

**SONA COLLEGE OF TECHNOLOGY, SALEM-5**

**(An Autonomous Institution)**

**M.E-Civil Engineering**

**(Construction Engineering and Management)**

**CURRICULUM and SYLLABI**

**[For students admitted in 2021-2022]**

**M.E / M.Tech Regulation 2019**

**Approved by BOS and Academic Council meetings**

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME I Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM101	Project Formulation and Appraisal	3	1	0	4	60
2	P19CEM102	Construction Planning, Scheduling and Control	3	1	0	4	60
3	P19CEM502	<b>Elective:</b> Advanced Concrete Technology	3	0	0	3	45
4	P19CEM507	<b>Elective:</b> Construction Project Management	3	0	0	3	45
5	P19GE101	<b>Research Methodology and IPR</b>	2	0	0	2	30
6	P19GE701	<b>Audit Course:</b> English for Research Paper Writing	2	0	0	0	30
<b>Practical</b>							
7	P19CEM103	Construction Engineering Laboratory	0	0	4	2	60
<b>Total Credits</b>						<b>18</b>	

Approved by

Chairperson, Civil Engineering BOS

**Dr.R.Malathy**

Member Secretary, Academic Council

**Dr.R.Shivakumar**

Chairperson, Academic Council & Principal

**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 ME II Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM201	Resource Management and Control in Construction	3	0	0	3	45
2	P19CEM202	Construction Laws and Regulations	3	0	0	3	45
3	P19CEM510	<b>Elective</b> – Project Safety Management	3	0	0	3	45
4	P19CEM515	<b>Elective</b> – Modern Construction Materials	3	0	0	3	45
5	P19GE702	<b>Audit Course</b> – Stress Management by Yoga	2	0	0	0	30
<b>Practical</b>							
7	P19CEM203	Software Application Laboratory for Construction Management	1	0	4	3	75
8	P19CEM204	Mini Project	0	0	4	2	60
<b>Total Credits</b>						<b>17</b>	

Approved by

**Chairperson, Civil Engineering BOS**

**Dr.R.Malathy**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

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

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME III Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM301	Advanced Construction Techniques	3	0	0	3	45
2	P19CEM517	<b>Professional Elective-</b> Quality Control and Quality Assurance in Construction	3	0	0	3	45
3	P19END601	<b>Open Elective-</b> Product Design and Manufacturing	3	0	0	3	45
	P19ISE601	<b>Open Elective-</b> Transport Safety					
<b>Practical</b>							
4	P19CEM302	Technical Seminar	0	0	2	1	30
5	P19CEM303	Practical Training	0	0	4	2	60
6	P19CEM304	Project Phase – I	0	0	16	8	240
<b>Total Credits</b>						<b>20</b>	

Approved by

**Chairperson, Civil Engineering BOS**  
**Dr.R.Malathy**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Civil, Third Semester ME CEM Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME IV Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credit</b>	<b>Total Contact Hours</b>
<b>Practical</b>							
1	P19CEM401	Project Phase – II	0	0	28	14	420
<b>Total Credits</b>						<b>14</b>	

**Approved by**

**Chairperson, Civil Engineering BOS**

**Dr.R.Malathy**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Civil, Fourth Semester ME CEM Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME I Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM101	Project Formulation and Appraisal	3	1	0	4	60
2	P19CEM102	Construction Planning, Scheduling and Control	3	1	0	4	60
3	P19CEM502	<b>Elective:</b> Advanced Concrete Technology	3	0	0	3	45
4	P19CEM507	<b>Elective:</b> Construction Project Management	3	0	0	3	45
5	P19GE101	<b>Research Methodology and IPR</b>	2	0	0	2	30
6	P19GE701	<b>Audit Course:</b> English for Research Paper Writing	2	0	0	0	30
<b>Practical</b>							
7	P19CEM103	Construction Engineering Laboratory	0	0	4	2	60
<b>Total Credits</b>						<b>18</b>	

Approved by

Chairperson, Civil Engineering BOS

**Dr.R.Malathy**

Member Secretary, Academic Council

**Dr.R.Shivakumar**

Chairperson, Academic Council & Principal

**Dr.S.R.R.Senthil Kumar**

Copy to:-

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

COURSE CODE	COURSE NAME					L	T	P	C				
P19CEM101	PROJECT FORMULATION AND APPRAISAL					3	1	0	4				
<b>Course Objective (s): The Purpose of learning this course is to:</b>													
<ul style="list-style-type: none"> <li>• Make the students familiar with financial planning</li> <li>• Understand the stages involved in project formulation</li> <li>• Identify the project appraisal methods.</li> <li>• Learn the concept of a feasibility study.</li> <li>• Understand the meaning of project appraisal.</li> </ul>													
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>													
CO1	Plan the process the formulation of project. (K2)												
CO2	Design the concepts of cash flows, time value of money and cost of capital. (K4)												
CO3	Identify the various theories of project appraisal.(K3)												
CO4	Interpret the various means of financing for a project.(K4)												
CO5	Plan the private sector participation in projects.(K4)												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:													
<b>CO – PO Mapping</b>													
COs	POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		
CO1	1	1	2	1		2				2	2		
CO2	2	1	2	1		2	2	2	1	2	2		
CO3	1	2	1	2	2	2	2	2	1	2	2		
CO4	2	1	2	2		2		2	2	2	2		
CO5	2	1	1	1		2				2	2		
CO	1.6	1.2	1.6	1.4	0.4	2	0.8	1.2	0.8	2	2		
<b>Correlation Level:</b>										1:Slight (Low)		2:Moderate (Medium)	
<b>UNIT-I</b>	<b>PROJECT FORMULATION</b>								<b>12 Hrs.</b>				
Project – Concepts – Capital investments - Generation and Screening of project Ideas - Project identification – Preliminary analysis, Market, Technical, Financial, Economic and ecological - Pre-Feasibility report and its Clearance, Project estimates and Techno-economic Feasibility report, Detailed project report – Different project clearances required.													
<b>UNIT-II</b>	<b>PROJECT COSTING</b>								<b>12 Hrs.</b>				
Project cash flows – Time value of money – Cost of capital.													
<b>UNIT-III</b>	<b>PROJECT APPRAISAL</b>								<b>12 Hrs.</b>				
NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of various methods – Indian practice of investment appraisal – International practice of appraisal – Analysis of risk – Different methods – Selection of a project and risk analysis in practice.													
<b>UNIT-IV</b>	<b>PROJECT FINANCING</b>								<b>12 Hrs.</b>				
Project financing – Means of finance – Financial institutions – Special schemes – Key financial Indicators - Ratios.													
<b>UNIT-V</b>	<b>PRIVATE SECTOR PARTICIPATION</b>								<b>12 Hrs.</b>				
Private sector participation in Infrastructure Development Projects – PPP- BOT, BOLT, BOOT - Technology transfer and foreign collaboration - Scope of technology transfer.													
								<b>TOTAL: 60 Hrs.</b>					

<b>REFERENCES:</b>	
1.	Amrish Gupta, Project Appraisal and Financing Paperback – 2017
2.	Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review,
3.	Barcus, S.W. and Wilkinson. J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
4.	Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India
5.	Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) United Nations Industrial Development Organisation (UNIDO) Bombay, 2012.



