

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 2023-2024]

PG Regulations 2023

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)

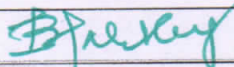
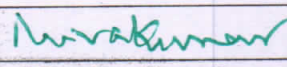
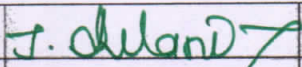
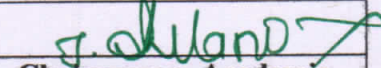
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)

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

Approved By

			
Chairperson - 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 CEM Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)

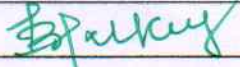
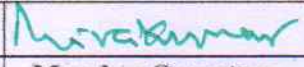
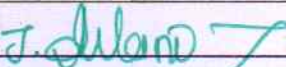

Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)

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 Regulations	3	0	0	0	3	PE	45	T	
5.	P23STR505	Elective: Formwork Engineering	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				

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Approved By

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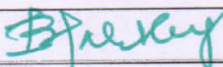
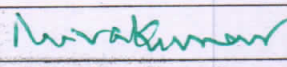
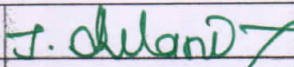
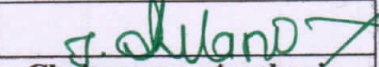
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)

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



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

CIVIL ENGINEERING					
M. E. / CONSTRUCTION ENGINEERING AND MANAGEMENT					
SEMESTER - I	STATISTICAL METHODS FOR ENGINEERS				C
P23MAT101E					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 and 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 principal components.				
Pre-requisites:					
<ul style="list-style-type: none"> Basics of calculus Basics of statistics 			<ul style="list-style-type: none"> 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, 11 th Edition (Reprint), 2019.	
REFERENCE BOOKS:		
1.	J. L. Devore, "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury Publishers, 5 th Edition, 2002.	
2.	R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9 th Edition, 2018.	
3.	R. A. Johnson and D. W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Publishers, 6 th Edition, 2007.	
4.	S. Ross, "A first course in probability", Pearson Publishers, 9 th Edition, 2019.	
 Dr. S. JAYABHARATHI ASSOCIATE PROFESSOR & HEAD DEPARTMENT OF MATHEMATICS, SONA COLLEGE OF TECHNOLOGY, SALEM-636 005. Tamilnadu. Ph: 0427 - 4099999.		
 Dr. M. RENUGA, Professor & Head, Department of Humanities & Languages, Sona College of Technology, SALEM - 636 005.		
HoD / Mathematics		BoS – Chairperson / Science and Humanities

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 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.
REFERENCES				
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", 2 nd Edition, Umesh Publications, 2017.			
5.	Saleh A. Mubarak ., "Construction Project Scheduling and Control" 4 th Edition, Wiley Publication, 2019.			

Dr. Seetharaman S.



P23CEM102	QUALITY CONTROL AND QUALITY ASSURANCE IN CONSTRUCTION				L	T	P	J	C
					3	0	2	0	4
Course Outcomes									
At 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 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	3	2	3	3	2				
CO5	3	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: 45 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: 30Hours.

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

- | | |
|----|---|
| 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. |
| 5. | Steven McCabe, "Quality Improvement Techniques in Construction", Addison Wesley Longman Ltd, England, 2016. |

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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 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 Concrete									
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-Geo-polymer 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
REFERENCES				
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., “Handbook on Advanced Concrete Technology”, Alpha Sience, NewDelhi, 2012			
5.	Neville, A.M., Properties of Concrete, Prentice Hall, 2013, London.			
6.	Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2008.			

Signature



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 correlation) 3-Strong, 2-Medium, 1-Weak									
COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)								
	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)					Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey			
CIE test II (10)									
CIE test III (10)									
Assignment / Problem- solving / Seminar (10)									
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
REFERENCES				
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			



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	Design high strength concrete and study the parameter affecting its performance						
CO2	Conduct Non-Destructive tests on existing concrete structures and apply engineering principles to understand behaviour of structural elements						
CO3	Gain practical knowledge of non-destructive testing and learn to calibrate and use proving rings and LVDTs						
Pre-requisite:- Nil							
CO/PO 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	1	2	2	1		
CO3	2	1	2	3	2		
Course Assessment methods							
Direct				Indirect			
CIE test I (20)	Total CIE: 60 marks Semester End Examination: 40 marks			Course end survey			
Quiz 1 (5)							
CIE test II (20)							
Quiz 2 (5)							
RTPS (10)							
LIST OF EXPERIMENTS							
<ol style="list-style-type: none"> Determine the mix design for high strength concrete. Determine the modulus of elasticity of concrete using cylindrical specimen. Correlation between cube strength, cylindrical strength, split tensile strength and modulus of rupture Determine the influence of cyclic load on steel beam. Determine the compressive strength of concrete by conducting a Rebound hammer test. Determine the compressive strength of concrete by conducting a Ultra Sonic Pulse Velocity test Assess the quality of concrete by conducting ultrasonic pulse velocity test. Behaviour of beams under flexure, shear, and torsion Determine the durability (Water absorption/Permeability/RCPT) of concrete Specimen 							
Theory:	Tutorial: --	Practical: 60 Hrs.	Project:--	Total Hours: 60 Hrs.			

