SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.E- Construction Engineering and Management

(Dept of Civil Engineering)

CURRICULUM and SYLLABI

[For students admitted in 2025-2026]

PG Regulations 2023

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Construction Engineering and Management

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MAT101E	Statistical Methods for Engineers	2	1	0	0	3	FC	45	TT
2.	P23CEM101	Construction Planning Scheduling and Control	3	0	0	0	3	PC	45	T
3.	P23CEM102	Quality Control and Quality Assurance in Construction	3	0	2	0	4	PC	75	TL
4.	P23CEM501	**Elective:** Advanced Concrete Technology	3	0	0	0	3	PE	45	T
5.	P23STR519	**Elective:** Internet of Things for Civil Engineers	3	0	0	0	3	PE	45	T
6.	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
7.	P23GE701	English for Research Paper Writing	2	0	0	0	0	AC	30	T
Practical courses										
8.	P23CEM103	Advanced Construction Engineering Laboratory	0	0	4	0	2	PC	60	L
Total Credits							21			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson – Civil BoS	**Member Secretary/ Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Civil, ~~First~~ Semester ME CEM Students and Staff, COE

Sona College of Technology, Salem

(An Autonomous Institution)

Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)

Branch: Construction Engineering and Management

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
		Theory courses								
1.	P23CEM201	Advanced Construction Techniques	3	0	0	0	3	PC	45	T
2.	P23CEM202	Resource Management and control in Construction	3	0	0	2	4	PC	75	TP
3.	P23CEM203	Construction Equipment and Management	3	0	0	0	3	PC	45	T
4.	P23CEM509	**Elective:** Contract Laws and Regulation	3	0	0	0	3	PE	45	T
5.	P23STR509	**Elective**: Prefabricated Structures	3	0	0	0	3	PE	45	T
6.	P23GE702	**Audit Course:** Stress Management by Yoga	2	0	0	0	0	AC	30	T
		Practical courses								
7.	P23CEM204	Construction Management Studio Laboratory	0	0	4	0	2	PC	60	L
8.	P23CEM205	Technical Seminar	0	0	2	0	1	PC	30	L
		Total Credits					**19**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project

Approved By

Chairperson – Civil Engineering, BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Civil, Second Semester CEM Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Construction Engineering and Management

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MAT101E	Statistical Methods for Engineers	2	1	0	0	3	FC	45	TT
2.	P23CEM101	Construction Planning Scheduling and Control	3	0	0	0	3	PC	45	T
3.	P23CEM102	Quality Control and Quality Assurance in Construction	3	0	2	0	4	PC	75	TL
4.	P23CEM501	**Elective:** Advanced Concrete Technology	3	0	0	0	3	PE	45	T
5.	P23STR519	**Elective:** Internet of Things for Civil Engineers	3	0	0	0	3	PE	45	T
6.	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
7.	P23GE701	English for Research Paper Writing	2	0	0	0	0	AC	30	T
Practical courses										
8.	P23CEM103	Advanced Construction Engineering Laboratory	0	0	4	0	2	PC	60	L
Total Credits							21			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson – Civil BoS	**Member Secretary/ Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Civil, ~~First~~ Semester ME CEM Students and Staff, COE

CIVIL ENGINEERING						
M. E. / CONSTRUCTION ENGINEERING AND MANAGEMENT						
SEMESTER - I	STATISTICAL METHODS FOR ENGINEERS	L	T	P	J	C
P23MAT101E		2	1	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	apply the concepts of random variable, moments, moment generating function and its properties to solve the problems and apply the standard distributions to appropriate problems.
CO2:	test the attributes and variables of large and small samples.
CO3:	apply the concepts of multiple and partial correlation, plane of regression, multiple and partial regression to solve the related problems.
CO4:	analyse the variances of several variable while applying standard designs like completely randomized design and randomized block design.
CO5:	apply the multivariate density concept and its properties to analyze the principle components.

Pre-requisites:

- Basics of calculus
- Basics of statistics
- Basics of geometry
- Basics of probability

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3

Course assessment methods [Theory]

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) Assignment / Problem- solving / Seminar (10)	Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01	PROBABILITY AND RANDOM VARIABLE	9 Hours

Discrete and continuous random variables, moments, moment generating function and their properties, binomial, Poisson and normal distributions.

Unit 02	TESTING OF HYPOTHESIS	9 Hours

Tests based on normal, t, χ^2 and F distributions for testing means, variances and proportions – Analysis of $r \times c$ tables – goodness of fit.

Unit 03	MULTIPLE AND PARTIAL CORRELATION AND MULTIPLE AND PARTIAL REGRESSION	9 Hours
Multiple and partial correlation – Method of least squares – Plane of regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations.		
Unit 04	**DESIGN OF EXPERIMENTS**	**9 Hours**
Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design.		
Unit 05	**MULTIVARIATE ANALYSIS**	**9 Hours**
Random vectors and matrices – mean vectors and covariance matrices – multivariate normal density and its properties – principal components: population components from standardized variables.		

Theory: 30 Hrs	Tutorial: - 15 Hrs	Practical:	Project:–	Total Hours: 45 Hrs

TEXT BOOK:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition (Reprint), 2019.

