# SONA COLLEGE OF TECHNOLOGY, SALEM-5

**(An Autonomous Institution)**

## M.E-Civil Engineering

## (Structural Engineering)

# CURRICULUM and SYLLABI

**[For students admitted in 2020-2021]**

**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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19STR101 | Finite Element Analysis | 3 | 1 | 0 | 4 |
| 2 | P19STR102 | Theory of Elasticity and Plasticity | 3 | 1 | 0 | 4 |
| 3 | P19STR504 | **Elective :** Stability of Structures | 3 | 0 | 0 | 3 |
| 4 | P19STR510 | **Elective :** Advanced Concrete Technology | 3 | 0 | 0 | 3 |
| 5 | P19GE101 | Research Methodology and IPR | 2 | 0 | 0 | 2 |
| 6 | P19GE701 | **Audit Course:** English for Research Paper Writing | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19STR103 | Structural Engineering Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **Total Credits** | **18** |

**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 STR 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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| | | | | | | | |
| 1 | P19STR201 | Advanced Design of Concrete Structures | 3 | 0 | 0 | 3 | 45 |
| 2 | P19STR202 | Advanced Design of Steel Structures | 3 | 0 | 0 | 3 | 45 |
| 3 | P19STR517 | **Elective –** Design of Sub Structures | 3 | 0 | 0 | 3 | 45 |
| 4 | P19STR525 | **Elective –** Internet of Things of Civil Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | P19GE702 | **Audit Course** – Stress Management by Yoga | 2 | 0 | 0 | 0 | 30 |
| **Practical** | | | | | | | |
| 6 | P19STR203 | Structural Software Application Laboratory | 1 | 0 | 4 | 3 | 75 |
| 7 | P19STR204 | 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 STR 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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | P19STR301 | Design of Steel Concrete Composite Structures | 3 | 0 | 0 | 3 | 45 |
| 2 | P19STR501 | **Elective**: Prefabricated Structures | 3 | 0 | 0 | 3 | 45 |
| 3 | P19END601 | **Open Elective:** Product Design and Manufacturing | 3 | 0 | 0 | 3 | 45 |
| 4 | P19ISE601 | **Open Elective:** Transport Safety | | | | | |
| **Practical** | | | | | | | |
| 5 | P19STR302 | Technical Seminar | 0 | 0 | 2 | 1 | 30 |
| 6 | P19STR303 | Practical Training | 0 | 0 | 4 | 2 | 60 |
| 7 | P19STR304 | Project Phase – I | 0 | 0 | 16 | 8 | 240 |
| | | | | | **Total Credits** | **20** | |

**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 STR 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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Practical** | | | | | | | |
| 1 | P19STR401 | Project Phase – II | 0 | 0 | 28 | 14 | 420 |
| | | | | | **Total Credits** | **14** | |

**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 STR 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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19STR101 | Finite Element Analysis | 3 | 1 | 0 | 4 |
| 2 | P19STR102 | Theory of Elasticity and Plasticity | 3 | 1 | 0 | 4 |
| 3 | P19STR504 | **Elective :** Stability of Structures | 3 | 0 | 0 | 3 |
| 4 | P19STR510 | **Elective :** Advanced Concrete Technology | 3 | 0 | 0 | 3 |
| 5 | P19GE101 | Research Methodology and IPR | 2 | 0 | 0 | 2 |
| 6 | P19GE701 | **Audit Course:** English for Research Paper Writing | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19STR103 | Structural Engineering Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **Total Credits** | **18** |

**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 STR Students and Staff, COE

| P19STR101 | FINITE ELEMENT ANALYSIS | 3 1 0 4 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1 Discuss the displacement models to solve practical problems in Structural engineering.

CO2 Apply numerical techniques of finite element analysis to solve real time problems.

CO3 Manipulate the shape function and interpolation function to study structural behaviour.

CO4 Implement linear and quadratic elements in the finite element analysis of various types of structures.

CO5 Predict structural behaviour using strain displacement matrix and element stiffness matrix.

