials.

UNIT - III PROCUREMENT MANAGEMENT [9]

Supply Management – Sources Of Supply – Out Sourcing Material Management - Procurement Organization - Procurement Planning - Functions Of Material Management - Inventory Control.

UNIT - IV STORE MANAGEMENT [9]

Storing of Materials-Management of stores – location – different types of stores – methods of storing – safety and security of materials – stores equipment – materials handling equipment – factors affecting materials handling

UNIT - V WASTE MANAGEMENT [9]

Scrap & Obsolete Materials-Management of surplus obsolete and scrap materials – reasons for accumulation of surplus obsolete and scrap materials – methods of disposal – regulations and procedures

Total (L: 45 T:0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Develop an ability to perform the role of a materials manager in an organization.
- Improve due date performance through use of MRP techniques with in capacity constraints.
- Analyze the inventory situation of a company and suggest improvements.
- Practice material planning through modern materials management.
- Lead the teams for effective coordinate to do waste management.

Reference(s):

- 1 Datta .A.K, "Materials Management: Procedures, Text and Cases", PHI Learning Pvt. Ltd., 2004.
- 2 Arnold, "Introduction To Materials Management", Pearson Education India,2017.
- 3 A.K.Chitale, R.C.Gupta , "Materials Management", Prentice hall India learning private limited. 2014.
- 4 Richard J. Tersine, "Modern Materials Management", John Hardin Campbell , 2007.
- 5 Gopalakrishnan .P, "Handbook of Materials Management", PHI Learning Pvt. Ltd. 2004.

SEMESTER - III

CN180E5	BUILDING ACOUSTICS AND NOISE CONTROL	L	T	P	C
		3	0	0	3

Objectives:

- To study the elements of sound and noise, and their control.
- To study the design of constructional measures to control acoustic

UNIT - I INTRODUCTION [9]

Sound waves, Frequency, Intensity, Wave length, Measurement of sound, Decibel scale speech and music frequencies, human ear characteristics-Tone structure.

UNIT - II DIFFERENT BUILDING MATERIAL [9]

Outdoor noise levels - acceptable indoor noise levels-IS codes –sono meter, determinate of density of a given building material, absorption co-efficient and measurements, choice of absorption material, resonance, reverberation, echo, exercises involving reverberation time and absorption co-efficient.

UNIT - III NOISE CONTROL [9]

Types of noises, transmission of noise, transmission loss, noise control and sound insulation, remedial measures and legislation.

UNIT - IV INVENTORY MODEL [9]

Walls/partitions, floors/ceilings, windows/doors, insulating fittings and gadgets machine mounting and insulation of machinery.

UNIT - V BASIC PRINCIPLES IN ACOUSTICS DESIGN [9]

Site selection, shape, volume, treatment for interior surfaces-basic principles in designing open air theatres, cinemas, broadcasting studios, concert halls, class rooms, lecture halls and theatres for acoustics.

Total (L: 45 T: 0) = 45 Periods

Course Outcomes: On Completion of this course the students will be able to

- Gain Knowledge to measurement of sound waves, wavelength and frequencies.
- Acquire Knowledge to different building material.
- Study the remedial measures and legislation.
- Acquire Knowledge of insulation of machinery.
- Gain Knowledge to interpolate the basic principles of acoustics design.

References :

1. Narasimhan .V .Dr., "An introduction to Building Physics", Kabeer printing works,chennai-5, 2004.
2. Croome .D.J, "Noise, Building and People", Pergumon Press, 2007.
3. Smith .B.J, R. J. Peters, Stephanie Owen, "Acoustics and Noise Control", Longman Group Ltd.- New york ,USA, 2002.
4. Thomas D. North wood, "Architecture acoustics", dowden, Hutchinson and Ross Inc., 2007.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)

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SEMESTER - III

ST183A1	ENGLISH FOR RESEARCH PAPER WRITING (Common to CN & ST)	L	T	P	C
		2	0	0	0

Objectives: Students will be able

- Understand that how to improve your writing skills and level of readability.
- Learn about what to write in each section.
- Understand the skills needed when writing a title.
- Ensure the good quality of paper at very first -time submission.

