SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.E-Civil Engineering
(Construction Engineering and Management)

CURRICULUM and SYLLABI

[For students admitted in 2022-2023]

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
		Theory					
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	**Elective:** Advanced Concrete Technology	3	0	0	3	45
4	P19CEM517	**Professional Elective:** Quality Control and Quality Assurance in Construction	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE701	**Audit Course:** English for Research Paper Writing	2	0	0	0	30
		Practical					
7	P19CEM103	Construction Engineering Laboratory	0	0	4	2	60
					Total Credits	**18**	

Approved by

Chairperson, Civil Engineering BOS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.R.Malathy	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

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    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
		Theory					
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	P19CEM511	**Professional Elective:** Construction Equipment and Management	3	0	0	3	45
4	P19CEM515	**Professional Elective:** Modern Construction Materials	3	0	0	3	45
5	P19GE702	**Audit Course:** Stress Management by Yoga	2	0	0	0	30
		Practical					
6	P19CEM203	Software Application Laboratory for Construction Management	1	0	4	3	75
7	P19CEM204	Mini Project	0	0	4	2	60
					Total Credits	**17**	

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

Mr - Civil
CEM
(1)

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
		Theory					
1	P19CEM301	Advanced Construction Techniques	3	0	0	3	45
2	P19CEM516	**Professional Elective:** Materials Management	3	0	0	3	45
3	P19ISE601	**Open Elective:** Transport Safety	3	0	0	3	45
	P19MIT602	**Open Elective:** Machine Learning					
		Practical					
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
					Total Credits	20	465

Approved by

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Member Secretary, Academic Council
Dr.R.Shivakumar

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

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05.07.2023

Regulations-2019

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

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

Approved by

Chairperson, Civil Engineering BOS

Dr.R.Malathy

Member Secretary, Academic Council

26/12/23

Dr.R.Shivakumar

Chairperson, Academic Council & Principal

Dr.S.R.R.Senthil Kumar

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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
		Theory					
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	**Elective:** Advanced Concrete Technology	3	0	0	3	45
4	P19CEM517	**Professional Elective:** Quality Control and Quality Assurance in Construction	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE701	**Audit Course:** English for Research Paper Writing	2	0	0	0	30
		Practical					
7	P19CEM103	Construction Engineering Laboratory	0	0	4	2	60
					Total Credits	**18**	

Approved by

Chairperson, Civil Engineering BOS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.Malathy	**Dr.R.Shivakumar**	**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**

Course Objective (s): The Purpose of learning this course is to:

- Make the students familiar with financial planning
- Understand the stages involved in project formulation
- Identify the project appraisal methods.
- Learn the concept of a feasibility study.
- Understand the meaning of project appraisal.

Course Outcome (s) (COs): At the end of this course, the students will be able to:

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)

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

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**

Correlation Level:	1:Slight (Low)	2:Moderate (Medium)

UNIT-I	**PROJECT FORMULATION**	**12 Hrs.**

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.

UNIT-II	**PROJECT COSTING**	**12 Hrs.**

Project cash flows – Time value of money – Cost of capital.

UNIT-III	**PROJECT APPRAISAL**	**12 Hrs.**

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of various methods – Indian practice of investment appraisal – International practice of appraisal – Analysis of risk – Different methods – Selection of a project and risk analysis in practice.

UNIT-IV	**PROJECT FINANCING**	**12 Hrs.**

Project financing – Means of finance – Financial institutions – Special schemes – Key financial Indicators - Ratios.

UNIT-V	**PRIVATE SECTOR PARTICIPATION**	**12 Hrs.**

Private sector participation in Infrastructure Development Projects – PPP- BOT, BOLT, BOOT - Technology transfer and foreign collaboration - Scope of technology transfer.

	TOTAL: 60 Hrs.