REFERENCE BOOKS:

1. J. L. Devore, "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury Publishers, 5th Edition, 2002.
2. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
3. R. A. Johnson and D. W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Publishers, 6th Edition, 2007.
4. S. Ross, "A first course in probability", Pearson Publishers, 9th Edition, 2019.

M.E/M.TECH REGULATIONS 2023	HEAD OF THE DEPARTMENT OF MATHEMATICS
S&H BoS DATE:08-07-2023	

Dr. S. JAYABHARATHI
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DEPARTMENT OF MATHEMATICS,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005. Tamilnadu.
Ph: 0427 - 4099 [illegible]

P23CEM101	CONSTRUCTION PLANNING SCHEDULING AND CONTROL	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1	Summarize the importance of planning.
CO2	Determine the project time and cost.
CO3	Know the time cost trade off, simulation and scheduling process.
CO4	Recognize the need of cost control.
CO5	Illustrate the database models and its applications in construction projects

Pre-requisite:- Nil

CO-PO Mapping

(3/2/1 indicates the strength of the correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3
CO2	3	2	2	3	1
CO3	3	2	3	2	3
CO4	3	2	1	3	2
CO5	2	3	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment / Problem solving / Seminar (10)	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

UNIT-I: CONSTRUCTION PLANNING — **9 Hours**

Introduction to Construction Projects - Project Categories - Project Participants - Project Life Cycle – Planning – Role of Planning Department in Construction- objectives – principles - stages of planning –Defining work task and precedence relationships among activities- Estimating durations and resources requirements- Coding system.

UNIT –II:PROJECT SCHEDULING — **9 Hours**

Construction scheduling - Work Breakdown Structure - Project Cost and Time Estimation - Bar Chart - Milestone Chart - CPM - PERT -RPM - LOB - Software's in construction scheduling.

UNIT –III:SCHEDULING WITH RESOURCE CONSTRAINTS — **9 Hours**

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 –IV: COST CONTROL — **9 Hours**

Monitoring and control of construction projects – quality control- importance-objectives – methods - cost control – objectives – control systems – direct and indirect cost control – project budgetary control – Project risk analysis and mitigation.

UNIT –V:ORGANIZING AND USE OF PROJECT INFORMATION — **9 Hours**

Types of project information- accuracy – use of information – computerized information – uses – database –

database models- relational model- centralized model- applications.				
Theory: 45 Hrs.	**Tutorial: –**	**Practical: –**	**Project: –**	**Total Hours: 45 Hrs.**
REFERENCE BOOKS:				
1.	Sengupta and Guha, "Construction Management and Planning", 1st Edition, Tata McGraw Hill Publication, 2015.			
2.	Chitkara K.K., "Construction Project Management Planning Scheduling and Controlling", 18th Reprint, Tata McGraw Hill, 2017.			
3.	Halpin, D.W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 2017.			
4.	Dr. Seetharaman S., "Construction Engineering and Management", 2nd Edition, Umesh Publications, 2017.			
5.	Saleh A. Mubarak ., "Construction Project Scheduling and Control" 4th Edition, Wiley Publication, 2019.			

P23CEM102	QUALITY CONTROL AND QUALITY ASSURANCE IN CONSTRUCTION	L	T	P	J	C
		3	0	2	0	4

COURSE OUTCOMES

Ath the end of the course, the student will be able to

CO1	Apply quality control aspects in planning and management.
CO2	study the various quality policy adopted in construction industries
CO3	Know the concept of objectives and advantage of quality assurance
CO4	be exposed to means of quality control
CO5	Understand the concept and importance of maintenance

Pre-requisite:- Nil

CO-PO Mapping

(3/2/1 indicates the strength of the correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	3	3	3	2	2
CO3	3	2	3	3	2
CO4	2	2	3	3	2
CO5	2	2	2	2	3

Course Assessment methods

Direct		Indirect
CIE test I (10) - Theory CIE test II (10) - Theory CIE test III (10) - Theory CIE test IV (10) - Laboratory Assignment/Quiz/Seminar/mini project (10)	Total CIE: **50 marks** Semester End Examination: **50 marks** **[SEE: Theory (35 marks), Lab (15 marks)]**	Course end survey

UNIT-I: QUALITY MANAGEMENT SYSTEMS — **9 Hours**

Types of organizations-Inspection, control and enforcement -Quality Management Systems and method - Responsibilities and authorities in quality assurances and quality Control- Architects, engineers, contractors, and special consultants, Quality circle.

UNIT –II:QUALITY POLICY — **9 Hours**

Quality policy -Objectives and methods In Construction Industry -Consumers satisfaction, Economics-Time of Completion -Statistical tolerance -Taguchi's concept of quality -Codes and Standards -Documents -Contract and construction programming -Inspection procedures -Processes and products -Total QA / QC programme and cost implication.

UNIT –III:QUALITY ASSURANCE — **9 Hours**

Objectives -Regularity agent, owner, design, contract and construction oriented objectives, methods -Techniques and needs of QA/QC -Different aspects of quality - Appraisals, Factors Influencing construction quality.

UNIT –IV: FACTORS OF CONSTRUCTION QUALITY — **9 Hours**

Appraisals - Critical, Major Failure Aspects and Failure Mode Analysis - Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction.