COURSE CODE	COURSE NAME					L	T	P	C		
P19CEM102	CONSTRUCTION PLANNING, SCHEDULING AND CONTROL					3	1	0	4		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>• Study how to develop project plan, estimate activity duration and relationship of activities</li> <li>• understand the network analysis tools for cost and time estimation</li> <li>• Calculate time schedules considering uncertainties</li> <li>• Learn how to monitor cash flows and estimate budgets</li> <li>• Study how to organise project information and types of databases</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
CO1	Explain the concepts of construction Planning (K2)										
CO2	Compute the construction Schedules using CPM (K3)										
CO3	Formulate scheduling Procedures with uncertain durations (K4)										
CO4	Plan the project budget, cash flow and schedule information (K5)										
CO5	Explain the various types of Project information and organize the database of the project (K4)										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	2	2	3	3	3	3
CO2	3	3	3	3	3	2	2	3	3	3	3
CO3	3	3	3	3	3	2	2	3	3	3	3
CO4	3	2	2	1	2	2	2	2	2	3	3
CO5	2	1	1	3	2	2	1	2	2	3	2
CO (Avg)	2.8	2.4	2.4	2.6	2.6	2	1.8	2.6	2.6	3	2.8
<b>Correlation Level:</b> 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High)											
<b>UNIT-I</b>		<b>CONSTRUCTION PLANNING</b>								<b>12 Hrs.</b>	
Basic Concepts in the development of construction plans – Choice of technology and construction method – Defining work tasks – Defining precedence relationships among activities – Estimating activity Durations – Estimating resource requirements for work activities – Coding systems.											
<b>UNIT-II</b>		<b>SCHEDULING PROCEDURES USING CPM</b>								<b>12 Hrs</b>	
Construction schedules – Critical Path Method – Scheduling calculations – Float – Presenting project schedules – Scheduling for Activity-on-Arrow and with leads, lags, and windows – Scheduling with resource constraints and precedence – Use of advanced scheduling techniques											
<b>UNIT-III</b>		<b>SCHEDULING PROCEDURES WITH UNCERTAINTY</b>								<b>12 Hrs.</b>	
Scheduling with uncertain durations – Calculations for Monte Carlo schedule simulation – Crashing and time/cost Trade-offs – Improving the scheduling process.											
<b>UNIT-IV</b>		<b>COST CONTROL, MONITORING AND ACCOUNTING</b>								<b>12 Hrs.</b>	
Cost control problem – Project budget – Forecasting for activity cost control – Financial accounting systems and cost accounts – Control of project cash flows –Schedule control – Schedule and budget updates – Relating cost and schedule information.											
<b>UNIT-V</b>		<b>ORGANIZATION AND USE OF PROJECT INFORMATION</b>								<b>12 Hrs.</b>	
Types of project information – Accuracy and use of information – Computerized organization and use of information – Organizing information in databases – Relational model of databases – Other conceptual models of databases – Centralized database management systems – Databases and applications Programs – Information transfer and flow.											
										<b>TOTAL: 60 Hours</b>	

REFERENCES:	
1.	Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995
2.	Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGraw-Hill Publishing Company, New Delhi, 2019.
3.	Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000
4.	Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York,

COURSE CODE	COURSE NAME					L	T	P	C			
P19CEM103	CONSTRUCTION ENGINEERING LABORATORY					0	0	4	2			
<b>Course Objective (s): The Purpose of learning this course is to:</b>												
<ul style="list-style-type: none"> <li>Practice the design of high strength concrete</li> <li>Gain the knowledge to conduct various Non-destructive tests</li> <li>Practice various engineering principles to understand the behavior of structures</li> </ul>												
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>												
CO1	Design high strength concrete and study the parameters affecting its performance (K4)											
CO2	Conduct Non-Destructive tests on existing concrete structures (K5)											
CO3	Apply Engineering principles to understand behaviour of structural elements (K5)											
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:												
<b>CO – PO Mapping</b>												
COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	2	1	3	3	2	1	2	2	3	1	
CO2	3	2	1	3	3	2	1	3	3	3	1	
CO3	3	3	1	3	3	2	1	1	1	3	1	
CO	3.0	2.3	1.0	3.0	3.0	2.0	1.0	2.0	2.0	3.0	1.0	
<b>Correlation Level:</b>										1:Slight (Low)	2:Moderate (Medium)	3:Substantial (High)
<b>CONTENTS:-</b>									<b>60 Hrs.</b>			
Study of stress-strain curve of high strength concrete												
Correlation between cube strength, cylindrical strength, split tensile strength and modulus of rupture												
Effect of cyclic loading on steel												
Non-Destructive testing of existing concrete members												
Behaviour of beams under flexure, shear and torsion												
<b>REFERENCES:</b>												
1.	Properties of Concrete, Neville A.M, 5 <sup>th</sup> Edition, Prentice Hall, 2013.											
2.	Concrete Technology, Shetty M.S., S.Chand and Co., 2008.											