REFERENCES:	
1.	Ambrish 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**

Course Objective (s): The Purpose of learning this course is to:
- Study how to develop project plan, estimate activity duration and relationship of activities
- understand the network analysis tools for cost and time estimation
- Calculate time schedules considering uncertainities
- Learn how to monitor cash flows and estimate budgets
- Study how to organise project information and types of databases

Course Outcome (s) (COs): At the end of this course, the students will be able to:

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)

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

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

Correlation Level:	1:Slight (Low)	2:Moderate (Medium)	3:Substantial (High)

UNIT-I	**CONSTRUCTION PLANNING**	**12 Hrs.**

Basic Concepts in the development of construction plans – Choice of technology and construction method – Defining work tasks – Defining precedence relationships among activities – Estimating activity Durations – Estimating resource requirements for work activities – Coding systems.

UNIT-II	**SCHEDULING PROCEDURES USING CPM**	**12 Hrs**

Construction schedules – Critical Path Method – Scheduling calculations – Float – Presenting project schedules – Scheduling for Activity-on-Node and with leads, lags, and windows – Scheduling with resource constraints and precedence – Use of advanced scheduling techniques

UNIT-III	**SCHEDULING PROCEDURES WITH UNCERTAINITY**	**12 Hrs.**

Scheduling with uncertain durations – Calculations for Monte Carlo schedule simulation – Crashing and time/cost Trade-offs – Improving the scheduling process.

UNIT-IV	**COST CONTROL, MONITORING AND ACCOUNTING**	**12 Hrs.**

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.

UNIT-V	**ORGANIZATION AND USE OF PROJECT INFORMATION**	**12 Hrs.**

Types of project information – Accuracy and use of information – Computerized organization and use of information – Organizing information in databases – Relational model of databases – Other conceptual models of databases – Centralized database management systems – Databases and applications Programs – Information transfer and flow.

	TOTAL: 60 Hours

	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, 1985.

COURSE CODE	COURSE NAME	L	T	P	C
P19CEM103	**CONSTRUCTION ENGINEERING LABORATORY**	0	0	4	2

Course Objective (s): The Purpose of learning this course is to:
- Practice the design of high strength concrete
- Gain the knowledge to conduct various Non-destructive tests
- Practice various engineering principles to understand the behavior of structures

Course Outcome (s) (COs): At the end of this course, the students will be able to:

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)

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

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**

Correlation Level: 1:Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

CONTENTS:-	60 Hrs.

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

REFERENCES:

1.	Properties of Concrete, Neville A.M, 5th 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

Course Objective (s): The Purpose of learning this course is to:

- Analyse the characterisation of concrete matrix with influencing factors like strength and behaviour
- Signify the various method of mix proportions
- Evaluate and study of the factors to affecting the durability of concrete
- Apply the special concrete with specified quality and study the limitations
- Evaluate the Concrete properties based on Non destructive methods

Course Outcome (s) (COs): At the end of this course, the students will be able to:

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)

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

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

Correlation Level: 1:Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

UNIT-I	CONCRETE CHARACTERISATION	9 Hrs.

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.

UNIT-II	PROPORTIONING CONCRETE MIXTURES	9 Hrs.

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.

UNIT-III	DURABILITY OF CONCRETE	9 Hrs.

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.

UNIT-IV	SPECIAL TYPES OF CONCRETE	9 Hrs.

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.

	TOTAL: 45Hrs.

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.	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
P19CEM517	**Quality Control and Quality Assurance in Construction**	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:
- Describe the principles of Quality management systems in construction.
- Implement the basic in quality policy methods and process in construction industry
- Suggest the feasibility in planning in quality objectives.
- Recognize the aspects of failure in terms of quality systems.
- Understand the quality techniques to be follow in improving the construction industry

Course Outcome (s) (COs): At the end of this course, the students will be able to:

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

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

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

Correlation Level: 1:Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

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 I QC programme and cost implication.

UNIT-III	QUALITY OBJECTIVES	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	FAILURE ASPECTS	9 Hours

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.

UNIT-V	CONSTRUCTION ACTIVITY	9 Hours

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.

	TOTAL: 45Hours

	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.