UNIT –V:MAINTENANCE MANAGEMENT — **9 Hours**

Introduction- objectives- need of maintenance – maintenance management- Planning systems for maintenance – Building Maintenance/ Facilities Management - Scheduled and contingency maintenance - case study.

Total Theory Hours = 30 Hours.

LIST OF EXPERIMENTS

1. To plot X-bar charts and process capability analysis for the given data
2. To plot C-chart using given experimental setup for the given data
3. Asses on how the inspection should be made to a building
4. Statistical quality control applied to business strategy (SIX SIGMA)
5. Assessing on how the quality has an impact on various aspects can be examined
6. Determination of reliability testing of materials for a project
7. Examine and prepare a report on how the maintenance is important for the building

Total Practical Hours = 30 Hours.

Theory: 45 Hrs.	Tutorial: –	Practical: 30 Hrs.	Project: –	Total Hours: 75 Hrs.

REFERENCE BOOKS:

1. James, J.O Brian, "Construction Inspection Handbook -Quality Assurance and: Quality Control", Van Nostrand, New York, 2012.
2. Juran Frank, J.M. and Gryna, F.M. "Quality Planning and Analysis", Tata McGraw Hill 2017.
3. John L. Ashford, "The Management of Quality in Construction", E & F.N, Spon. New York, 2009.
4. Clarkson H. Oglesby, "Productivity Improvement in Construction", McGraw-Hill, 2009.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23CEM501	ADVANCED CONCRETE TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

At the end of the course, the student will be able to...

CO1	Discuss microstructure concrete and dimensional stability
CO2	Prepare a mix design for the various mix proportions
CO3	Enumerate the properties of ingredients used in concretes
CO4	Explain the different types of special concrete and their applications in construction
CO5	Explain different types of non-destructive testing methods.

Pre-requisite:- Concrete Technology

CO-PO Mapping

(3/2/1 indicates the strength of the correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	1	2	2	1
CO2	2	2	2	2	2
CO3	3	2	3	3	1
CO4	3	2	3	2	2
CO5	2	2	2	2	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment / Problem solving / Seminar (10)	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

UNIT-I: CONCRETE CHARACTERISATION — **9 Hours**

Microstructure of concrete: Aggregate phase, hydrated cement paste, interfacial transition zone. Strength: strength-porosity relationship, failure modes in concrete, factors affecting compressive strength, behavior of concrete under various stress states. Dimensional stability: Elastic behavior, drying shrinkage and creep, thermal shrinkage and thermal properties of concrete – maturity of Concret

UNIT –II: PROPORTIONING CONCRETE MIXTURES — **9 Hours**

Significance and objectives, general considerations, procedures, Methods of concrete mix design IS & ACI Method, design of high strength concrete, High performance concrete, and Self Compacting Concrete using relevant codes. Testing and control of concrete quality: Methods and significance, accelerated strength testing, core tests and quality control charts – sampling and acceptance criteria.

UNIT –III: DURABILITY OF CONCRETE — **9 Hours**

Structure of water, permeability, causes of deterioration of concrete: surface wear, crystallization of salts in pores, frost action, effect of fire, sulfate attack, alkali aggregate reaction, and corrosion of embedded steel in concrete: Mechanism-control, development of holistic model of concrete deterioration, concrete in the marine environment. Methods of providing durable concrete, short-term tests to assess long-term behaviour.

UNIT –IV: SPECIAL TYPES OF CONCRETE — **9 Hours**

Self-compacted concrete-Self curing concrete-shrinkage compensation concrete, pervious concrete-concrete containing polymers-Geopolymer concrete-heavy weight concrete for radiation shielding-high performance concrete, high strength concrete, shotcrete, fibre reinforced concrete - Roller compacted concrete - bacterial concrete-Mass concrete – 3D Printing Concrete– their materials, mix proportions, properties, applications and limitations.

UNIT –V: NON-DESTRUCTIVE TESTING				9 Hours
Surface hardness methods, Penetration resistance techniques, pull out tests, maturity method, stress wave propagation methods, electrical methods, electrochemical methods, electromagnetic methods, Tomography of reinforced concrete-Rebound hammer – Ultra sonic pulse velocity meter – Cover meter – Rebar locator				
Theory: 45 Hrs.	**Tutorial: --**	**Practical: --**	**Project: --**	**Total Hours: 45 Hrs.**

REFERENCE BOOKS:

1.	Kumar Mehta, Paulo J.M Monteiro., Concrete Microstructure, properties and Materials,McGraw Hill Education(India) Pvt Ltd, New Delhi,2014
2.	Job Thomas, "Concrete Technology", Cengage Learning India, 2015
3.	Gambhir. M.L., Concrete Technology, McGraw Hill Education, 2011..
4.	Nayak, N.V, Jain. A.K., "Hand book on Advanced Concrete Technology", Alpha Science, New Delhi, 2012.
5.	Neville, A.M., Properties of Concrete, Prentice Hall, London, 2013.
6.	Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2008.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23STR519	INTERNET OF THINGS FOR CIVIL ENGINEERS	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

At the end of the course, the student will be able to...

CO1	Understand the architecture of Internet of Things.
CO2	Know the basic concept of Web of Things.
CO3	Identify the sensors for various applications in the IoT.
CO4	Application of IoT in Smart Cities.
CO5	Discuss the role of IoT in Environmental monitoring.