COURSE CODE	COURSE NAME					L	T	P	C		
P19CEM502	ADVANCED CONCRETE TECHNOLOGY					3	0	0	3		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Analyse the characterisation of concrete matrix with influencing factors like strength and behaviour</li> <li>Signify the various method of mix proportions</li> <li>Evaluate and study of the factors to affecting the durability of concrete</li> <li>Apply the special concrete with specified quality and study the limitations</li> <li>Evaluate the Concrete properties based on Non destructive methods</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
CO1	Discuss microstructure concrete and dimensional stability (K4)										
CO2	Prepare a mix design for the various concrete grades (K3)										
CO3	Enumerate the properties of ingredients considered for durability of concretes (K4)										
CO4	Explain the different types of special concrete and their applications in construction (K3)										
CO5	Explain different types of non-destructive testing methods (K4)										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1	3	1	1	--	1	3	2	2
CO2	1	2	1	3	1	1	--	1	3	2	2
CO3	1	2	1	3	1	1	--	1	3	2	2
CO4	1	2	1	3	1	1	--	1	3	2	2
CO5	1	2	1	3	1	1	--	1	3	2	2
CO	1	2	1	3	1	1	--	1	3	2	2
<b>Correlation Level:</b> 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High)											
<b>UNIT-I</b>	<b>CONCRETE CHARACTERISATION</b>								<b>9 Hrs.</b>		
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.											
<b>UNIT-II</b>	<b>PROPORTIONING CONCRETE MIXTURES</b>								<b>9 Hrs.</b>		
Significance and objectives, general considerations, procedures, Methods of concrete mix design, design of high strength and high performance concrete using relevant codes. Testing and control of concrete quality: Methods and significance, accelerated strength testing, core tests and quality control charts.											
<b>UNIT-III</b>	<b>DURABILITY OF CONCRETE</b>								<b>9 Hrs.</b>		
Water as an agent of deterioration: 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.											
<b>UNIT-IV</b>	<b>SPECIAL TYPES OF CONCRETE</b>								<b>9 Hrs.</b>		
Roller compacted concrete-self compacted concrete-shrinkage compensation concrete, pervious concrete-concrete containing polymers-heavy weight concrete for radiation shielding-high performance concrete, high strength concrete, shotcrete, fibre reinforced concrete- bacterial concrete-Mass concrete – their materials, mix proportions, properties, applications and limitations.											

UNIT-V	NON-DESTRUCTIVE METHODS	9 Hrs.
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.		
		<b>TOTAL: 45Hrs.</b>
<b>REFERENCES:-</b>		
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.	Gupta.B.L, Amit Gupta, "Concrete Technology, Jain Book Agency, 2010	
5.	Neville, A.M., Properties of Concrete, Prentice Hall, 2013, London	
6.	Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2008	
7.	IS 10262:2019, Concrete Mix Proportioning – Guidelines (Second Revision), Bureau of Indian Standars, New Delhi.2019	

COURSE CODE	COURSE NAME					L	T	P	C			
P19CEM507	CONSTRUCTION PROJECT MANAGEMENT					3	0	0	3			
<b>Course Objective (s): The Purpose of learning this course is to:</b>												
<ul style="list-style-type: none"> <li>Understand the various management techniques for successful completion of construction project</li> <li>Study about the requirements for organizing and controlling systems in project management.</li> <li>Gain knowledge on construction design systems, execution and monitoring of projects</li> <li>Gain knowledge in coordination, direction and managing of a project</li> <li>Learn about utilization of labor, materials and equipment.</li> </ul>												
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>												
CO1	Explain the concept of project and role of project managers (K4)											
CO2	Develop the project plan and controlling systems (K3)											
CO3	Illustrate the characteristics of working systems and monitoring contracts (K4)											
CO4	Describe the project direction and control the process at various stages (K4)											
CO5	Explain the various resource management and inventory control (K4)											
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:												
<b>CO – PO Mapping</b>												
COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	2	3	3	3	2	2	3	2	3	3	2	
CO2	2	3	3	2	3	2	3	3	3	2	2	
CO3	2	3	3	3	3	1	3	2	3	2	2	
CO4	2	3	3	3	3	2	2	3	3	2	2	
CO5	2	3	3	3	2	3	2	3	3	2	2	
CO (Avg)	2	3	3	2.8	2.6	2	2.6	2.6	3	2.2	2	
<b>Correlation Level:</b>										1:Slight (Low)	2:Moderate (Medium)	3:Substantial (High)
<b>UNIT-I</b>		<b>INTRODUCTION TO PROJECT</b>								<b>9 Hrs.</b>		
Concept of a Project – Characteristic features – Project life cycle – Phases – Project management – tools and techniques for project management – Role of project managers.												
<b>UNIT-II</b>		<b>ROLE OF PROJECT MANAGEMENT</b>								<b>9 Hrs.</b>		
Development of project plan and objectives – Programming – Scheduling – Project organization – Organization and project team – Role of communication in project management – Controlling systems.												
<b>UNIT-III</b>		<b>WORKING SYSTEMS</b>								<b>9 Hrs.</b>		
Working systems – Characteristics – Class of systems – Design of systems – Work break down system (WBS) – Project execution plan – Project procedure manual –Sub systems of project management- monitoring of projects- Networks – Monitoring contracts.												
<b>UNIT-IV</b>		<b>PROJECT DIRECTION</b>								<b>9 Hrs.</b>		
Project direction – Direction during production stage – Value engineering review – Stages – Directives – Project coordination – Procedure – Interface management – Project control – Scope for progress control – Overall project progress control – Stages – Methods.												
<b>UNIT-V</b>		<b>RESOURCE MANAGEMENT</b>								<b>9 Hrs.</b>		
Basic concept – Labour requirements – Labour productivity – Site productivity – Equipment Management – Material management- Procurement organization – Procurement planning – Functions of material management – Inventory control												
										<b>TOTAL: 45 Hrs.</b>		

REFERENCES:	
1.	Prasanna Chandra, "Project Planning, Analysis, Selection, Implementation and review", Tata Mcgraw Hill, 2017.
2.	Chitkara, K.K "Construction Project Management: Planning Scheduling and control", Tata McGraw-Hill Publishing Company, New Delhi- 2019
3.	Frederick E. Gould, "Construction Project Management", Pearson Publications, Vary E. Joyce, Massachusetts Institute of Technology, 2000
4.	Choudhury, S "Project Management", Pearson Publishing company New Delhi 2008.
5.	Sengutha .B, Guha .H, "Construction Management and Planning", Tata Mc Graw Hill, 2001.

COURSE CODE	COURSE NAME										L	T	P	C
P19GE101	RESEARCH METHODOLOGY AND IPR										2	0	0	2
<b>Course Objective (s): The Purpose of learning this course is to:</b>														
<ul style="list-style-type: none"> <li>Impart the knowledge of various steps involved in scientific research</li> <li>Educate students on different types of sampling, test hypothesis and one tailed chi-square test</li> <li>Introduce students to the types of report and the mechanism to write reports along with intellectual property rights and its importance</li> <li>Explain the theories and functions of international trademark law and law of patents</li> </ul>														
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>														
CO1	Review the literature of the research problem (K2)													
CO2	Choose appropriate data collection and sampling method according to the research problem (K4)													
CO3	Interpret the results of research and communicate effectively with their peers (K4)													
CO4	Explain the Importance of intellectual property rights (K1)													
CO5	Evaluate trade mark, develop and register patents (K5)													
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:														
<b>CO – PO Mapping</b>														
COs	POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11			
CO1	3	3	3	3	3	3	2	1	1	3	2			
CO2	3	3	3	3	3	3	1	2	1	3	1			
CO3	3	3	3	3	3	3	2	2	1	3	2			
CO4	3	3	3	3	3	2	2	2	1	2	1			
CO5	3	3	3	3	3	3	2	2	1	2	2			
CO (Avg)	3	3	3	3	3	3	2	2	1	2.6	1.6			
<b>Correlation Level:</b> 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														
<b>UNIT-I Introduction to Research Methods 6</b>														
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														
<b>UNIT-II Sampling Design and Hypothesis Testing 6</b>														
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.														
<b>UNIT-III Interpretation and Report Writing 6</b>														
Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report.														
<b>UNIT-IV Introduction to Intellectual Property 6</b>														
Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.														
<b>UNIT-V Trade Marks, Copy Rights and Patents 6</b>														
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														