CIVIL ENGINEERING

M. E. / CONSTRUCTION ENGINEERING AND MANAGEMENT

SEMESTER – I	**STATISTICAL METHODS FOR ENGINEERS**	L	T	P	C
P19CEM501		2	1	0	3

COURSE OUTCOMES

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

1. 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.
2. test the attributes and variables of large and small samples.
3. apply the concepts of multiple and partial correlation , plane of regression and multiple and partial regression to solve the related problems.
4. analyse the variances of several variable while applying standard designs like completely randomized design and randomized block design.
5. apply the multivariate density concept and its properties to analyze the principal components.

CO / PO Mapping											
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11
CO1	3	3	3	3	3		2				
CO2	3	3	3	3	3		2				
CO3	3	3	3	3	3		2				
CO4	3	3	3	3	3		2				
CO5	3	3	3	3	3		2				

UNIT – I   PROBABILITY AND RANDOM VARIABLE   9

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

UNIT – II   TESTING OF HYPOTHESIS   9

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 – III   MULTIPLE AND PARTIAL CORRELATION AND MULTIPLE AND   9
**   PARTIAL REGRESSION**

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.

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UNIT – IV   DESIGN OF EXPERIMENTS   9
Analysis of variance – One way and two way classifications – Completely randomized design –
Randomized block design.

UNIT – V   MULTIVARIATE ANALYSIS   9
Random vectors and matrices – mean vectors and covariance matrices – multivariate normal density
and its properties – principal components: population components from standardized variables.

Theory: **30 Hours**   Tutorial: **15 Hours**   Total: **45 Hours**
TEXT BOOK:

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

REFERENCE BOOKS:

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

Prof. S. JAYABHARATHI
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BoS - Chairperson
Science and Humanities
Sona College of Technology
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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 strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO12	PSO1	PSO2
CO1	3	3	3	3	2						3	3	3
CO2	3	3	3	3	2						3	3	3
CO3	3	3	3	3	2						3	3	3
CO4	3	3	3	3	2						3	3	3
CO5	3	3	3	3	2			3			3	3	3

UNIT I   INTRODUCTION TO RESEARCH METHODS   6

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   6

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 III   INTERPRETATION AND REPORT WRITING   6

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   6

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

16-09-2022

Dr. J. AKILANDESWARI
PROFESSOR & HEAD
Department of Information Technology
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005

M Tech Regulations 2019

5

UNIT V   TRADE MARKS, COPY RIGHTS AND PATENTS   6

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

THEORY: 30 Hours   TUTORIAL: -   PRACTICAL: -   TOTAL: 30 Hours
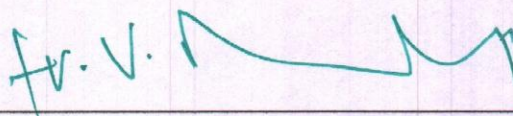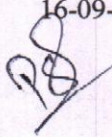
TEXT BOOKS

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.

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, 4th edition, Sage publisher, 2014.

3. D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1st Edition, 2016.

4. Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1st Edition, 2012.

5. Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1st Edition, 2017.

6. M.Ashok Kumar and Mohd.Iqbal Ali :"Intellectual Property Rights" Serials Pub

16-09-2022   **Dr. J. AKILANDESWARI**   M Tech Regulations 2019   6
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                   SALEM-636 005

P19GE701   **English for Research Paper Writing**

2 0 0 0

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
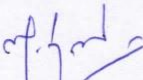
Unit – V   6

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

Total: 30 hours

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
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	P19CEM511	**Professional Elective:** Construction Equipment and Management	3	0	0	3	45
4	P19CEM515	**Professional Elective:** Modern Construction Materials	3	0	0	3	45
5	P19GE702	**Audit Course:** Stress Management by Yoga	2	0	0	0	30
Practical							
6	P19CEM203	Software Application Laboratory for Construction Management	1	0	4	3	75
7	P19CEM204	Mini Project	0	0	4	2	60
					Total Credits	**17**	

Approved by

Chairperson, Civil Engineering BOS   **Member Secretary, Academic Council**   **Chairperson, Academic Council & Principal**
    Dr.R.Malathy   **Dr.R.Shivakumar**   **Dr.S.R.R.Senthil Kumar**

Copy to:-
        HOD/Civil, Second Semester ME CEM Students and Staff, COE

P19CEM201	Resource Management and Control in Construction	L T P C 3 0 0 3

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

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	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 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 AND LEVELLING	9 Hrs.
Time-cost trade off, Computer application – Resource levelling, resource list, resource allocation, Resource loading, Cumulative cost –Value Management.	