**UNIT-I: INDRODUCTION** **9**

Differential equilibrium equations - Strain displacement relation - Linear constitutive relation - Special cases - Principle of stationary potential energy - Application to finite element methods. Some numerical techniques in finite element analysis.

**UNIT –II: DISPLACEMET MODELS** **9**

Displacement models - Convergence requirements. Natural coordinate systems - Shape function. Interpolation function - Linear and quadratic elements - Lagrange and Serendipity elements - Strain displacement matrix - Element stiffness matrix and nodal load vector.

**UNIT –III: ISOPARAMETRIC ELEMENTS** **9**

Two dimensional isoparametric elements - Four noded quadrilateral elements - Triangular elements - Computation of stiffness matrix for isoparametric elements - Numerical integration (Gauss quadrature) - Convergence criteria for isoparametric elements.

**UNIT –IV: APPLICATIONS OF FEM** **9**

Assemblage of elements – Direct stiffness method - Special characteristics of stiffness matrix - Boundary condition and reaction - Gauss elimination and LDLT decomposition - Basic steps in finite element analysis.

**UNIT –V: ANALYSIS OF STRUCTURES** **9**

Analysis of framed Structures - 2D truss element - 2D beam element. Analysis of plate bending: Basic theory of plate bending - Displacement functions - plate bending Elements. Plane stress and plane strain analysis: Triangular elements - Rectangular elements.

**Total:45 hrs.**

**REFERENCE BOOKS:**


1. Bhavikatti.S.S, “Finite Element Analysis”, New Age International Publishers, 2015.
2. Chandrupatla, R.T. and Belegundu, A.D., “Introduction to Finite Elements in Engineering”, Prentice Hall of India, 2011.
3. Rao.S.S, “Finite Element Method in Engineering”, Butterworth – Heinmann, UK, 2008.
4. Logan D. L., A First Course in the Finite Element Method, Cengage Learning, 2015.
5. R.D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley &Sons, 2011.

| P19STR102 | THEORY OF ELASTICITY AND PLASTICITY | 3 1 0 4 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1 Explain the concept of stress and strain and their relationships
CO2 Analyze the two dimensional problems in Cartesian and polar coordinates
CO3 Apply the concept of torsion to Prismatic bars of different sections
CO4 Solve simple problems of elasticity and plasticity understanding the basic concepts.
CO5 Apply numerical methods to solve continuum problems.

**UNIT-I: ANALYSIS OF STRESS AND STRAIN IN CARTESIAN COORDINATES 9**

Displacement, Analysis of stress (two and three dimension)- Body force, surface force - Uniform state of stress – Principal stresses - stress transformation laws - Differential equations of equilibrium. Analysis of strain (two and three dimension) Strain displacement relations - Compatibility equations - state of strain at a point – strain transformation - principal strain - principle of superposition. Stress-strain relations - generalized Hooke's law - Lame's constants, Boundary value problems

**UNIT –II: TWO DIMENSIONAL PROBLEMS OF ELASTICITY IN CARTESIAN COORDINATES 9**

Plane stress and Plane strain problems - Airy's stress function - Polynomials – Direct method of determining Airy's polynomial stress function - Solution of Biharmonic equation by fourier series - St. Venant principle.

**UNIT –III: TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES 9**

General equations in polar coordinates - Stress distribution symmetrical about an axis - Pure bending of curved bars - Strain components in polar coordinates - Displacements for symmetrical stress distribution - Rotating Disc - Bending of a curved bar by force at the end

**UNIT –IV: TORSION OF PRISMATIC BARS 9**

General solutions of the problem by displacement (St. Venant's warping function) and force (Prandtl's stress function) approaches - Membrane analogy-Torsion of shafts of circular and noncircular (elliptic, triangular and rectangular) cross sectional shapes. Torsion of hollow thin walled single and multicelled sections.