## REFERENCES:

1.	C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques ,4th Edition, New Age International Publishers, 2019.
2.	Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets”, Delmar Cengage Learning, 4th Edition, 2012.
3.	Prabuddha Ganguli, “Intellectual Property Rights: Unleashing the Knowledge Economy”, Tata Mc Graw Hill Education, 1st Edition, 2008.
4.	Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013.
5.	Ranjith Kumar, Research Methodology – A step by step Guide for Begineers, 4th edition, Sage publisher, 2014.
6.	D Llewelyn & T Aplin W Cornish, “Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights”, Sweet and Maxwell, 1st Edition, 2016.
7.	Ananth Padmanabhan, “Intellectual Property Rights-Infringement and Remedies”, Lexis Nexis, 1st Edition, 2012.
8.	Ramakrishna B and Anil Kumar H.S, “Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers”, Notion Press, 1st Edition, 2017.
9.	M.Ashok Kumar and Mohd.Iqbal Ali :”Intellectual Property Rights” Serials Pub

**Course Outcomes:**

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

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

**Unit – I** 6  
 Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness

**Unit – II** 6  
 Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.

**Unit- III** 6  
 Key skills to frame a title, to draft an abstract, to give an introduction

**Unit – IV** 6  
 Skills required to organise review of literature, methods, results, discussion and conclusions

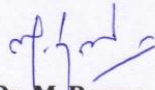
**Unit – V** 6  
 Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

**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**

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



**Dr. M. Renuga**  
 BoS – Chairperson,  
 Science & Humanities  
 HOD / H&L

**Total: 30 hours**

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME II Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM201	Resource Management and Control in Construction	3	0	0	3	45
2	P19CEM202	Construction Laws and Regulations	3	0	0	3	45
3	P19CEM510	<b>Elective</b> – Project Safety Management	3	0	0	3	45
4	P19CEM515	<b>Elective</b> – Modern Construction Materials	3	0	0	3	45
5	P19GE702	<b>Audit Course</b> – Stress Management by Yoga	2	0	0	0	30
<b>Practical</b>							
7	P19CEM203	Software Application Laboratory for Construction Management	1	0	4	3	75
8	P19CEM204	Mini Project	0	0	4	2	60
<b>Total Credits</b>						<b>17</b>	

Approved by

**Chairperson, Civil Engineering BOS**

**Dr.R.Malathy**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

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

COURSE CODE	COURSE NAME					L	T	P	C				
P19CEM201	Resource Management and Control in Construction					3	0	0	3				
<b>Course Objective (s): The Purpose of learning this course is to:</b>													
<ul style="list-style-type: none"> <li>To Understand the concept of resource involved in construction.</li> <li>To Understand the effective labour Management and Control of Various Resources Involved in Construction.</li> <li>To Knowledge about the effect of Material and Equipment Management,</li> <li>To know about the proper utilization of Time Management in construction</li> <li>To understand the Resource Allocation and Resource Levelling in Construction.</li> </ul>													
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>													
CO1	Know the management and planning of various resources involved in construction.												
CO2	Describe the effect of resource planning.												
CO3	Illustrate the management of materials and equipment.												
CO4	Explain the effect of time management.												
CO5	Identify the process of resource allocation and resource levelling in construction.												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:													
<b>CO – PO Mapping</b>													
COs	POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		
CO1	2	1	1	1	-	1	2	2	1	1	1		
CO2	2	2	3	2	-	2	2	1	1	1	1		
CO3	2	2	3	1	-	1	2	1	1	1	1		
CO4	1	2	2	2	-	2	2	2	2	1	1		
CO5	1	3	2	2	-	2	2	1	2	1	1		
COs	1.6	2	2.2	1.6	-	1.6	2	1.4	1.4	1	1		
<b>Correlation Level:</b>										1:Slight (Low)		2:Moderate (Medium)	
<b>UNIT-I</b>		<b>Resource Planning</b>								<b>09 Hrs.</b>			
Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.													
<b>UNIT-II</b>		<b>Labour Management</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-III</b>		<b>Materials and Equipment</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-IV</b>		<b>Time Management</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-V</b>		<b>Resource Allocation and Levelling</b>								<b>09 Hrs.</b>			

Time-cost trade off, Computer application – Resource levelling, resource list, resource allocation, Resource loading, Cumulative cost –Value Management.

**TOTAL:45 Hours**

**REFERENCES:**

1.	Andrew, D. Szilagg, “Hand Book of Engineering Management”, 2002.
2.	Glenn .A, Sea's and Reichard, Clough .H, “Construction Project Management”, John Wiley and Sons, Inc, 2009.
3.	Harvey, A. Levine, “Project Management using Micro Computers”, Obsome
4.	James, A., Adrain, “Quantitative Methods In Construction Management”, American Elsevier Publishing Co., Inc., 2003.

COURSE CODE	COURSE NAME					L	T	P	C				
P19CEM202	Construction Laws and Regulations					3	0	0	3				
<b>Course Objective (s): The Purpose of learning this course is to:</b>													
<ul style="list-style-type: none"> <li>Understand the concepts of effective contracting</li> <li>Understand the process of tendering for economic completion of a project.</li> <li>Know the various dispute solving techniques according to laws</li> <li>Understand the various types of tax and potential problems.</li> <li>Understand the various laws for construction labours</li> </ul>													
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>													
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												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate.													
<b>CO – PO Mapping</b>													
COs	POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		
CO1	1	2	1	3	1	1	--	1	3	2	2		
CO2	1	2	1	3	1	1	--	1	3	2	2		
CO3	1	2	1	3	1	1	--	1	3	2	2		
CO4	1	2	1	3	1	1	--	1	3	2	2		
CO5	1	2	1	3	1	1	--	1	3	2	2		
COs	1	2	1	3	1	1	--	1	3	2	2		
<b>Correlation Level:</b>										1:Slight (Low)		2:Moderate (Medium)	
<b>UNIT-I</b>		<b>Contract Agreements</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-II</b>		<b>Tendering Concepts</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-III</b>		<b>Appointment of Arbitrator</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-IV</b>		<b>Types of Tax Involved in Construction</b>								<b>09 Hrs.</b>			
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.													
<b>UNIT-V</b>		<b>Labour Laws</b>								<b>09 Hrs.</b>			
Indian Contracts Act - Labour laws – workmen compensation act – minimum wages Act – Child labour Act- Industrial dispute Act- Maternity benefit Act – Domestic emerging on													