Signature



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)				
	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)	Course end survey
Assignment / Problem –Solving /Seminar (10) Total CIE: 40 Marks Semester End Examination : 60 Marks	

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.

S. Padma
4.8.23

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.

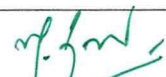
REFERENCE BOOKS

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

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Professor & Head,
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Sona College of Technology,
SALEM - 67

Sona College of Technology, Salem
(An Autonomous Institution)

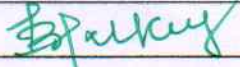
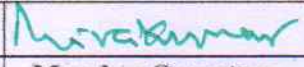
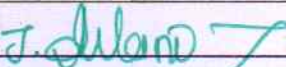

Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)

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 Regulations	3	0	0	0	3	PE	45	T	
5.	P23STR505	Elective: Formwork Engineering	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

Approved By

			
Chairperson - 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

COURSE OUTCOMES

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

CO1	Understand the various processes involved in sub-structure construction.
CO2	Understand the various processes involved in super-structure construction.
CO3	Understand the construction techniques carried in bridges, tunnelling.
CO4	Know about the rehabilitation techniques carried out for a structure.
CO5	Understand the concept of demolition and safety precaution during demolition.

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	2	2	1
CO2	3	2	2	2	2
CO3	3	3	2	2	2
CO4	3	3	2	2	1
CO5	3	1	2	2	1

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**9Hrs.**

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**9Hrs.**

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**9Hrs.**

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
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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.

Dejani



P23CEM202	RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION	3	0	0	2	4
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COURSE OUTCOMES

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

CO1	Understand the various concepts of resource planning.
CO2	Understand the various approaches of labour management.
CO3	Analyze the planning and selection of various materials and equipment's for construction.
CO4	apply the techniques of time management
CO5	Allocate the resources for the construction projects.

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	2	2
CO2	3	2	2	1	2
CO3	3	2	2	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2

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>

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P23CEM203

CONSTRUCTION EQUIPMENT AND MANAGEMENT

3 0 0 0 3

COURSE OUTCOMES

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

CO1	Understand the functions of equipment operations.
CO2	Understand the functions of various earthwork equipment selections.
CO3	Understand the construction methods involved in sub structure and super structure construction
CO4	Interpret a suitable equipment for concreting works
CO5	Understand the various equipment 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	2	2	1	2
CO2	3	2	1	2	2
CO3	3	1	2	2	2
CO4	3	2	1	1	1
CO5	3	2	2	1	1

Course Assessment methods

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

UNIT-I: CONSTRUCTION EQUIPMENT SELECTION

9 Hrs.

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

9 Hrs.

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.

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Version 1.0

ME (CEM)

Semester - I

APPROVED
Board of Studies
PG Regulations 2023 (ME/M.Tech)Civil Engineering
Chairperson

Autonomous

P23CEM509	CONTRACT LAWS AND REGULATIONS	3	0	0	0	3
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COURSE OUTCOMES

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

CO1	study the elements of concluding, and administering contracts
CO2	Know about the concepts of tendering procedures.
CO3	achieve awareness on arbitrations and legal procedures
CO4	explain the different taxes involved in construction activities
CO5	gain knowledge on labour regulations and their impact on managing of contracts

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	2	2	2
CO2	1	2	2	2	2
CO3	3	2	2	2	2
CO4	2	2	2	2	2
CO5	2	2	2	3	2

Course Assessment methods

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

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
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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. 5. <http://nptel.ac.in/courses/105103093>

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COURSE OUTCOMES

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

CO1	Explain materials and behavior of formwork
CO2	Discuss the design of foundation, wall and column formwork
CO3	Describe the design the formwork for beam, slab, bridges and special structures
CO4	Demonstrate the design of Flying Formwork slipform techniques
CO5	Discuss the design of formwork for supports – Scaffolds and precast concrete

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	1	2	1
CO2	3	2	1	2	1
CO3	3	2	1	2	1
CO4	3	2	1	2	1
CO5	3	2	1	2	1

Course Assessment methods

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

UNIT-I: INTRODUCTION**9 Hrs.**

Introduction-Formwork as a temporary structure-requirements for Formwork-selection of Formwork-Classification of Formwork- Formwork Materials-Timber-Plywood-Steel-Aluminium Form-Plastic Forms-other Material-Form Coating and Mould Linings-Form Anchors-Tie System-Spreaders, Spacers-Form Linings Materials.