Pre-requisite:- Nil

CO-PO Mapping

(3/2/1 indicates the strength of the correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	2	2
CO2	2	1	3	2	2
CO3	2	-	-	3	2
CO4	3	2	3	2	2
CO5	3	3	-	2	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment / Problem solving / Seminar (10)	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

UNIT-I: INTRODUCTION — **9 Hours**

Definition and functional Requirements-Motivation-Architecture-Web3.0 View of IoT-Ubiquitous IoT applications-Four pillars of IoT-DNA of IoT-The Toolkit approach for End-user participation in the Internet of Things .Middleware for IoT: Overview-Communication middleware for IoT-IoT Information Security

UNIT –II: IOT ENABLING TECHNOLOGY — **9 Hours**

Wireless sensor network – cloud computing – big data analysis-communication protocol-embedded system. IoT levels. Web of things versus Internet of things-Two pillars of the web-Architecture standardization foe WoT. The cloud of things.

UNIT –III: IOT SENSORS — **9 Hours**

Introduction –Detectable phenomena-conversion methods-commonly measured quantities-Physical Principles-Selection of sensor-Need for sensor –role of sensor. Types of sensor: Requirements, Advantages, disadvantages and application-Pressures sensor-Temperature sensor-Humidity sensor-chemical sensor-Accelerometer and gyroscope

UNIT –IV: SMART CITY APPLICATION — **9 Hours**

Smart transportation –Intelligent parking-Autonomous Vehicle network. Smart buildings –Energy aware-inter building Navigation. Environmental sensing-Sustainable cities-City insights. Health monitoring of structures-Case studies

UNIT –V: STRUCTURAL AND ENVIRONMENTAL MONITORING — **9 Hours**

Structural health monitoring – components of structural health monitoring – Application of IoT in Structural health monitoring – case study. Water management –Process –application. Air pollution-Methods-advantages. Water monitoring-quality standards. Indication of calamities-alert systems-applications. Smart irrigation-case study. Micro climate monitoring. Room automation using IOT – Hands on Training

Theory: 45 Hrs.	Tutorial: –	Practical: –	Project: –	Total Hours: 45 Hrs.

REFERENCE BOOKS:

1.	The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012
2.	Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
3.	The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012
4.	Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

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Autonomous

P23GE101 **RESEARCH METHODOLOGY AND IPR** 3 0 0 0 3

(Common to all M.E /M.Tech Programmes)

COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Review the literature of the research problem
2. Choose appropriate data collection and sampling method according to the research problem.
3. Interpret the results of research and communicate effectively with their peers
4. Explain the Importance of intellectual property rights
5. Evaluate trade mark, develop and register patents.

CO/PO, PSO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak COs Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
COs	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	3
CO2	2	3	3	3	3
CO3	2	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory)	Assignment / Problem –Solving /Seminar (10) Total CIE: **40 Marks** Semester End Examination : **60 Marks**	Course end survey

UNIT I INTRODUCTION TO RESEARCH METHODS 9

Definition and Objective of Research, Various steps in Scientific Research, Types of Research, Criteria for Good Research, Defining Research Problem, Research Design , Case Study Collection of Primary and Secondary Data, Collection Methods: Observation, Interview, Questionnaires, Schedules,

UNIT II SAMPLING DESIGN AND HYPOTHESIS TESTING 9

steps in Sampling Design, Types of Sample Designs, Measurements and Scaling Techniques -Testing of hypotheses concerning means (one mean and difference between two means -one tailed and two tailed tests), concerning variance — one tailed Chi-square test.

UNIT II INTERPRETATION AND REPORT WRITING 9

Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY 9

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.

UNIT V TRADE MARKS, COPY RIGHTS AND PATENTS 9

Purpose and function of trade marks, acquisition of trade mark rights, trade mark registration processes, trademark claims —trademark Litigations- International trademark law Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Lecture: 45, Tutorial: 0, Total: 45 Hours

TEXT BOOKS

1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques An Edition, New Age International Publishers, 2019.
2. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Delmar Cengage Learning, 4" Edition, 2012.
3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", Tata Mc Graw Hill Education, 1" Edition, 2008.

REFERENCE BOOKS

1. Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013.
2. Ranjith Kumar, Research Methodology — A step by step Guide for Begineers, 4" edition, Sage publisher, 2014.
3. D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1" Edition, 2016.
4. Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1" Edition, 2012.
5. Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1" Edition, 2017.
6. M.Ashok Kumar and Mohd. Iqbal Ali :"Intellectual Property Rights" Serials Pub

S. Padma 4.8.23

Dr.S.PADMA, M.E., Ph.D.,
Professor and Head,
Department of EEE.
Sona College of Technology
Salem-636 005. Tamil Nadu.