misconduct.	
<b>TOTAL:45 Hours</b>	
<b>REFERENCES:</b>	
1.	John G. Betty., “Engineering Contracts”, McGraw Hill, 2003.
2.	Gajaria G.T., “Laws Relating to Building and Engineering Contracts in India”, M. M. Tripathi Private Ltd., Bombay, 1982 Tamilnadu PWD Code, 2006.
3.	Jimmie Hinze, “Construction Contracts”, McGraw Hill, 2001 4. Joseph T. Bockrath, “Contracts, the Legal Environment for Engineers and Architects”, McGraw Hill, 2000.
4.	Joseph T. Bockrath, “Contracts, the Legal Environment for Engineers and Architects”, McGraw Hill, 2000.

COURSE CODE	COURSE NAME					L	T	P	C		
P19CEM203	Software Application Laboratory for Construction Management					1	0	4	3		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>To Plan and Schedule using Ms Project Software</li> <li>To Plan and Schedule using Primavera Software</li> <li>To understand critical path and resource levelling by using softwares.</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
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										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate.											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	3	2	3	2	3	3
CO3	3	2	2	3	3	3	2	3	2	2	2
COs	3	2.67	2.67	3	3	3	2	3	2	2.67	2.67
<b>Correlation Level:</b>										1:Slight (Low)	2:Moderate (Medium)
<b>CYCLE-I</b>										<b>35 Hrs.</b>	
Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project. Design of a simple equipment information system for a construction project. Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.											
<b>CYCLE-II</b>										<b>40 Hrs.</b>	
Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking. Simulation models for project risk analysis.											
										<b>TOTAL:75 Hours</b>	
<b>REFERENCES:</b>											
1.	Krishnamoorthy .C.S and Rajeev .S, Computer Aided Design, Narosa publishing										
2.	Harrison .H .B, Structural Analysis and Design, vol. I & II, Pergamon press, 2001.										
3.	Billy E. Giliet Introduction to Operation Research - Computer Oriented Algorithmic										
4.	Paulson. B.R., Computer Applications in Construction, McGraw Hill, 2005.										
5.	Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice										



COURSE CODE	COURSE NAME					L	T	P	C		
P19CEM204	Mini Project					0	0	4	2		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Collect the related articles and identify the problems</li> <li>Understand the various techniques for analyse complex structural system</li> <li>Give the solution and techniques applying with Engineering Principles</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
CO1	Identify Construction Engineering problems reviewing available literature.										
CO2	Study different techniques used to analyze complex construction systems.										
CO3	Work on the solutions given and present solution by using his/her technique applying engineering principles.										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate.											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	2	1	2	3	2	2
CO2	3	3	3	3	3	2	1	2	3	2	2
CO3	3	3	3	3	3	2	1	2	3	2	2
COs	3	3	3	3	3	2	1	2	3	2	2
<b>Correlation Level:</b>										1:Slight (Low)	2:Moderate (Medium)
										<b>60 Hrs.</b>	
<p>Mini Project will have mid semester presentation and end semester presentation. Mid Semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.</p> <p>End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.</p> <p>Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.</p>											

COURSE CODE	COURSE NAME					L	T	P	C				
P19CEM510	<b>Elective – Project Safety Management</b>					3	0	0	3				
<b>Course Objective (s): The Purpose of learning this course is to:</b>													
<ul style="list-style-type: none"> <li>To make them recognize and evaluate safety in construction.</li> <li>To make them analyze the effects of workplace exposures, injuries and illnesses, fatalities.</li> <li>To enable them appropriate hazard controls following the hierarchy of controls.</li> <li>Make them capable to select appropriate control methodologies based on the hierarchy of controls</li> <li>Understand the role of stakeholders in safety</li> </ul>													
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>													
CO1	Study the accountabilities and responsibilities for the delivery of safety strategy and performance.												
CO2	Know appropriate safety information and training related programme.												
CO3	Describe the safety measurements and record keeping.												
CO4	Ensure that all staff is provided with adequate and appropriate safety information												
CO5	Provide the necessary training to build and maintain meaningful aerodrome operational safety leadership skills.												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate.													
<b>CO – PO Mapping</b>													
COs	POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		
CO1	3	1	2	1		2				3	3		
CO2	2	1	2	2		2	2	2	3	3	3		
CO3	3	2	3	2	3	3	2	2	2	2	1		
CO4	2	3	2	3	2	2	3	3	1	1	2		
CO5	2	3	1	1	2	3	3	2	2	1	1		
COs	2.4	2	2	1.8	1.4	2.4	2	1.8	1.6	2	2		
<b>Correlation Level:</b>										1:Slight (Low)		2:Moderate (Medium)	
<b>UNIT-I</b>		<b>CONSTRUCTION ACCIDENTS</b>							<b>09 Hrs.</b>				
Accidents and their Causes – Human Factors in Construction Safety – Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications.													
<b>UNIT-II</b>		<b>SAFETY PROGRAMMES</b>							<b>09 Hrs.</b>				
Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives-Implementation of 5'S													
<b>UNIT-III</b>		<b>CONTRACTUAL OBLIGATIONS</b>							<b>09 Hrs.</b>				
Contractual obligations - Safety in Construction Contracts – Substance Abuse – Safety Record Keeping.													
<b>UNIT-IV</b>		<b>DESIGNING FOR SAFETY</b>							<b>09 Hrs.</b>				
Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures –Workers Compensation.													

<b>UNIT-V</b>	<b>OWNERS' AND DESIGNERS' OUTLOOK</b>	<b>09 Hrs.</b>
Owner's responsibility for safety – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document.		
		<b>TOTAL:45 Hours</b>
<b>REFERENCES:</b>		
1.	Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health	
2.	TamilNadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health	
3.	Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.	