	Total Hours: 45 hrs.

REFERENCE BOOKS:
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 McGraw Hill C.A. Publishing Co., Inc. 2008.
4. James, A., Adrain, "Quantitative Methods In Construction Management", American Elsevier Publishing Co., Inc., 2003.

P19CEM202	Construction Laws and Regulations	L T P C 3 0 0 3

COURSE OUTCOMES

At the end of the 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

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.

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.

Total Hours: 45 hrs.

REFERENCE BOOKS:

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.

P19CEM203	**Software Application Laboratory for Construction Management**	**L T P C** **1 0 4 3**

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

1. Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project.
2. Design of a simple equipment information system for a construction project.
3. Scheduling of a 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.

Total Hours: 75 hrs.

REFERENCE BOOKS:

1. Krishnamoorthy .C.S and Rajeev .S, Computer Aided Design, Narosa publishing house, New Delhi, 2001.
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 Approach, Tata McGraw Hill, 2000.
4. Paulson. B.R., Computer Applications in Construction, McGraw Hill, 2005.
5. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice Hall Inc., 2009.

P19CEM204	Mini Project	L T P C
		0 0 4 2

COURSE OUTCOMES

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

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.

Syllabus Contents:	**30 Hrs.**

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.

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.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

Total Hours: 60Hrs

P19CEM511	Construction Equipment and Management	3 0 0 3

COURSE OUTCOMES:

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

CO1 Explain the Project life cycle, construction types and role of Project Managers
CO2 Describe the Organization for Project Management
CO3 Discuss about design and Construction process
CO4 Discuss the Various construction Process
CO5 Estimate the cost of Construction

UNIT- I: THE OWNERS' PERSPECTIVE	9

Introduction - Project life cycle - Types of construction - Selection of professional services construction contractors - Financing of constructed facilities - Legal and regulatory requirements - Changing environment of the construction industry - Role of project managers.

UNIT- II: ORGANIZING FOR PROJECT MANAGEMENT	9

Project management – Modern trends - Strategic planning - Effects of project risks on organization - Organization of project participants - Traditional designer - Constructor sequence professional construction management - Owner-Builder operation - Turnkey operation leadership and motivation for the project team.

UNIT- III: DESIGN AND CONSTRUCTION PROCESS	9

Design and construction as an integrated system - Innovation and technological feasibility innovation and economic feasibility - Design methodology - Functional design - Construction site environment

UNIT – IV: LABOUR, MATERIAL AND EQUIPMENT UTILIZATION	9

Historical perspective - Labour productivity - Factors affecting job-site productivity - Labour relations in construction - Problems in collective bargaining - Materials management - Material procurement and delivery - Inventory control - Tradeoffs of costs in materials management. Construction equipment - Choice of equipment and standard production rates - Construction processes queues and resource bottlenecks.

UNIT – V: COST ESTIMATION	9

Costs associated with constructed facilities - Approaches to cost estimation - Type of construction cost estimates - Effects of scale on construction cost - Unit cost method of estimation - Methods for allocation of joint costs - Historical cost data - Cost indices applications of cost indices to estimating - Estimate based on Engineer's list of quantities estimation of operating costs.

Total Hours: 45 Hrs.

REFERENCE BOOKS:

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 2019.
2. Choudhury S , Project Management, McGraw-Hill Publishing Company, New Delhi, 20018.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
5. George J.Ritz , Total Construction Project Management – Pearson Education,2013.