**UNIT –V: PLASTIC DEFORMATION 9**

Introduction to stress-strain curve - Ideal plastic body - Criterion of yielding - Rankine's theory - St.Venant's theory - Tresca's criterion - Beltramis theory - Von-mises criterion - Mohr's theory of yielding - yield surface – Plastic potential, Isotropic Hardening-Flow rule (plastic stress- strain relation) Prandtl Reuss equations - Plastic work - Plastic potential Nadai's sand heap analogy.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


1. Sadhu Singh, Theory of Plasticity, Khanna Publishers, N.Delhi, 2008.
2. S. Timoshenko and J. N. Goodier, Theory of Elasticity, Mc Graw Hill Book Co., 2010.
3. RagabA.R., Bayoumi S.E., Engineering Solid Mechanics, CRC Press,1999
4. Computational Elasticity, AmeenM, Narosa, 2005.
5. Advanced Mechanics of Solids, Srinath L.S, Tata McGraw Hill, 2009.

| P19STR103 | STRUCTURAL ENGINEERING LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

***COURSE OUTCOMES***

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

CO1 Design high strength concrete and study the parameters affecting its performance

CO2 Conduct Non-Destructive tests on existing concrete structures

CO3 Apply Engineering principles to understand behaviour of structural elements

**CONTENTS:-** **30**

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

Model study on continuous beam with influence line coefficients

**Total: 30 hrs.**

**REFERENCE BOOKS:**

1. Properties of Concrete, Neville A.M, 5th Edition, Prentice Hall, 2013.

2. Concrete Technology, Shetty M.S., S.Chand and Co., 2008.

| P19STR504 | STABILITY OF STRUCTURES | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1 Obtain the concept of structural stability of structures
CO2 Compare the method and analysis of structures
CO3 Design a beam column behaviour and torsional buckling in beams
CO4 Explain the buckling of portal frame with various modes
CO5 Describe the buckling plates with different approaches

**UNIT – I: STABILITY OF COLUMNS** **9**

Introduction-Methods of neutral equilibrium- Effective-length concept and design curve- Governing equation for columns- Eigen value problem-Elastic structural stability-Structural instability-Analytical methods for the stability analysis, equilibrium, imperfections and energy methods - Non-prismatic columns - Built up columns - Buckling modes effect of shear on buckling load - Large deflection theory

**UNIT – II: METHODS OF ANALYSIS AND INELASTIC BUCKLING** **9**

Approximate methods - Rayleigh and Galerkin methods - Numerical methods (New mark's Finite Difference and matrix methods) -Analysis of columns - Experimental study of column behaviour - South well plot - Column curves - Derivation of column design formula - Effective length of Columns - Inelastic behavior - Tangent modulus and Double modulus theory.

**UNIT – III: BEAM COLUMNS** **9**

Beam columns: Introduction-Behaviour, Stability analysis of beam column with single and several concentrated loads, distributed load and end couples. Beams: Torsional buckling-Combined Torsional and flexural buckling. Lateral buckling of beams, pure bending of simply supported and cantilever beams.

**UNIT – IV: BUCKLING OF FRAMES** **9**

Buckling of frames-Introduction-Modes of buckling-Critical load using various methods:- Neutral equilibrium-Slope-deflection equations-Matrix Analysis.

**UNIT – V: BUCKLING OF PLATES** **9**

Buckling of plates-Differential equation of plate buckling-Critical load on plates for various boundary conditions-Energy method-Finite difference method.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


1. Chajes, A. "Principles of Structures Stability Theory", Prentice Hall of India, 1990.
2. Ashwin Kumar, "Stability of Structures", Allied Publishers Ltd, New Delhi, 1998.
3. Gambhir, "Stability Analysis and Design of Structures", springer, New York, 2010.
4. Iyengar, N.G.R, "Structural Stability of Columns and Plates" East West Press Pvt Ltd, New Delhi, 1986.
5. Timoshenko, S.P, and Gere, J.M., "Theory of Elastic stability", McGraw-Hill Company, 2017.

| P19STR510 | ADVANCED CONCRETE TECHNOLOGY | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

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

**UNIT – I: CONCRETE CHARACTERISATION** **9**

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**

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**

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**

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**

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: 45 hrs.**

**REFERENCE BOOKS:**


1. .Kumar Mehta, Paulo J.M Monteiro., Concrete Microstructure,properties and Materials,McGraw Hill Education(India) Pvt Ltd, New Delhi,2014
2. Job Thomas, "Concrete Technology", Cengage Learning India, 2015
3. Gambhir.M.L., Concrete Technology, McGraw Hill Education, 2011..
4. 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.

