# SONA COLLEGE OF TECHNOLOGY, SALEM-5

**(An Autonomous Institution)**

## B.E- Civil Engineering

# CURRICULUM and SYLLABI

**[For students admitted in 2019-2020]**

## B.E / B.Tech Regulation 2019

**Approved by BOS and Academic Council meetings**

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)**
**Branch: Civil Engineering**

| S.No | Course Code | Course Title | L | T | P | C | Category |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19ENG101 | English for Engineers - I | 2 | 0 | 2 | 3 | HS |
| 2 | U19MAT102A | Linear Algebra and Calculus | 3 | 1 | 0 | 4 | BS |
| 3 | U19PHY103A | Physics for Civil Engineering | 3 | 1 | 0 | 4 | BS |
| 4 | U19CHE14A | Chemistry for Civil Engineering | 3 | 1 | 0 | 4 | BS |
| 5 | U19EGR106 | Engineering Graphics ** | 2 | 0 | 2 | 3 | ES |
| **Practical** | | | | | | | |
| 7 | U19PCL108A | Physics and Chemistry Laboratory-I # | 0 | 0 | 3 | 1.5 | BS |
| 8 | U19WPL112 | Workshop Practices Laboratory | 0 | 0 | 2 | 1 | ES |
| 9 | U19GE101 | Basic Aptitude-I | 0 | 0 | 2 | 0 | EEC |
| **Total Credits** | | | | | | | |
| **Optional Language Elective*** | | | | | | | |
| 11 | U19OLE1101 | French | 0 | 0 | 2 | 1 | HS |
| 12 | U19OLE1102 | German | | | | | |
| 13 | U19OLE1103 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

# Laboratory classes on alternate weeks for physics and chemistry. The lab examination will be conducted separately for 50 marks each with 2 hours durations.

** The examination will be conducted for 3 hours through CAD software and manual drafting

**Approved By**

| Chairperson, Science and Humanities BoS | Chairperson, Civil Engineering BoS | Member Secretary, Academic Council | Chairperson, Academic Council & Principal |
|---|---|---|---|
| **Dr.M.Renuga** | **Dr.R.Malathy** | **Dr.R.Shivakumar** | **Dr.S.R.R.Senthil Kumar** |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)**
**Branch: Civil Engineering**

| S.No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Category |
|---|---|---|---|---|---|---|---|
| | | **Theory** | | | | | |
| 1 | U19ENG201A | English for Engineers -II | 2 | 0 | 2 | 3 | HSMC |
| 2 | U19MAT202A | Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 | BSC |
| 3 | U19PPR205 | Problem Solving using Python Programming | 3 | 0 | 0 | 3 | BSC |
| 4 | U19BEE206 | Basics of Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | ESC |
| 5 | U19CE201 | Basics of Engineering Mechanics | 3 | 1 | 0 | 4 | BSC |
| | | **Practical** | | | | | |
| 6 | U19BEE207 | Basics of Electrical Engineering Laboratory | 0 | 0 | 2 | 1 | ESC |
| 7 | U19PCL208A | Physics and Chemistry Laboratory-II | 0 | 0 | 3 | 1.5 | BSC |
| 8 | U19PPL211 | Python Programming Laboratory | 0 | 0 | 2 | 1 | ESC |
| 9 | U19GE201 | Basic Aptitude-II | 0 | 0 | 2 | 0 | EEC |
| | | | | | **Total Credits** | **20.5** | |
| | | **Optional Language Elective*** | | | | | |
| 10 | U19LE1201 | French | 0 | 0 | 2 | 1 | HSMC |
| 11 | U19LE1202 | German | | | | | |
| 12 | U19LE1203 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