P19CEM515	Modern Construction Materials	L T P C 3 0 0 3

COURSE OUTCOMES

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

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

UNIT-I: SPECIAL CONCRETE	9 Hrs

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.

UNIT –II: METALS	9 Hrs

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.

UNIT –III: COMPOSITES	9 Hrs

Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.

UNIT –IV: OTHER MATERIALS	9 Hrs

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.

UNIT –V: SMART AND INTELLIGENT MATERIALS	9 Hrs

Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.

	Total: 45 hrs.

REFERENCE BOOKS:

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., 2005.

2 0 0 0

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
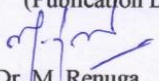
Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice -Personality development, positive thinking-Good characters to lead a moral life

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
Theory							
1	P19CEM301	Advanced Construction Techniques	3	0	0	3	45
2	P19CEM516	**Professional Elective:** Materials Management	3	0	0	3	45
3	P19ISE601	**Open Elective:** Transport Safety	3	0	0	3	45
	P19MIT602	**Open Elective:** Machine Learning					
Practical							
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
					Total Credits	20	465

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

05.07.2023

Regulations-2019

SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005.
DEPARTMENT OF CIVIL ENGINEERING
M.E CONSTRUCTION ENGINEERING AND MANAGEMENT (Full Time)
CURRICULUM for REGULATION R2019

S.No.	Course Code	Name of the Course	L	T	P	Credit
		SEMESTER – III				
1	P19CEM301	Advanced Construction Techniques	3	0	0	3
2	P19CEM516	**Professional Elective:** Materials Management	3	0	0	3
3		**Open Elective:**	3	0	0	3
4	P19CEM302	Technical Seminar	0	0	2	1
5	P19CEM303	Practical Training	0	0	4	2
6	P19CEM304	Project Phase – I	0	0	16	8
					Total Credits	20

COURSE CODE	COURSE NAME	L	T	P	C
P19CEM301	Advanced Construction Techniques	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:
- Know the various elements and methods of sub-structure construction
- Identify the tall building construction process and techniques
- Categorize the various components and applications of large-span construction
- Understand the concept of special structure construction
- Cognize the various repair and rehabilitation techniques and its advantages

Course Outcome (s) (COs): At the end of this course, the students will be able to:

CO1	Understand the various methods involved in sub-structure construction (K2).
CO2	Study the procedure involved in tall structure construction (K1).
CO3	Know the construction techniques carried in bridges, tunnelling, domes etc (K3).
CO4	Study the construction process of special structures and offshore structures (K1).
CO5	Know about the rehabilitation and demolition techniques carried out for a structure (K2).

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	-	-	2	3
CO2	3	3	3	3	3	2	2	-	1	2	3
CO3	3	3	3	2	3	2	2	1	1	2	3
CO4	2	3	3	3	3	2	2	2	1	2	3
CO5	2	3	3	2	2	2	2	1	-	2	3
CO (Avg)	2.6	2.8	3	2.6	2.6	2	2	1.3	1	2	3

Correlation Level: 1: Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

UNIT-I	SUB STRUCTURE CONSTRUCTION	9

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. Coffer dam: Purpose – types – techniques. Cable anchoring – screw anchor – necessity- applications. Grouting: Need – materials – techniques – applications – guniting and shotcreting. Well points - dewatering – techniques.

UNIT-II	TALL STRUCTURES CONSTRUCTION	9

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.

UNIT-III	LARGE SPAN STRUCTURES CONSTRUCTION	9

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.

UNIT-IV	SPECIAL STRUCTURE CONSTRUCTION	9

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

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.

TOTAL: 45Hours

REFERENCES:		
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
P19CEM516	Materials Management	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:

- Identify the materials and organize the management
- Plan and purchase the materials as per norms and legal aspects
- Understand the procurement management
- Know the storing of materials and factors for handling the materials
- Cognize the various waste management

COURSE OUTCOMES

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

CO1 To study the different types of materials and its identification for its usage.