COURSE CODE	COURSE NAME					L	T	P	C		
P19CEM515	Elective – Modern Construction Materials					3	0	0	3		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Know about the exceptional behaviors of various special concrete in practice.</li> <li>Know about the properties, types and process of steel, aluminium and its coatings on reinforcement.</li> <li>Gain knowledge about the properties and its application of polymers.</li> <li>Understand the concept of façade materials, admixtures and its applications.</li> <li>Know the conception of smart and intelligent materials</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
CO1	Study the properties and applications of special concrete.										
CO2	Understand the various concepts of steels.										
CO3	Study the concepts of composites on FRP.										
CO4	Study the usage of materials on construction activities.										
CO5	Understand the concepts of smart and intelligent materials										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate.											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	1	-	1	3	2	1	1	1
CO2	2	2	2	2	-	2	3	1	1	1	1
CO3	2	2	2	2	-	1	2	1	2	1	1
CO4	2	2	2	2	-	2	3	2	2	1	1
CO5	1	2	2	2	-	2	2	1	2	1	1
COs	1.8	1.8	1.8	1.8	-	1.6	2.2	1.4	1.6	1	1
<b>Correlation Level:</b>										1:Slight (Low)	2:Moderate (Medium)
<b>UNIT-I</b>		<b>SPECIAL CONCRETE</b>								<b>09 Hrs.</b>	
Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.											
<b>UNIT-II</b>		<b>METALS</b>								<b>09 Hrs</b>	
Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.											
<b>UNIT-III</b>		<b>COMPOSITES</b>								<b>09 Hrs</b>	
Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.											
<b>UNIT-IV</b>		<b>OTHER MATERIALS</b>								<b>09 Hrs</b>	
Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.											
<b>UNIT-V</b>		<b>SMART AND INTELLIGENT MATERIALS</b>								<b>09 Hrs</b>	
Types & Differences between Smart and Intelligent Materials – Special features – Case studies											

showing the applications of smart & Intelligent Materials.	
	<b>TOTAL:45 Hours</b>
<b>REFERENCES:</b>	
1.	Ashby, M.F. and Jones. D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
2.	Ganapathy, C., Modern Construction Materials, Eswar Press, 2015.
3.	Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
4.	Santhakumar.A.R., Concrete Technology, Oxford University press, New Delhi, 2005.
5.	Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
6.	Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd.,

COURSE CODE	COURSE NAME					L	T	P	C				
P19GE702	Audit Course – Stress Management by Yoga					2	0	0	0				
<b>Course Objective (s): The Purpose of learning this course is to:</b>													
<ul style="list-style-type: none"> <li>Understand the benefits of Yoga and thus ensure social well being</li> <li>Perform and study breathing related asanas</li> <li>Perform yoga to ensure mental physical health of mankind</li> <li>Understand role of women in yoga and create self destructive habits</li> <li>Implement yoga for moral health</li> </ul>													
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>													
CO1	Develop physical and mental health thus improves 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												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:													
<b>CO – PO Mapping</b>													
COs	POs												
	PO1	P	PO3	PO4	PO5	PO6	PO7	PO8	PO	PO10	PO11		
CO1	3	3	3	1	2	1	-	-	-	2	3		
CO2	2	3	3	1	2	-	-	-	-	2	3		
CO3	2	3	3	-	2	1	-	-	-	3	3		
CO4	3	3	3	1	2	1	-	-	-	2	2		
CO5	2	3	3	-	2	1	-	-	-	3	3		
COs	3	3	3	-	2	1	-	-	-	3	2		
<b>Correlation Level:</b>										1:Slight (Low)		2:Moderate (Medium)	
<b>UNIT-I</b>									<b>12 Hrs.</b>				
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- Pranayama yoga – Nadi suthi, Practice and Spinal Scaleance Practice													
<b>UNIT-II</b>									<b>12</b>				
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 pituritary – Raja Yoga. 2. Santhi Yoga – Practice – Balancing of physical and mental power.													
<b>UNIT-III</b>									<b>12</b>				
Raja yoga – 3. Sagasrathara yoga – practice - Activation of dormanant brain cells – kayakalpa Theory - Kayakalpa – practice – yogic exercise to improve physical and mental health and practice – Asanas –explanation –Practice – benefits.													
<b>UNIT-IV</b>									<b>12</b>				
Sun namaskar – 12 Poses – explanation and practice - yoga – Asana –padmasana, vajrasana, chakrasana, vinachasans etc., Stress management with yoga – Role of women and yoga Equality, non-violence, Humanity, Self-Control – Food and Yoga Aware of self-destructive													

habits,Avoid fault thinking (thought analysis – practice) – Yoga free Anger (Neutralization of anger) & Practice.		
<b>UNIT-V</b>		<b>12</b>
Moralisation of Desire & Practice - Punctuality – Love – kindness – Compassion Eradication of worries –practices in Geetha – Sense of duty – Devotion, Self-Reliance, Confidence, Concentration, truthfulness, Cleanliness.		
		<b>TOTAL:60 Hours</b>
<b>REFERENCES:</b>		
1.	“Yogic Asanas for Group Training Par-I” Janardan Swami Yigabhyasi Mandal,	
2.	“Rajayoga or Conquering theInternal Nature” by Swami Vivekananda Advaita Ashram (Publication Department), Kolkatta	

**Course Outcomes:**

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

1. Develop physical and mental health thus improving social health
2. Increase immunity power of the body and prevent diseases
3. Accelerate memory power
4. Achieve the set goal with confidence and determination
5. Improve stability of mind, pleasing personality and work with awakened wisdom

**UNIT – I****6**

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 – II****6**

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 – III****6**

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 –IV****6**

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

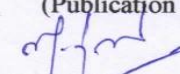
**UNIT – V****6**

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.

**Reference Books**

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

**Total: 30 hours**

  
Dr. M. Renuga  
BoS – Chairperson,  
Science & Humanities  
HOD / H&L



**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME III Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	P19CEM301	Advanced Construction Techniques	3	0	0	3	45
2	P19CEM517	<b>Professional Elective-</b> Quality Control and Quality Assurance in Construction	3	0	0	3	45
3	P19END601	<b>Open Elective-</b> Product Design and Manufacturing	3	0	0	3	45
	P19ISE601	<b>Open Elective-</b> Transport Safety					
<b>Practical</b>							
4	P19CEM302	Technical Seminar	0	0	2	1	30
5	P19CEM303	Practical Training	0	0	4	2	60
6	P19CEM304	Project Phase – I	0	0	16	8	240
<b>Total Credits</b>						<b>20</b>	

Approved by

**Chairperson, Civil Engineering BOS**  
**Dr.R.Malathy**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Civil, Third Semester ME CEM Students and Staff, COE