P23GE701	English for Research Paper Writing	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Demonstrate research writing skills both for research articles and thesis
CO2:	Frame suitable title and captions as sub-headings for articles and thesis
CO3:	Write each section in a research paper and thesis coherently
CO4:	Use language appropriately and proficiently for effective written communication
CO5:	Exhibit professional proof-reading skills to make the writing error free

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**6 Hours**
Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness	
Unit 02:	**6 Hours**
Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.	
Unit 03:	**6 Hours**
Key skills to frame a title, to draft an abstract, to give an introduction	
Unit 04:	**6 Hours**
Skills required to organise review of literature, methods, results, discussion and conclusions	
Unit 05:	**6 Hours**
Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing	

Theory: 30 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 30 Hrs

TEXT BOOKS

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

REFERENCES

1	Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages
Sona College of Technology,
SALEM - 6

P23CEM103	ADVANCED CONSTRUCTION ENGINEERING LABORATORY	L	T	P	J	C
		0	0	4	0	2

COURSE OUTCOMES

At the end of the course, the student will be able to...

CO1	Apply standard testing methods to determine the mechanical and physical properties of high-strength and conventional concrete
CO2	Evaluate the durability and quality characteristics of concrete using non-destructive and advanced testing techniques
CO3	Analyze the fresh and hardened behavior of special concretes such as SCC and assess their performance under dynamic and environmental conditions

Pre-requisite:- Nil

CO-PO Mapping

(3/2/1 indicates the strength of the correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	3	3
CO2	3	2	1	3	3
CO3	3	3	1	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz I (5) CIE test II (20) Quiz I (5) RTPS (10)	Total CIE: **60 marks** Semester End Examination: **40 marks**	Course end survey

LIST OF EXPERIMENTS

1. Determine the mix design for high strength concrete.
2. Determine the modulus of elasticity of concrete using cylindrical specimen.
3. Correlation between cube strength, cylindrical strength, split tensile strength and modulus of rupture
4. Determine the compressive stregnth of concrete by conducting a Rebound hammer test.
5. Assess the quality of concrete by conducting ultrasonic pulse velocity test.
6. Determine the durability of concrete specimens using RCPT
7. Determine the permeability characteristics of concrete specimen
8. Evaluate the workability characteristics of self-compacting concrete (SCC)
9. Evaluate the setting time of concrete specimen
10. Determine the impact resistance of the concrete specimen

Theory: –	Tutorial: –	Practical: 60 Hrs.	Project: –	Total Hours: 60 Hrs.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

Sona College of Technology, Salem

(An Autonomous Institution)

Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)

Branch: Construction Engineering and Management

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
		Theory courses								
1.	P23CEM201	Advanced Construction Techniques	3	0	0	0	3	PC	45	T
2.	P23CEM202	Resource Management and control in Construction	3	0	0	2	4	PC	75	TP
3.	P23CEM203	Construction Equipment and Management	3	0	0	0	3	PC	45	T
4.	P23CEM509	**Elective:** Contract Laws and Regulation	3	0	0	0	3	PE	45	T
5.	P23STR509	**Elective**: Prefabricated Structures	3	0	0	0	3	PE	45	T
6.	P23GE702	**Audit Course:** Stress Management by Yoga	2	0	0	0	0	AC	30	T
		Practical courses								
7.	P23CEM204	Construction Management Studio Laboratory	0	0	4	0	2	PC	60	L
8.	P23CEM205	Technical Seminar	0	0	2	0	1	PC	30	L
		Total Credits					**19**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project

Approved By

Chairperson – Civil Engineering, BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Civil, Second Semester CEM Students and Staff, COE

P23CEM201	ADVANCED CONSTRUCTION TECHNIQUES	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

Upon completion of this course, the student will be able to…

CO1	Apply appropriate advanced construction techniques and dewatering methods by analyzing site conditions, structural requirements, and execution challenges.
CO2	Analyze modern concreting, prestressing, erection, and material-handling techniques for efficient construction of tall, large-span, and complex structural systems.
CO3	Evaluate appropriate construction sequences for complex industrial, bridge, marine, and special structural systems.
CO4	Analyze appropriate techniques to enhance the safety, durability, and performance of existing structures.
CO5	Analyze suitable demolition and dismantling techniques to ensure safe sequencing and compliance with safety practices.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	3	3
CO2	2	3	2	3	3
CO3	2	3	2	3	3
CO4	2	3	2	3	3
CO5	2	3	2	3	3

Course Assessment Methods

Direct		Indirect
CIE Test I (10) CIE Test II (10) CIE Test III (10)	Assignment /Seminar/Problem solving (10) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course End Survey

UNIT-I: SUBSTRUCTURE CONSTRUCTION **9 Hrs.**

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 for underground open excavation.

UNIT –II: SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS **9 Hrs.**

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ

prestressing in high rise structures, Post tensioning of slab- Aerial transporting – Handling and erecting lightweight components on tall structures.

UNIT –III: CONSTRUCTION OF SPECIAL STRUCTURES **9 Hrs.**

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, and sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks.

UNIT –IV:REHABILITATION AND STRENGTHENING TECHNIQUES **9 Hrs.**

Seismic retrofitting - Strengthening of beams, columns, slab and masonry wall - Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

UNIT –V:DEMOLITION **9 Hrs.**

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

Theory: 45 Hrs.	Tutorial: -	Practical: -	Project: -	Total Hours: 45 Hrs.