**P19GE101 RESEARCH METHODOLOGY AND IPR 2 0 0 2**

## 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

## UNIT 1 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 2 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 3 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 4 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.

## UNIT 5 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

**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

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

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| | | | | | | | |
| 1 | P19STR201 | Advanced Design of Concrete Structures | 3 | 0 | 0 | 3 | 45 |
| 2 | P19STR202 | Advanced Design of Steel Structures | 3 | 0 | 0 | 3 | 45 |
| 3 | P19STR517 | **Elective –** Design of Sub Structures | 3 | 0 | 0 | 3 | 45 |
| 4 | P19STR525 | **Elective –** Internet of Things of Civil Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | P19GE702 | **Audit Course** – Stress Management by Yoga | 2 | 0 | 0 | 0 | 30 |
| **Practical** | | | | | | | |
| 6 | P19STR203 | Structural Software Application Laboratory | 1 | 0 | 4 | 3 | 75 |
| 7 | P19STR204 | 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 STR Students and Staff, COE

| P19STR201 | Advanced Design of Concrete Structures | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Describe the design philosophy of Concrete Structures
CO2. Design the columns, walls, corbels, deep beams and grid floors
CO3. Design the flat slabs by yield line approach
CO4. Discuss the inelastic behaviour of concrete beams and columns
CO5. Deliberate the detailing for ductility of beams, columns and frames

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

Calculation of deflection and crack width according to IS Code. Construction of Interaction curve for compression member with axial force and bending – Design of slender column. Behaviour of beams for flexure, shear and torsion.

**UNIT –II: DESIGN OF SPECIAL REINFORCED CONCRETE ELEMENTS** **9 Hrs.**

Design of Reinforced Concrete walls, Design of shear wall, – Strut and tie method of analysis for corbels and deep beams, Design of corbels, deep beams and grid floors.

**UNIT –III: FLAT SLABS AND YIELD LINE APPROACH** **9 Hrs.**

Design of flat slabs according to IS method - Design of spandrel beams - Yield line analysis and design of square, rectangular, triangular and circular slabs with various boundary conditions. Hillerborg's strip method.

**UNIT –IV: INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND COLUMNS** **9 Hrs.**

Inelastic behaviour of concrete beams by Baker's method, moment – rotation - curvature characteristics. Limit analysis – Conditions for moment redistribution - Stress-Strain behaviour of confined and unconfined columns.

**UNIT –V: DUCTILE DETAILING** **9 Hrs.**

Concept of Ductility – Design and detailing of beams, columns for ductility - Design of cast-in-situ joints in frames – Determination of ductility factor for singly and doubly reinforced beams.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


1. Gambhir.M. L., "Design of Reinforced Concrete Structures", Prentice Hall of India, 2012.
2. Purushothaman, P, "Reinforced Concrete Structural Elements: Behaviour Analysis and Design", Tata McGraw Hill, 1984
3. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design', Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
4. Varghese, P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2005.
5. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, 2007.

| P19STR202 | Advanced Design of Steel Structures | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Explain and design the different types of steel connections
CO2. Analysis and design various components of industrial structures.
CO3. Design the steel members subjected to combined forces.
CO4. Design steel chimney subjected to wind loads.
CO5. Evaluate the behaviour and design of light gauge elements.

**UNIT-I: DESIGN OF CONNECTIONS** **9 Hrs.**

Introduction- Classification of connections. Bolted and Welded connections: Basic concepts- Beam-to-Beam connections. Beam-Column connection: Unstiffened and Stiffened seated Connections-Moment Resistant Connections.

**UNIT –II: ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS** **9 Hrs.**

Industrial building-Planning-Structural framing-Elements of industrial building- Analysis and design of trusses-Design of Purlins, Gable column and Gable wind girder-Introduction to pre-engineered building. Design and detailing for earthquake and wind loads. Design consideration for durability.