COURSE CODE	COURSE NAME					L	T	P	C		
<b>P19CEM301</b>	<b>Advanced Construction Techniques</b>					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>		
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>• Know the various elements and methods of sub-structure construction</li> <li>• Identify the tall building construction process and techniques</li> <li>• Categorize the various components and applications of large-span construction</li> <li>• Understand the concept of special structure construction</li> <li>• Cognize the various repair and rehabilitation techniques and its advantages</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
<b>CO1</b>	Understand the various methods involved in sub-structure construction (K2).										
<b>CO2</b>	Study the procedure involved in tall structure construction (K1).										
<b>CO3</b>	Know the construction techniques carried in bridges, tunnelling, domes etc (K3).										
<b>CO4</b>	Study the construction process of special structures and offshore structures (K1).										
<b>CO5</b>	Know about the rehabilitation and demolition techniques carried out for a structure (K2).										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	2	3	3	2	2	2	-	-	2	3
<b>CO2</b>	3	3	3	3	3	2	2	-	1	2	3
<b>CO3</b>	3	3	3	2	3	2	2	1	1	2	3
<b>CO4</b>	2	3	3	3	3	2	2	2	1	2	3
<b>CO5</b>	2	3	3	2	2	2	2	1	-	2	3
<b>CO (Avg)</b>	2.6	2.8	3	2.6	2.6	2	2	1.3	1	2	3
<b>Correlation Level:</b> 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)											
<b>UNIT-I</b>	<b>SUB STRUCTURE CONSTRUCTION</b>									<b>9</b>	
Box Jacking: Need – elements – concept – precautions – advantages. Pipe jacking: Technique – factors – applications – advantages. Diaphragm walls – methods – sheet piles – applications – advantages. Piling techniques: Classifications – factors. Well and caisson: Types – sinking method –precautions. Cofferdam: Purpose – types – techniques. Cable anchoring – screw anchor – necessity- applications. Grouting: Need – materials – techniques – applications – guniting and shotcreting. Well points - dewatering – techniques.											
<b>UNIT-II</b>	<b>TALL STRUCTURES CONSTRUCTION</b>									<b>9</b>	
Concrete in tall buildings – types of concrete pumps – factors – blockage – causes - clearing –safety. Slip form techniques: Vertical - chimney – horizontal – concrete paving methods. Suspended form work: Purpose – methods – advantages - erection techniques. Prestressing techniques – in situ prestressing in high rise structures.											
<b>UNIT-III</b>	<b>LARGE SPAN STRUCTURES CONSTRUCTION</b>									<b>9</b>	
Tunnelling: Purpose – aspects – shafts – mucking – construction techniques – advantages – trenchless technology. Bow string bridges: Systems – arrangements – advantages. Suspension and cable stayed bridges: Parallel – radial patterns – concept. Domes: Types – structural framing – erection methods. Aerial transportations – components – advantages – applications.											
<b>UNIT-IV</b>	<b>SPECIAL STRUCTURE CONSTRUCTION</b>									<b>9</b>	
Lattice tower: Definition – techniques. Rigging of transmission line structures: Definition –precaution – stages involved. Advanced construction techniques in offshore construction practice: Various operations – under water concrete - vacuum dewatering of concrete flooring. Articulated structure – definition – mechanism.											

UNIT-V	REPAIR AND STRENGTHENING TECHNIQUES	9
<p>Mud Jacking: Techniques – behavior of slab – advantages. Micro piles: Uses – stages – applications- benefits. Shallow profile pipeline laying –procedure – specifications – sub aqueous pipe lines –laying methods. Sheet piles protection techniques. Water proofing: Need – above and below ground. Under pinning: Need – methods. Demolition and dismantling: Principles – methods – modern demolition techniques – controlled demolition – mechanical method – hydro demolition – advantages – sequence of demolition – beams – columns – walls – general sequence.</p>		
<b>TOTAL: 45Hours</b>		
<b>REFERENCES:</b>		
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	
3.	Brown.R, "Practical Foundation Engineering Hand Book", Mcgraw Hill Publications,	
4.	Patrick Powers .J, "Construction Dewatering: New Methods and Applications" John Wiley	

COURSE CODE	COURSE NAME						L	T	P	C	
P19CEM302	Technical Seminar						0	0	2	1	
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Improve the presentation skill and answer the questions in a brief manner within the stipulated time</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
<ul style="list-style-type: none"> <li>Know the way of presentation about their understanding/concepts in a clear manner (K2).</li> </ul>											
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	3	3	2	2	3	2
CO2	3	3	3	3	3	3	3	2	2	3	2
CO3	3	3	3	3	3	3	3	2	2	3	2
CO4	3	3	3	3	3	3	3	2	2	3	2
CO5	3	3	3	3	3	3	3	2	2	3	2
CO (Avg)	3	3	3	3	3	3	3	2	2	3	2
<b>Correlation Level:</b> 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)											
<b>TOTAL: 30 Hours</b>											
<p>The students will work for two hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice related to construction engineering and management and to engage in dialogue with the audience. A brief copy of their talk 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 also answer the queries on the topic. The students as audience also should interact. Evaluation will be based on the technical presentation and the report and also on the interaction during the seminar.</p>											

COURSE CODE	COURSE NAME						L	T	P	C	
<b>P19CEM303</b>	<b>Practical Training</b>						<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Trained in tackling a practical field/industry-orientated problem related to Construction Engineering.</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
<ul style="list-style-type: none"> <li>Develop skills in facing and solving the field problems (K5)</li> </ul>											
<b>Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:</b>											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO2</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO3</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO4</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO5</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO (Avg)</b>	3	3	3	3	3	3	3	2	2	3	2
<b>Correlation Level:</b> 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)											
<b>TOTAL: 60 Hours</b>											
<p>The students individually undertake training in reputed engineering companies doing construction during the summer vacation for a specified duration of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.</p>											

COURSE CODE	COURSE NAME						L	T	P	C	
<b>P19CEM304</b>	<b>Project Phase – I</b>						<b>0</b>	<b>0</b>	<b>16</b>	<b>8</b>	
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Express his/her findings in the project in sequenced manner and defend their ideas</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
<ul style="list-style-type: none"> <li>The students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way.</li> </ul>											
<b>Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:</b>											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO2</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO3</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO4</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO5</b>	3	3	3	3	3	3	3	2	2	3	2
<b>CO (Avg)</b>	3	3	3	3	3	3	3	2	2	3	2
<b>Correlation Level:</b> 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)											
<p>The student individually works on a specific topic approved by the head of the division under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of construction engineering and management. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.</p>											