REFERENCE BOOKS:

1. Sankar, S.K.& Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.
2. Gahlot .P.S & Sanjay Sharma,Building repair and maintenance management "CBS Publications.2006.
3. Brown.R, "Practical Foundation Engineering Hand Book", McGraw Hill Publications, 2005.
4. Patrick Powers J, "Construction Dewatering: New Methods and Applications" John Wiley & Sons, 2002.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23CEM202	RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION	L	T	P	J	C
		3	0	0	2	4

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1	Apply systematic resource planning techniques for effective identification, procurement, and allocation of materials, labour, and equipment in construction projects.
CO2	Apply productivity analysis methods to assess labour efficiency and identify factors affecting optimum labour utilization.
CO3	Evaluate material procurement decisions by analyzing time of purchase, required quantities, sourcing options, transportation logistics, and site distribution constraints.
CO4	Analyze and optimize construction resources and time–cost performance using systems approach and critical planning tools.
CO5	Optimize project time, cost, and resources using computer-based scheduling and value management techniques.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	2	3	3	3

Course Assessment Methods

Direct		Indirect
CIE Test I (10) - Theory CIE Test II (10) - Theory CIE Test III (10) – Theory CIE Test IV (10) – Project	Assignment /Quiz/Seminar (10) Total CIE: **50 marks** Semester End Examination: **50 marks** [SEE- Theory 35 marks, Project:15 marks]	Course End Survey

UNIT-I: RESOURCE PLANNING — 9 Hrs.

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 Hrs.

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, optimum use Labour- Productivity analysis for labour.

UNIT –III: MATERIALS AND EQUIPMENT MANAGEMENT				9 Hrs.
Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.				
UNIT –IV: TIME AND COST MANAGEMENT				**9 Hrs.**
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-Fast track construction.				
UNIT –V: RESOURCE ALLOCATION CONCEPTS				**9 Hrs.**
Time-cost trade off, Computer application – Resource levelling, resource smoothing resource list, resource allocation, Resource loading, Cumulative cost –Value Management.				
Theory: 45 Hrs.	**Tutorial: -**	**Practical: -**	**Project: -30 Hrs**	**Total Hours: 75 Hrs.**

REFERENCE BOOKS:

1. S. Keoki Sears, Glenn A. Sears, Richard H. Clough, Jerald L. Rounds, Robert O. Segner "Construction Project Management", 6th Edition, John Wiley & Sons Inc., New Jersey, 2015.
2. K. K. Chitkara., "Construction Project Management Planning, Scheduling and Controlling", 4th edition, Tata McGraw-Hill Education, 2019.
3. Harvey, A. Levine, "Project Management using Micro Computers", Obsome McGraw Hill C.A. Publishing Co., Inc. 2008.
4. Andrew Whyte, "Integrated Design and Cost Management for Civil Engineers", CRC Press, 2014
5. https://nptel.ac.in/courses/105104161/5

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23CEM203	CONSTRUCTION EQUIPMENT AND MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

Upon completion of this course, the student will be able to...

CO1	Identify various types of construction equipment and analyze project requirements for effective equipment planning and utilization.
CO2	Classify various types of earthwork and earthmoving equipment used in excavation, hauling, spreading, and compaction works.
CO3	Select and evaluate erection equipment such as cranes and mobile cranes based on load characteristics, site constraints, and safety considerations.
CO4	Select appropriate aggregate, concrete, and asphalt equipment based on project requirements, productivity, and quality control considerations.
CO5	Implement maintenance management practices and evaluate equipment replacement strategies for reliable and economical operation.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	3
CO2	3	2	3	3	3
CO3	3	2	2	3	3
CO4	3	2	2	3	3
CO5	3	2	3	3	3

Course Assessment Methods

Direct		Indirect
CIE Test I (10) CIE Test II (10) CIE Test III (10)	Assignment /Seminar/Problem solving (10) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course End Survey

UNIT-I: CONSTRUCTION EQUIPMENT SELECTION **9Hrs.**

Identification – Planning of equipment – Selection of Equipment - Equipment Management in Projects - Maintenance Management – Equipment cost – Operating cost – Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment- Replacement Analysis - Safety Management.

UNIT –II: EQUIPMENT FOR EARTHWORK **9 Hrs.**

Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment

UNIT –III: OTHER CONSTRUCTION EQUIPMENT	9 Hrs.
Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Equipment for Demolition.	
UNIT –IV: ASPHALT AND CONCRETING EQUIPMENT	**9Hrs.**
Aggregate production- Different Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Pumping Equipment – Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment.	
UNIT –V:CONSTRUCTION EQUIPMENT MANAGEMENT	**9 Hrs.**
Identification – Planning - Equipment Management in Projects - Maintenance Management –Replacement – Equipment Productivity Analysis-Cost Control of Equipment – Depreciation Analysis – Safety Management	

Theory: 45 Hrs.	Tutorial: -	Practical: -	Project: -	Total Hours: 45 Hrs.