**UNIT –III: DESIGN OF COMBAINED FORCES** **9 Hrs.**

Design of members subjected to combined forces: Beam-Column-Crane Gantry Girders –Design of simple bases, Gusseted bases and Moment Resisting Base Plates

**UNIT –IV: DESIGN OF STEEL CHIMNEY** **9 Hrs.**

Introduction to chimneys -Types-Dimensions of steel stacks-Components: Lining- Breech openings and access ladder-Loading and load combinations-Design considerations-Design of self supporting and guyed steel chimney.

**UNIT –V: DESIGN OF LIGHT GAUGE STEEL STRUCTURES** **9 Hrs.**

Light gauge steel section: Introduction-Applications-Advantages-Behaviour-Forms-Edge and Intermediate stiffener-Stiffened, unstiffened and multiple stiffened element-Flat-width ratio-Effective width for load and deflection determination-Analysis and design of compression and flexural members.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


1. Subramanian N, “Design of Steel Structures”, Oxford University Press, New Delhi 2011.
2. Duggal S.K, “Design of Steel Structures”, Tata McGraw-Hill Education, 2009.
3. Shiyekar M.R, “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd, 2017.
4. Punmia B.C., Comprehensive Design of Steel Structures, Lakshmi Publications, New Delhi, 2000.
5. Teaching Resource on Structural steel Design, INSDAG, Ministry of Steel Publishing, 2000.
6. Bhavikatti.S.S, “Deign of Steel structures”, I.K. International publishing house, New Delhi, 2009.

| P19STR203 | Structural Software Application Laboratory | 1 0 4 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Analysis and design of steel roof trusses by softwares

CO2. Analysis and design of Reinforced Concrete frames by softwares

CO3. Analysis of various members by Finite Element Analysis softwares

**Contents** **45 Hrs.**

1. Analysis and design of 2D and 3D Steel roof trusses for static, wind and seismic forces.
2. Analysis and design of 2D and 3D Reinforced Concrete rigid frames for static, wind and seismic forces.
3. Finite Element modeling, analysis and design of Reinforced Concrete and Steel Elements.

**Total: 75 hrs.**

**References:-**


1. Laboratory manuals prepared by Civil Engineering Department, Sona College of Technology, Salem.
2. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design', Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
3. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi 2011
4. Prof. S.K. Bhattacharyya and Dr. D. Maity "Finite Element Analysis" NPTEL Web course, IIT Kharagpur.

| P19STR204 | Mini Project | 0 0 4 2 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Identify structural engineering problems reviewing available literature.

CO2. Study different techniques used to analyze complex structural 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: 60 hrs.**

| P19STR517 | Design of Substructures | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Describe the basic requirements of foundations and design the shallow foundations
CO2. Design of pile foundations
CO3. Design of well foundations
CO4. Design of machine foundations
CO5. Design of foundations on expansive soil

**UNIT-I: SHALLOW FOUNDATIONS** **9 Hrs.**

Soil investigation – Basic requirements of foundation – Types and selection of foundations. Bearing capacity of soil - plate load test – Design of reinforced concrete isolated, strip, combined and strap footings – mat foundation.

**UNIT –II: PILE FOUNDATIONS** **9 Hrs.**

Introduction – Types of pile foundations – load carrying capacity - pile load test – structural design of straight piles –configuration of piles- different shapes of piles cap – structural design of pile cap.

**UNIT –III: WELL FOUNDATIONS** **9 Hrs.**

Types of well foundation – Grip length – load carrying capacity – construction of wells – Failures and Remedies – Design of well foundation – Lateral stability.

**UNIT –IV: MACHINE FOUNDATIONS** **9 Hrs.**

Introduction – Types of machine foundation – Basic principles of design of machine foundation – Dynamic properties of soil – vibration analysis of machine foundation – Design of foundation for Reciprocating machines and Impact machines – Reinforcement and construction details – vibration isolation.