UNIT - I [6]

Planning and Preparations, Word order, Breaking up long sentences, Structuring, Paragraphs and Sentences, Being concise and removing redundancy, Avoiding Ambiguity and vagueness

UNIT - II [6]

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing Paraphrasing and plagiarism, Sections of a paper, abstracts, Introduction, Review of the Literature, methods, results, discussions, conclusions, the final check.

UNIT - III [6]

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 literature.

UNIT - IV [6]

Skills are needed when writing the methods, skills needed when writing the results, skills are needed when writing the discussion, skills are needed when writing the conclusions.

UNIT - V [6]

Useful phrases, how to ensure paper is as good as it could possibly be the first time submission.

Total = 30 Periods

Course Outcomes : On Completion of this course, the student will be able to

- Know how to improve your writing skills and level of readability
- Learn about what to write in each section
- Improved skills needed when writing a title, abstract and introduction.
- Improved skills needed when writing, methods, results and discussion.
- Ensure the good quality of paper at very first time submission.

Reference Books :

- 1 Goldbort R (2006) Writing for Science, Yale University Press (available on google books)
- 2 Day R (2006) How to write and publish a scientific paper, Cambridge University Press
- 3 Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book
- 4 Adrian Wallwork, English for Writing Research Papers, Springer New York ,Dordrecht Heidelberg London, 2011

SEMESTER - III

CN18321	PROJECT WORK – PHASE I	L	T	P	C
		0	0	12	6

Objective: *To know about needs of the industry and research and provide solutions/suggestions related to construction engineering and management.*

1. Every student shall have a supervisor who is the member of the faculty of the institution. Selection of faculty supervisor has to be completed within the first two weeks from the day of beginning of third semester.
2. The students should make discussion with his supervisor for selecting topic.
3. In consultation with supervisor, student has to collect research papers and journals.
4. Preferably it can be an experimental work or it can be a case study.
5. A detailed study of the collected literatures to be carried out.
6. The methodology should be framed and works carried out based on the framed methodology.
7. Phase - I project report should be submitted at the end of the semester as per guidelines.
8. This project report should be evaluated jointly by external and internal examiners.

Course Outcomes: On Completion of this course, the student will be able to

- *Identify current industry / research needs.*
- *Acquire knowledge on the experimental projects.*
- *Collect the data from the literature surveys and able to frame the methodology.*
- *Summarize the works carried out and can be compared with the Codal provisions.*
- *Apply the solutions for the results identified.*

SEMESTER - III

CN18322	PRACTICAL TRAINING	L	T	P	C
		0	0	20	1

Objective: *To prepare students to gain confidence in solving practical issues related to construction engineering and management.*

1. The faculty allotted for practical training act as supervisor.
2. The student shall finally produce a comprehensive report covering back field information, field survey, methodology implemented results and discussions with conclusion.
3. This practical training report shall be submitted for evaluation.
4. The knowledge gained in practical training shall be assessed in presentation.
5. The practical training report should be evaluated by internal examiner.

Course Outcomes: On Completion of this course, the student will be able to

- Gain knowledge about the practical training related to construction engineering and management.
- Determine the industrial exposure through various industrial experiments.
- Enhance the collective skills between theoretical knowledge and real time work.
- Enhancement knowledge on the impact of health, safety and environmental solutions on productivity, quality and society at large.
- Apply the solutions for the problems identified.

SEMESTER - IV

CN18421	PROJECT WORK – PHASE II	L	T	P	C
		0	0	30	12

Objectives: *To know about needs of the industry and research and provide solutions / suggestions related to construction engineering and management.*

1. The supervisor allotted for project phase I will continue to supervise project phase II.
2. As per methodology suggested in phase I, the project can be implemented.
3. Outcome of implementation can be studied and each student shall finally produce a comprehensive report covering background information, literature survey, methodology, results and discussions with conclusion.
4. This final report shall be in type written form as specified in the guidelines.
5. The project report should be evaluated jointly by external and internal examiners.

Course Outcomes: On Completion of this course, the student will be able to

- Identify current industry / research needs.
- Acquire knowledge on the experimental projects.
- Collect the data from the literature surveys and able to frame the methodology.
- Summarize the works carried out and can be compared with the Codal provisions.
- Apply the solutions for the results identified.