	COURSE NAME				L	T	P	C			
P19CEM517	Quality Control and Quality Assurance in Construction				3	0	0	3			
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Describe the principles of Quality management systems in construction.</li> <li>Implement the basic in quality policy methods and process in construction industry</li> <li>Suggest the feasibility in planning in quality objectives.</li> <li>Recognize the aspects of failure in terms of quality systems.</li> <li>Understand the quality techniques to be follow in improving the construction industry</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
CO1	Understand the elements of quality planning and the implication										
CO2	Study the various quality policy adopted in construction industries										
CO3	Aware of objectives and advantage of quality assurance										
CO4	Exposed to means of quality control										
CO5	Study the relationship between quality and safety management										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	1		2	2			2	2
CO2	2	1	1	1		1	2	1	1	2	2
CO3	1	2	1	1		2	2	2	1	2	1
CO4	2	1	2	2	2	2	1	1	1	2	2
CO5	2	1	1	1		1	2			2	2
CO (Avg)	1.6	1.2	1.2	1.2	2	1.6	1.8	1.3	1	2	1.8
<b>Correlation Level:</b>		1:Slight (Low)			2:Moderate (Medium)			3:Substantial (High)			
<b>UNIT-I</b>			<b>QUALITY MANAGEMENT SYSTEMS</b>						<b>9 Hours</b>		
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.											
<b>UNIT-II</b>			<b>QUALITY POLICY</b>						<b>9 Hours</b>		
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 I QC programme and cost implication.											
<b>UNIT-III</b>			<b>QUALITY OBJECTIVES</b>						<b>9 Hours</b>		
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.											
<b>UNIT-IV</b>			<b>FAILURE ASPECTS</b>						<b>9 Hours</b>		
Critical, major failure aspects and failure mode analysis -Stability methods and tools, optimum design –Reliability testing- reliability coefficient and reliability prediction - Selection of new materials -Influence of drawings detailing, specification, standardization -Bid preparation- Reliability Based Design.											
<b>UNIT-V</b>			<b>CONSTRUCTION ACTIVITY</b>						<b>9 Hours</b>		
Construction activity, environmental safety. Social and environmental factors- Natural causes and speed of Construction -Life cycle costing- Reliability and Probabilistic methods-Value engineering and value analysis.											
									<b>TOTAL: 45Hours</b>		

**REFERENCES:**

1.	James, J.O Brian, "Construction Inspection Handbook -Quality Assurance and:Quality Control", Van Nostrand, New York, Third Edition, 2013.
2.	Juran Frank, J.M. and Gryna, F.M. "Quality Planning and Analysis", Tata McGraw Hill 2002.
3.	Hutchins.G, ISO 9000, Viva Books. New Delhi 2003.
4.	Clarkson H. Oglesby, "Productivity Improvement in Construction", McGraw-Hill, 2009.
5.	John L. Ashford, "The Management of Quality in Construction", E & F.N, Spon. New York, 2009.



## Open Electives

### CIVIL

COURSE CODE	COURSE NAME	L	T	P	C						
<b>P19CEM601</b>	<b>DISASTER MITIGATION AND MANAGEMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>						
<b>Course Objective (s): The Purpose of learning this course is to:</b>											
<ul style="list-style-type: none"> <li>Understand the hazards in disaster and catastrophes</li> <li>Identify the causes and effects of various types of disasters</li> <li>Cognize the preparedness and forecasting the disasters</li> <li>Know the various aspects of post disaster activities</li> <li>Analysis the past disasters through various case studies</li> </ul>											
<b>Course Outcome (s) (COs): At the end of this course, the students will be able to:</b>											
<b>CO1</b>	Identify the types of hazards, vulnerability and micro zonation (K2)										
<b>CO2</b>	Explain the causes and effects of disasters (K4)										
<b>CO3</b>	Discuss the preparedness and forecasting the disasters (K4)										
<b>CO4</b>	Explain various post disaster activities (K4)										
<b>CO5</b>	Discuss the disaster management solutions from case studies (K5)										
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:											
<b>CO – PO Mapping</b>											
COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	3	3	2	2	3	2	3	2	2	3
<b>CO2</b>	3	3	3	2	2	3	2	3	2	2	3
<b>CO3</b>	3	3	3	2	2	3	2	3	2	2	3
<b>CO4</b>	3	3	3	2	2	3	2	3	2	2	3
<b>CO5</b>	3	3	3	2	2	3	2	3	2	2	3
<b>CO</b>	3	3	3	2	2	3	2	3	2	2	3
<b>Correlation Level:</b> 1:Slight (Low) 2:Moderate (Medium) 3:Substantial											
<b>UNIT-I</b>	<b>INTRODUCTION</b>										<b>Hours</b>
Meaning and types of hazards, disasters and catastrophes – Disaster Management; Earthquakes: causes and effects – measurements - earthquake zones India – vulnerability and micro zonation;- volcanic hazards											
<b>UNIT-II</b>	<b>CAUSES AND EFFECTS</b>										<b>Hours</b>
Landslides : Causes and effects – landslide prone zones in India –Cyclone: Origin and types - effects on land and sea – damage assessment; Flooding: Tsunami –Soil Erosion-Drought :Characteristics- Occurrence – Preventive measures											
<b>UNIT-III</b>	<b>PREPAREDNESS AND FORECASTING</b>										<b>Hours</b>
Emerging approaches in Disaster Management- Pre- disaster stage (preparedness) - Preparing hazard zonation maps, Predictability/forecasting& warning- Preparing disaster preparedness plan- Land use zoning- Disaster resistant house construction- Population reduction in vulnerable areas- Awareness											
<b>UNIT-IV</b>	<b>POST DISASTER ACTIVITIES</b>										<b>Hours</b>
Emergency Stage - Rescue training for search & operation at national & regional level-Immediate relief-Assessment surveys- Post Disaster stage-Rehabilitation- Political Administrative Aspect- Social Aspect-Economic Aspect- Environmental Aspect- Mitigation - Role of Media - Monitoring Management- Preventive Measures- A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster& Disaster in Hills with particular reference to India -Ecological planning for sustainability & sustainable development in India-Sustainable rural development											

UNIT-V	CASE STUDIES	Hours
Soft Solutions for Disaster Management - Case studies - Earthquake, volcano and landslide - Flood prone area analysis and management – risk assessment – cyclones and floods - Drought and desertification		
		<b>TOTAL: 45 Hrs.</b>
REFERENCES:		
1.	National Disaster Management Division (2004) Disaster Management in India - A Status Report, Ministry of Home Affairs, Government of India, New Delhi.	
2.	UNDRO (1995) Guidelines for Hazard Evaluation Procedures, United Nations Disasters Relief Organization, Vienna	
3.	Nagarajan, R., (2004) Landslide Disaster Assessment and Monitoring, Anmol Publications, New Delhi. 4. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.	

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for ME IV Semester under Regulations 2019**  
**Civil Engineering**  
**Branch: Construction Engineering and Management**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credit</b>	<b>Total Contact Hours</b>
<b>Practical</b>							
1	P19CEM401	Project Phase – II	0	0	28	14	420
<b>Total Credits</b>						<b>14</b>	

**Approved by**

**Chairperson, Civil Engineering BOS**

**Dr.R.Malathy**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Civil, Fourth Semester ME CEM Students and Staff, COE