**UNIT –V: SPECIAL FOUNDATIONS** **9 Hrs.**

Foundation on expansive soils – choice of foundation – under-reamed pile foundation. Foundation for concrete Towers, chimneys – Design of anchors- Reinforced earth retailing walls.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


1. Bowles .J.E., "Foundation Analysis and Design", McGraw Hill Publishing co., New York, 1997.
2. Swamy Saran, Analysis and Design of substructures, Oxford and IBH Publishing Co. Pvt. Ltd., 2006.
3. Tomlinson.M.J, "Foundation Design and Construction", Longman, Sixth Edition, New Delhi, 1995.
4. Varghese.P.C, "Design of Reinforced Concrete Foundations" – PHI learning private limited, New Delhi – 2009.

| P19STR525 | Internet of Things of Civil Engineering | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

To enable students to

CO1. Discuss the architecture of Internet of Things (IOT)
CO2. Know the concept of Web of Things (WoT)
CO3. Know the Sensors used in IoT
CO4. Application of IoT in Smart Cities
CO5. Discuss the role of IoT in Environmental monitoring

**UNIT-I: INTRODUCTION** **10 Hrs.**

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

**UNIT –II: WEB OF THINGS** **10 Hrs.**

Web of things versus Internet of things - Two pillars of the web-Architecture Standardization for WoT - Unified Multitier WoT Architecture.Cloud of Things: Grid / SOA and cloud computing – Mobile Cloud computing - The cloud of things.

**UNIT –III: IOT SENSORS** **9 Hrs.**

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

**UNIT –IV: SMART CITY APPLICATION** **8 Hrs.**

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

**UNIT –V: ENVIRONMENTAL MONITORING** **8 Hrs.**

Water management – Process – application.Airpollution – Methods - Advantages. Water monitoring - Quality standards. Indication of calamities - Alert systems - Applications. Smart irrigation - case study. Micro climate monitoring.

**Total: 45 hrs.**

**REFERENCE BOOKS:**


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

**P19GE702** **Stress Management by Yoga**

**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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | P19STR301 | Design of Steel Concrete Composite Structures | 3 | 0 | 0 | 3 | 45 |
| 2 | P19STR501 | **Elective**: Prefabricated Structures | 3 | 0 | 0 | 3 | 45 |
| 3 | P19END601 | **Open Elective:** Product Design and Manufacturing | 3 | 0 | 0 | 3 | 45 |
| 4 | P19ISE601 | **Open Elective:** Transport Safety | | | | | |
| **Practical** | | | | | | | |
| 5 | P19STR302 | Technical Seminar | 0 | 0 | 2 | 1 | 30 |
| 6 | P19STR303 | Practical Training | 0 | 0 | 4 | 2 | 60 |
| 7 | P19STR304 | Project Phase – I | 0 | 0 | 16 | 8 | 240 |
| | | | | | **Total Credits** | **20** | |

**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 STR Students and Staff, COE

| P19STR301 | Design of Steel Concrete Composite Structures | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1. Understand the steel-concrete composite actions
CO2. Design of composite members
CO3. Design of connections in composite structures
CO4. Behaviour of box girder bridges
CO5. Seismic behaviour of composite structures

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

Introduction to steel - concrete composite construction – Codes – Composite action – Serviceability and Construction issues in design.

**UNIT –II: DESIGN OF COMPOSITE MEMBERS** **9 Hrs.**

Design of composite beams, slabs, columns, beam – columns - Design of composite trusses.

**UNIT –III: DESIGN OF CONNECTIONS** **9 Hrs.**

Shear connectors – Types – Design of connections in composite structures – Design of shear connectors – Partial shear interaction.

**UNIT –IV: COMPOSITE BOX GIRDER BRIDGES** **9 Hrs.**

Introduction - behaviour of box girder bridges - design concepts.

**UNIT –V: CASE STUDIES** **9 Hrs.**

Case studies on steel - concrete composite construction in buildings - seismic behaviour of composite structures.