REFERENCE BOOKS:

1. Peurifoy R.L., "Construction Planning, Equipment and Methods", 9th Edition, McGraw Hill, Singapore, 2018.
2. Sharma S.C., "Construction Equipment and Management", 5th Edition, Khanna Publishers, New Delhi, 2019..
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2010.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23CEM509	CONTRACT LAWS AND REGULATIONS	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1	Explain the fundamentals of contract agreements in engineering, including elements, types of contracts, standard contract documents, conditions of contract, and the application of the Law of Torts.
CO2	Analyze the tendering process by interpreting tender documents, methods of inviting tenders, and evaluating tenders based on technical and financial criteria in accordance with FIDIC conditions of contract
CO3	Apply procedures related to Earnest Money Deposit, security deposits, appointment of arbitrators, and dispute resolution mechanisms to manage contractual disputes effectively in construction projects.
CO4	Assess potential contractual problems and taxation aspects in construction projects, including price variation, liquidated damages, insurance, income tax, VAT, and statutory planning approvals through case studies.
CO5	Outline the provisions of the Indian Contract Act and major labour laws applicable to construction projects, including compensation, wages, and industrial dispute regulations.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	3	3
CO2	2	2	3	3	3
CO3	2	2	3	3	3
CO4	-	2	3	3	3
CO5	2	2	3	3	3

Course Assessment Methods

Direct		Indirect
CIE Test I (10) CIE Test II (10) CIE Test III (10)	Assignment /Seminar/Problem solving (10) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course End Survey

UNIT-I: CONTRACT AGREEMENTS **9 Hrs**

Functions of Contracts in engineering- Introduction to Contract agreements, Terms involved in Contract agreements - Elements of Contracts -Types of Contracts – Standard Contract Document - Conditions of Contract-Law of Torts.

UNIT –II: TENDERING CONCEPTS	9 Hrs
Tendering Process - tender documents – requirements for tendering –Methods of inviting tenders-Evaluation of Tender from Technical, financial aspects – Two Cover System- Preparation of the Documentation- FIDIC conditions of contract	
UNIT –III: APPOINTMENT OF ARBITRATOR	**9 Hrs**
Earnest Money Deposit (EMD) – Security deposits - Arbitrator- appointment of arbitrator-power and duties of arbitrator – dispute review board- Violations – Certificates, Forms, and Schedules – Extension of time and extended stay-Case study.	
UNIT –IV: TYPES OF TAX INVOLVED IN CONSTRUCTION	**9 Hrs**
Potential Contractual Problems – price variation clause – fine and Liquidated Damages – insurance income tax – sales tax – VAT – Legal requirements of planning –Local government approval-Case study.	
UNIT –V: LABOUR LAWS	**9 Hrs**
Indian Contracts Act - Labour laws – workmen compensation act – minimum wages Act – Child labour Act- Industrial dispute Act- Maternity benefit Act – Domestic emerging on misconduct.	

Theory: 45 Hrs.	Tutorial: -	Practical: -	Project: -	Total Hours: 45 Hrs.

REFERENCE BOOKS:

1. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2010.
2. Joseph T. Bockrath, "Contracts, the Legal Environment for Engineers and Architects", McGraw Hill, 2010
3. John G. Betty., "Engineering Contracts", McGraw Hill, 2003.
4. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", 4th edition, LexisNexis Butterworths India, 2000
5. Saleh A. Mubarak ., "Construction Project Scheduling and Control" 4th Edition, Wiley Publication, 2019
6. http://nptel.ac.in/courses/105103093

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23STR509	PREFABRICATED STRUCTURES	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

Upon completion of this course, the student will be able to...

CO1	Analyze and compare prefabricated and monolithic construction systems, classify types of prefabrication, and handling and erection stresses in prefabricated construction practices.
CO2	Apply the principles of design, detailing, and construction of precast structural elements and their joints in precast construction systems
CO3	Analyze and select appropriate production setups and manufacturing methods for precast construction, dimensional tolerances of precast elements, and apply techniques for quality-controlled production
CO4	Select, and apply appropriate equipment and techniques for hoisting and erection of structural members to ensure safe and efficient construction practices.
CO5	Design and detail precast concrete structural units for industrial and factory buildings in accordance with relevant design codes and practical construction requirements.

CO-PO Mapping

(3/2/1 indicates the strength of correlation) 3- Strong, 2-Medium, 1-Weak.

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3
CO2	2	1	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Assessment Method

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment /Problem-solving / Seminar (10)	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course End Survey

UNIT-I: GENERAL PRINCIPLES OF FABRICATION **9 Hrs.**

Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization– Disuniting of structures – Handling and erection stresses.

UNIT –II: PREFABRICATED ELEMENTS **9 Hrs.**

Roof and floor panels – wall panels – shear walls - columns – Joints for different structural connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings –Expansion joints in pre-cast construction

UNIT –III: PRODUCTION TECHNOLOGY	9 Hrs.
Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.	
UNIT –IV: HOISTING TECHNOLOGY	**9 Hrs.**
Equipment for hoisting and erection – Elimination of erection stresses – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads – Lifting with external pre-stressing.	
UNIT –V: APPLICATIONS	**9 Hrs.**
Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns - water tanks	

Theory: 45 Hrs.	Tutorial: -	Practical: -	Project: -	Total Hours: 45 Hrs.