UNIT –II: FORMWORK DESIGN CONCEPTS & FOUNDATION FORMWORK**9 Hrs.**

Loads on Formwork-Dead or Permanent Loads-Imposed Loads-Environmental Loads-Design Basis (Assumption Made in Formwork Design)-Estimating Permissible Stress-Maximum Bending Moment, Shear Force, and Deflection-Formwork for Foundation-Conventional Formwork for Foundation- Foundation Formwork Design-Illustration on Foundation Wall Design.

UNIT –III: WALL & COLUMN FORMWORK**9 Hrs.**

Wall Formwork: Conventional Wall Formwork-Proprietary Wall Formwork System-Large Area Wall Forms-Climbing Formwork- Different types of Climbing formwork – Doka climbing Formwork -Wall Form Design- Illustration of Wall Formwork Design Using Plywood and H-16 Beams, Column Formwork: Conventional Column Formwork-Proprietary Column Formwork- Column Formwork System- Doka form work system- PERI Column Formwork-Disposable Column Formwork-All Metal Column Formwork-Achieving Formwork - Economy in Column Construction-Design for Column Formwork-Illustration of Column Formwork Design-Example.

UNIT –IV: SLAB AND BEAM FORMWORK**9 Hrs.**

Traditional Slab and Beam Formwork-Slab and Beam Formwork Solutions offered by L & T-Beam and Slab Formwork Solution by PERI and Mivan - achieving Economy in Slab Construction-Design of Slab and Beam Construction-Illustration of Slab and Beam Formwork Design-Illustration of Proprietary Slab Formwork-Formwork arrangement for Caissons-Formwork for Piers And Pier Caps-Bridge Superstructures-Formwork for Bridge Railing/Parapets/Edge Beams-Cases Temporary Support Structures of Bridges.

UNIT –V: FLYING FORMWORK**9 Hrs.**

Some Examples of Flying Formwork-Flying Formwork Cycle-Advantages And Limitation of Flying Formwork-Design Issues in Flying Forms-Safety Issues in Flying Forms-Table Forms-Tunnel Formwork System-Column Mounted Shoring

System-Gang Forms-Slipform-Vertical Slipform-Horizontal Slipform-Types of Slipform-Functions of Various Slipform Components-Assembly, Sliding And Dismantling of Slip form – Slip form Design Issues-Some Cases in Slip form - Safety Operation during Slip form Erection-Productivity Issues in Slip form Construction. Failure of formworks.

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

1. Kumar NeerajJha, "Formwork for concrete structures", Tata Mcgraw Hill Education Private Limited New Delhi – 2012
2. JanarthanSha&S.K.Sinha, " Modern Practices in Formwork for Civil Engineering Construction Works, University Science Press, New Delhi, 2014
3. Oberlender. D, Robert L. Peurifoy, "Formwork for Concrete Structures", McGraw Hill Publishers, NewYork, 2010



P23CEM204	CONSTRUCTION MANAGEMENT STUDIO LABORATORY	0	0	4	0	2
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COURSE OUTCOMES

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

CO1	Prepare quantity takeoff and delivery of bid for construction projects.
CO2	Prepare track project report using Primavera software.
CO3	Plan scheduling and track construction projects using MS project and analyze the risks factors in projects

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	2	2	2
CO2	1	2	2	2	2
CO3	3	2	2	2	2

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. EPS, OBS, WBS of an engineering construction project.
2. Design of a simple equipment information system for a construction project.
3. Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.
4. Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.
5. Simulation models for project risk analysis.
6. Resource allocation for construction project and leveling of the resources.
7. Monitoring of the construction project, tracking and taking reports using tools like MS project scheduling systems

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

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P23CEM205	TECHNICAL SEMINAR	0	0	2	0	1
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COURSE OUTCOMES

At the end of the course, the students 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	Trained to face an audience and to solve any critical problem during their Interview

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	1	2	2
CO2	2	2	2	1	1
CO3	2	2	1	1	2

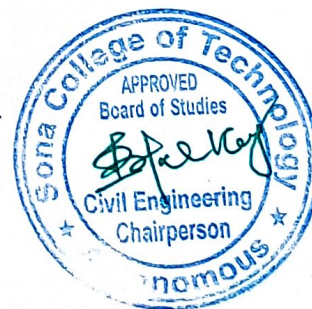
Course Assessment methods

Direct		Indirect
Presentation I (30 marks) Presentation II (35 marks) Presentation III (35 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 a three presentations on any topic of their choice related to Construction Engineering and Management 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. The students will be evaluated through a viva-voce examination by a team of internal faculty members assigned by HoD for each presentation of the student.

Theory: --	Tutorial: --	Practical: 30 Hrs	Project: --	Total Hours: 30 Hrs.
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P. D. Patil



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


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