CO2 To Study about the material organizing and purchasing

CO3 To Study about the material supply and demand

CO4 To Study about the material storage

CO5 To study the causes of wastage of materials

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO-PO Mapping:-

COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1		3	2	3	2		3	1
CO2	2	1	1		3	2	3	2	1	2	1
CO3	2	1	1		2	3	3	2	2	2	1
CO4	2	1	1		2	3	3	2	2	2	1
CO5	2	1	1		2	3	3	2	2	3	1
CO (Avg)		1	1		2.4	2.6	3	2	1.4	2.4	1

Correlation Level: 1: Slight (Low) 2:Moderate (Medium) 3:Substantial (High)

UNIT-I:MATERIAL CLASSIFICATION   9 Hrs

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

UNIT –II MATERIAL PURCHASING   9 Hrs

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

UNIT –III: PROCUREMENT MANAGEMENT   9 Hrs

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

UNIT –IV: STORE MANAGEMENT   9 Hrs

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

UNIT –V: WASTE MANAGEMENT	9 Hrs

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

Total: 45 hrs.

REFERENCE BOOKS:

1. Datta .A.K, "Materials Management: Procedures, Text and Cases", PHI Learning Pvt. Ltd., 2004.
2. Arnold, "Introduction To Materials Management", Pearson Education India,2009
3. Richard J. Tersine, "Principles Of Inventory And Materials ,Management", Prentice Hall,2004
4. Richard J. Tersine, "Modern Materials Management", John Hardin Campbell - 2007
5. Gopalakrishnan .P, "Handbook of Materials Management", PHI Learning Pvt. Ltd. 2004

COURSE CODE	COURSE NAME	L	T	P	C
P19CEM302	Technical Seminar	0	0	2	1

Course Objective (s): The Purpose of learning this course is to:

- Improve the presentation skill and answer the questions in a brief manner within the stipulated time

Course Outcome (s) (COs): At the end of this course, the students will be able to:

- Know the way of presentation about their understanding/concepts in a clear manner (K2).

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO	3	3	3	3	3	3	3	2	2	3	2

Correlation Level: 1: Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

TOTAL: 30 Hours

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.
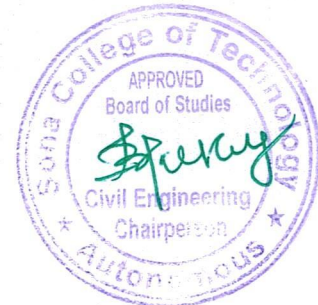
COURSE CODE	COURSE NAME	L	T	P	C
P19CEM303	Practical Training	0	0	4	2

Course Objective (s): The Purpose of learning this course is to:

- Trained in tackling a practical field/industry-orientated problem related to Construction Engineering.

Course Outcome (s) (COs): At the end of this course, the students will be able to:

- Develop skills in facing and solving the field problems (K5)

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO	3	3	3	3	3	3	3	2	2	3	2

Correlation Level: 1: Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

	TOTAL: 60 Hours

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.
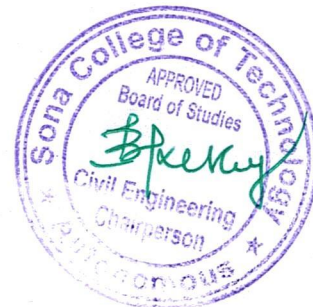
COURSE CODE	COURSE NAME	L	T	P	C
P19CEM304	Project Phase – I	0	0	16	8

Course Objective (s): The Purpose of learning this course is to:

- Express his/her findings in the project in sequenced manner and defend their ideas

Course Outcome (s) (COs): At the end of this course, the students will be able to:

- 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.

Knowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:

CO – PO Mapping

COs	POs										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO	3	3	3	3	3	3	3	2	2	3	2

Correlation Level: 1: Slight (Low)   2:Moderate (Medium)   3:Substantial (High)

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.
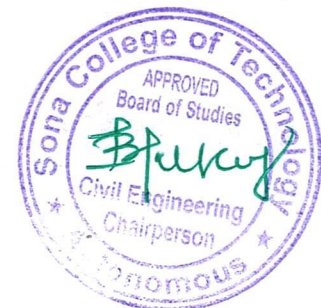
Course Code   : P19ISE601
Course Name : TRANSPORT SAFETY

Lecture	-	3 Hrs/Week	
Tutorial	-	0 Hrs/Week	
Practical	-		

Internal Marks   50
External Marks   50
Credits   3

Pre-requisites subject: Nil

Upon completion of this course the students will be able to

Course Outcomes	**C01** explain the dangers of transporting hazardous goods and the safe procedures to be followed during transit.
	C02 Determine the main factors contribute to the safety in road transport and implement appropriate measures to prevent accidents.
	C03 know the methods of selecting and training drivers and teach them the safe procedures to be followed.
	C04 Analyze the construction features of road and rails which contribute the accidents and design appropriate traffic management.
	C05 implement the methods of keeping repair shop and off road vehicle safe and the wafer ways of servicing the vehicles.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak													
Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO – 1	3	-	-	-	1	3	3	3	2	2	3	3	2	2
CO – 2	3	2	2	1	3	3	3	3	2	2	-	2	2	3
CO – 3	2	3	2	3	3	3	3	3	3	3	3	2	2	3
CO – 4	2	1	3	3	3	3	2	3	1	2	-	2	3	3
CO - 5	1	3	3	3	-	3	-	3	3	3	2	3	2	2

UNIT I TRANSPORTATION OF HAZARDOUS GOODS   L 9 T 0

Transport emergency card (TREM) – driver training-parking of tankers on the highways-speed of the vehicle – warning symbols – design of the tanker lorries -static electricity-responsibilities of driver – inspection and maintenance of vehicles-check list- loading and decanting procedures – communication.

UNIT II ROAD TRANSPORT   L 9 T 0

Introduction – factors for improving safety on roads – causes of accidents due to drivers and pedestrians-design, selection, operation and maintenance of motor trucks-preventive maintenance check lists-motor vehicles act – motor vehicle insurance and surveys – modern sensor devices.

UNIT III DRIVER AND SAFETY   L 9 T 0

Driver safety programme – selection of drivers – driver training-tacho-graph-driving test-driver's responsibility-accident reporting and investigation procedures-fleet accident frequency-safe driving incentives-slogans in driver cabin-motor vehicle transport workers act- driver relaxation and rest pauses – speed and fuel conservation – emergency planning and Haz mat codes

UNIT IV ROAD SAFETY   L 9 T 0

Road alignment and gradient-reconnaissance-ruling gradient-maximum rise per k.m.- factors influencing alignment like tractive resistance, tractive force, direct alignment, vertical curves-breaking characteristics of vehicle-skidding-restriction of speeds-significance of speeds-Pavement conditions – Sight distance – Safety at intersections – Traffic control lines and guide posts-guard rails and barriers – street lighting and illumination overloading-concentration of driver. Plant railway: Clearance-track-warning methods-loading and unloading-moving cars-safety practices.

UNIT V SHOP FLOOR AND REPAIR SHOP SAFETY   L 9 T 0

Transport precautions-safety on manual, mechanical handling equipment operations-safe driving movement of cranes-conveyors etc., servicing and maintenance equipment-grease rack operation wash rack operation-battery charging-gasoline handling-other safe practices-off the road motorized equipment.

TOTAL NUMBER OF PERIODS= 45

Content beyond syllabus

- Aviation safety
- Maritime safety
- Railway safety
- Traffic management
- Safety management systems

Learning Resources

TEXT BOOKS:

1. Popkes, C.A. "Traffic Control and Road Accident Prevention" Chapman and Hall Limited, 1986.
2. Babkov, V.F., "Road Conditions and Traffic Safety" MIR Publications, Moscow, 1986.