**Total: 45hrs.**

**REFERENCE BOOKS:**


1. Johnson R.P., "Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings", Vol.I, Blackwell Scientific Publications, 2004.
2. Oehlers D.J. and Bradford M.A., "Composite Steel and Concrete Structural Members, Fundamental behaviour", Pergamon press, Oxford, 1995.
3. Owens.G.W and Knowles.P, "Steel Designers Manual", Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.

| P19STR501 | PREFABRICATED STRUCTURES | 3 0 0 3 |
|---|---|---|

***COURSE OUTCOMES***

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

CO1 Explain the principles and concepts of Prefabricated Structures.
CO2 Describe prefabricated elements along with their structural connections.
CO3 Summarize the production techniques of prefabricated elements.
CO4 Elucidate the hoisting techniques adopted in prefabrication construction.
CO5 Discuss the applications of prefabrication in construction field.

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

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

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

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

**UNIT–III: PRODUCTION TECHNOLOGY** **9**

Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.

**UNIT–IV: HOISTING TECHNOLOGY** **9**

Equipment for hoisting and erection – Elimination of erection stresses – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads – Lifting with external pre-stressing.

**UNIT–V: APPLICATIONS** **9**

Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns - water tanks

**Total: 45 hrs.**

**REFERENCE BOOKS:**

1. I. T. Koncz, Manual of Precast Concrete Construction, Vol. I, II, III & IV, Berlin, 1971
2. B. Lewicki, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam, London, New York, 1998
3. L. Mokk, Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland BetorVerlag, 2009
5.Kims S. Elliot, Precast Concrete Structures, CRC Press, Taylor & Francis, 2017
6. IS15916:2011, Building design and erection using prefabricated concrete. BIS, India, 2011.

| P19STR302 | Technical Seminar | 0 0 2 1 |
|---|---|---|
| ***COURSE OUTCOMES*** | | |
| The students will be trained to face an audience and to tackle any problem during group discussion in the Interviews | | |
| **Syllabus** | | |
| The students will work for two hours per week guided by a group of staff members. They will be asked to give a presentation on any topic of their choice related to Structural Engineering and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report and also on the interaction shown during the seminar. | | |
| | | |

**Total: 30hrs**

| P19STR303 | Practical Training | 0 0 4 2 |
|---|---|---|

***COURSE OUTCOMES***

To train the students in the field work so as to have a firsthand knowledge of practical problems related to Structural Engineering in carrying out engineering tasks.
To develop skills in facing and solving the field problems
They are trained in tackling a practical field/industry orientated problem related to Structural Engineering.

**Syllabus**

The students individually undertake training in reputed Industries during the summer vacation for a specified period 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.

**Total: 60 hrs.**

| P19STR304 | Project Work Phase – I | 0 0 16 8 |
|---|---|---|
| ***Course Outcomes*** | | |
| At the end of the course 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. | | |
| **Sylaabus** | | |
| The student individually works on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical 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 | | |

**Total: 240hrs**

# Open Electives

## CIVIL

| P19CEM601 | DISASTER MITIGATION AND MANAGEMENT | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

***COURSE OUTCOMES***

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

- CO1 Identify the types of hazards, vulnerability and micro zonation
- CO2 Explain the causes and effects of disasters
- CO3. Discuss the preparedness and forecasting the disasters
- CO4 Explain various post disaster activities
- CO5 Discuss the disaster management solutions from case studies

**Unit 1 INTRODUCTION** **9 Hrs.**

.Meaning and types of hazards, disasters and catastrophes – Disaster Management; Earthquakes: causes and effects – measurements - earthquake zones India – vulnerability and micro zonation;- volcanic hazards

**Unit –II CAUSES AND EFFECTS** **9 Hrs.**

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

**Unit –III PREPAREDNESS AND FORECASTING** **9 Hrs.**

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

**Unit –IV POST DISASTER ACTIVITIES** **9 Hrs.**

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** **9 Hrs.**

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

**Total: 45 hrs.**

**Reference Books:**

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: Structural Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Practical** | | | | | | | |
| 1 | P19STR401 | Project Phase – II | 0 | 0 | 28 | 14 | 420 |
| | | | | | **Total Credits** | **14** | |

**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 STR Students and Staff, COE