REFERENCE BOOKS:

I. T. Koncz, Manual of Precast Concrete Construction, Vol. I, II, III & IV, Berlin, 2012

2. B. Lewicki, Building with Large Prefabricates, Elsevier Publishing Company, , New York, 2008

4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland BetorVerlag, 2009

5.Kims S. Elliot, Precast Concrete Structures, CRC Press, Taylor & Francis, 2017

6. IS15916:2011, Building design and erection using prefabricated concrete. BIS, India, 2011.

Sona College of Technology APPROVED Board of Studies Civil Engineering Chairperson Autonomous

P23GE702	Stress Management by Yoga	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Develop physical and mental health thus improving social health
CO2:	Increase immunity power of the body and prevent diseases
CO3:	Accelerate memory power
CO4:	Achieve the set goal with confidence and determination
CO5:	Improve stability of mind, pleasing personality and work with awakened wisdom

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: **6 Hours**

Yoga-Introduction - Astanga Yoga- 8 parts-Yam and Niyam etc.- Do's and Don'ts in life-Benefits of Yoga and Asana- Yoga Exercise- and benefits- Pranayam Yoga- Nadi suthi, Practice and Spinal Sclearance Practice-Regularization of breathing techniques and its effects-Practice and kapalapathy practice.

Unit 02: **6 Hours**

Neuromuscular breathing exercise and Practice- Magarasa Yoga, 14 points Acupressure techniques and practice-Body relaxation practice and its benefits- Raja Yoga- 1.Agna –explanation and practice- Activation of Pituitary- Raja Yoga- 2. Santhi Yoga-Practice-Balancing of physical and mental power.

Unit 03: **6 Hours**

Raja Yoga- 3. Sagasrathara yoga –practice- Activation of dormant brain cells-Kayakalpa-theory- Kayakalpa –practice-Yogic exercise to improve physical and mental health and practice-Asanas –explanation-Practice-benefits

Unit 04: **6 Hours**

Sun namaskar- 12 poses-explanation and practice-Yoga –Asana-Padmasana, vajrasana,chakrasana, viruchasana etc-Stress management with Yoga-Role of women and Yoga Equality, nonviolence, Humanity, Self- control- Food and yoga Aware of self-destructive habits Avoid fault thinking (thought analysis-Practice)-Yoga Free from ANGER (Neutralization of anger)& practice

Unit 05: **6 Hours**

Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice - Personality development, positive thinking-Good characters to lead a moral life How to clear the polluted mind- Benefits of blessing- Five- fold culture –explanation- Karma Yoga Practice In Geetha- Sense of duty-Devotion, self- reliance, confidence, concentration, truthfulness, cleanliness.

Theory: 30 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 30 Hrs

REFERENCES

1	'Yogic Asanas for Group Tarining-Part-I" Janardan Swami Yogabhyasi Mandal, Nagpur
2	"Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

HOD
Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

P23CEM204	CONSTRUCTION MANAGEMENT STUDIO LABORATORY	L	T	P	J	C
		0	0	4	0	2

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1	Formulate quantity take-off and delivery of bid for construction projects.
CO2	Prepare project track report using management software.
CO3	Develop project schedules, monitor the progress of construction activities, and evaluate associated risk factors

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	3
CO2	2	2	3	2	3
CO3	2	2	3	2	3

Course Assessment Methods

Direct		Indirect
CIE Test I (20) Quiz 1 (5) CIE Test II (20) Quiz 2 (5)	RTPS (10) Total CIE: **60 marks** Semester End Examination: **40 marks**	Course End Survey

1. Design of a simple equipment information system for a construction project.
2. Quantity take-off, Preparation and delivery of the bid or proposal of an engineering construction project.
3. Scheduling of a small construction project scheduling systems including reports and tracking.
4. Simulation models for project risk analysis.
5. Resource allocation for construction project and levelling of the resources.
6. Monitoring of the construction project, tracking and taking reports

Theory: -	Tutorial: -	Practical: 60 Hrs.	Project: -	Total Hours: 60 Hrs.

REFERENCE BOOKS:

1. Laboratory manuals prepared by Civil Engineering Department, Sona College of Technology, Salem.
2. Carl S Chattfield and Timothy D Johnson, "Microsoft Project 2016 Step by Step", 1st Edition, Pearson Publication, 2016.
3. Daniel L. Williams, Elaine Britt Krazer, "Oracle Primavera P6 Version 8: Project and Portfolio Management", 1st Edition, Packt Publishing Ltd., 2012.

Sona College of Technology Approved Board of Studies Civil Engineering Chairperson Autonomous

P23STR205	TECHNICAL SEMINAR	L	T	P	J	C
		0	0	2	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to....

CO1	Collect an innovative / novelty topic related to the desirable area.
CO2	Present their understandings from the research studies in an effective manner.
CO3	Demonstrate the ability to defend technical content with logical reasoning, respond to questions confidently, and exhibit professional interaction during their presentations.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-weak

COs	PO1	PO2	PO3	PO4	PO5
CO1	2	2	1	2	2
CO2	2	2	2	1	1
CO3	2	2	1	1	2

Course Assessment Methods

Direct		Indirect
Review I (10 marks) Review II (20 marks) Review III (20 marks) Final Presentation (50 marks)	Total CIE: **100 marks** Semester End Examination: -	Course End Survey

The students will work for two hours per week guided by a group of staff members. They will be asked to give three presentations on any topic of their choice related to Structural Engineering and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report, also on the interaction shown during the seminar.

Review-I, II and III will consist of a panel constituted by the Head of the Department. Final Presentation will consist of a panel constituted by the Office of Controller of Examination consisting of one coordinator and one internal member from the Department.

Theory: -	Tutorial: -	Practical: 30 Hrs	Project: -	Total Hours: 30 Hrs.

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