REFERENCES

1. Kadiyali, "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 1983.
2. Motor Vehicles Act, 1988, Government of India.
3. "Accident Prevention Manual for Industrial Operations", NSC, Chicago, 1982.
4. Pasricha, "Road Safety guide for drivers of heavy vehicle" Nasha Publications, Mumbai, 1999.
5. K.W.Ogden, "Safer Roads – A guide to Road Safety Engineering"

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PREAMBLE

Machine learning is a rapidly evolving field of study that focuses on developing algorithms and models capable of learning from data and making predictions or decisions without being explicitly programmed. The power of machine learning lies in its ability to uncover patterns, relationships, and insights from large and complex datasets. By analyzing and extracting valuable information from data, machine learning algorithms can make predictions, classify data, detect anomalies, recommend actions, and automate decision-making processes.

Machine learning is an exciting and rapidly expanding field that leverages the power of data and algorithms to make predictions and automate decision-making. Python's versatility and rich ecosystem of libraries make it an ideal language for developing and deploying machine learning models. By mastering machine learning techniques, you can unlock the potential of data and contribute to advancements in various industries.

COURSE OUTCOMES

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

1. Explain the concepts of different types of learning and apply linear regression
2. Summarize the concepts of logistic regression and implement the same with python
3. Explain and apply the concepts of Neural networks and support vector machines
4. Evaluate the hypothesis based on factors like bias and variance
5. Explain the concepts of clustering, dimensionality reduction and anomaly detection.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	1				1	1		1	2	2
CO2	3	3	3	3	3				1	1		1	2	2
CO3	3	3	3	3	3				1	1		1	2	2
CO4	3	3	3	1	1				1	1		1	2	2
CO5	3	3	1	1	1				1	1		1	2	2

UNIT I   INTRODUCTION AND LINEAR REGRESSION   9

Introduction to Artificial Intelligence - What is machine learning? – Supervised Learning – unsupervised learning – Linear Regression – cost function – gradient descent algorithm – normal equation - Gradient descent for multiple variables – feature scaling – learning rate – polynomial regression – normal equation

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UNIT II   LOGISTIC REGRESSION   9

Hypothesis representation – decision boundary – nonlinear decision boundaries – cost function – gradient descent – advanced optimizations – multi class classification problems – **Regularization** - Problem of overfitting – cost function optimization for regularization – regularized linear regression – regularization with normal equation - regularized logistic regression

UNIT III   NEURAL NETWORKS AND SUPPORT VECTOR MACHINES   9

Overview and summary – neurons and brain – model representation – artificial neural networks representation – example – multiclass classification – cost function – back propagation algorithm – gradient checking – random initialization – Support vector machines – optimization objective – cost function – large margin intuition – decision boundary – kernels – adapting to nonlinear classifiers - implementation

UNIT IV   ADVICE FOR APPLYING MACHINE LEARNING   9

Debugging a learning algorithm – evaluating a hypothesis – model selection and training, validation test sets – bias Vs variance – regularization and bias/variance – learning curves machine learning system design

UNIT V   OTHER TOPICS   9

Unsupervised learning – k-means algorithm – optimization objective – choosing number of clusters - Dimensionality reduction – principle component analysis - Anomaly detection – algorithm – developing and evaluating the algorithm – anomaly detection Vs supervised algorithm -Case study – recommender system – collaborative filtering - Large scale machine learning – online learning – map reduce and parallelism.

Total: 45 hours

REFERENCES

1. Stanford's machine learning course presented by Professor Andrew Ng – online resource - http://www.holehouse.org/mlclass/

2. James, G., Witten, D., Hastie, T., Tibshirani, R, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.

3. Tom M. Mitchell, "Machine Learning", 1st edition, McGraw Hill Education, 2017.

4. Ethem Alpaydın, "Introduction to Machine Learning", The MIT Press, 2nd edition, 2013.

5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.

6. Sebastianraschka, "Python Machine Learning", Packt Publishing Ltd., 2017.

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

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

Approved by

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Dr.R.Malathy

Member Secretary, Academic Council

26/12/23

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

22.12.2023

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