**Approved By**

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|---|---|---|---|
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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester III under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | U19MAT301A | Fourier Analysis and Statistics | 3 | 1 | 0 | 4 |
| 2 | U19CE301 | Mechanics of Fluids | 2 | 1 | 0 | 3 |
| 3 | U19CE302 | Strength of Materials -I | 2 | 1 | 0 | 3 |
| 4 | U19CE303 | Construction Materials and Practices | 3 | 0 | 0 | 3 |
| 5 | U19CE304 | Surveying | 3 | 0 | 0 | 3 |
| 6 | U19GE302 | **Mandatory Course :** Environment and Climate Science | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | U19CE305 | Materials Testing Laboratory | 0 | 0 | 2 | 1 |
| 8 | U19CE306 | Survey Laboratory | 0 | 0 | 2 | 1 |
| 9 | U19ENG301 | Communication Skill Laboratory | 0 | 0 | 2 | 1 |
| 10 | U19GE301 | Soft Skills and Aptitude-I | 0 | 0 | 2 | 1 |
| | | | | | **Total Credits** | **20** |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester IV under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | U19CE401 | Environmental Engineering | 3 | 0 | 0 | 3 |
| 2 | U19CE402 | Strength of Materials-II | 2 | 1 | 0 | 3 |
| 3 | U19CE403 | Transportation Engineering | 3 | 0 | 0 | 3 |
| 4 | U19CE404 | Concrete Technology | 3 | 0 | 0 | 3 |
| 5 | U19CE903 | **Professional Elective -** Elements of Building Planning | 3 | 0 | 0 | 3 |
| 6 | U19CE904 | **Professional Elective -** Energy Efficiency and Green Building Professional | 3 | 0 | 0 | 3 |
| 7 | U19GE403 | **Mandatory Course** : Essence of Indian Traditional Knowledge | 2 | 0 | 0 | - |
| **Practical** | | | | | | |
| 8 | U19CE405 | Fluid Mechanics Laboratory | 0 | 0 | 2 | 1 |
| 9 | U19CE406 | Concrete and Highway Laboratory | 0 | 0 | 2 | 1 |
| 10 | U19CE407 | Environmental Engineering Laboratory | 0 | 0 | 2 | 1 |
| 11 | U19GE401 | Soft Skills and Aptitude-II | 0 | 0 | 2 | 1 |
| | | | | | **Total Credits** | **19** |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester V Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19CE501 | Structural Analysis-I | 2 | 1 | 0 | 3 | 45 |
| 2 | U19CE502 | Soil Mechanics | 2 | 1 | 0 | 3 | 45 |
| 3 | U19CE503 | Design of Reinforced Concrete Elements | 2 | 1 | 0 | 3 | 45 |
| 4 | U19CE907 | **Elective** - Architecture and Town Planning | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CE908 | **Elective** -Building Services and Safety Regulations | 3 | 0 | 0 | 3 | 45 |
| 6 | noc21-ce71 | **Elective** -Introduction to Engineering Seismology | 3 | 0 | 0 | 3 | 45 |
| **Open Elective** | | | | | | | |
| 7 | U19CS1003 | Internet of Things | 3 | 0 | 0 | 3 | 45 |
| 8 | U19ME1004 | Renewable Energy Sources | 3 | 0 | 0 | 3 | 45 |
| 9 | U19ME1006 | 3D Printing | 3 | 0 | 0 | 3 | 45 |
| **Practical** | | | | | | | |
| 10 | U19CE504 | Survey Camp | 0 | 0 | 2 | 1 | 30 |
| 11 | U19CE505 | Computer Aided Civil Engineering Drawing | 0 | 0 | 2 | 1 | 30 |
| 12 | U19CE506 | Soil Mechanics Laboratory | 0 | 0 | 2 | 1 | 30 |
| 13 | U19GE501 | Soft Skills and Aptitude-III | 0 | 0 | 2 | 1 | 30 |
| | | | | | **Total Credits** | **22** | |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester VI Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19CE601 | Water Resources and Irrigation Engineering | 3 | 0 | 0 | 3 | 45 |
| 2 | U19CE602 | Structural Analysis-II | 2 | 1 | 0 | 3 | 45 |
| 3 | U19CE603 | Foundation Engineering | 3 | 0 | 0 | 3 | 45 |
| 4 | U19CE604 | Limit State Design of Steel Structures | 3 | 1 | 0 | 4 | 60 |
| 5 | U19CE916 | **Professional Elective** - Repair and Rehabilitation of Structures | 3 | 0 | 0 | 3 | 45 |
| 6 | U19CE917 | **Professional Elective** - Prefabricated Structures | 3 | 0 | 0 | 3 | 45 |
| | U19CE920 | **Professional Elective** - Traffic Engineering and Management | | | | | |
| **Practical** | | | | | | | |
| 7 | U19CE605 | Civil Engineering Software Applications Laboratory | 0 | 0 | 4 | 2 | 60 |
| 8 | U19CE606 | Innovative Projects | 0 | 0 | 2 | 1 | 30 |
| 9 | U19GE602 | Professional Development Skills | 0 | 0 | 2 | 1 | 30 |
| | | | | | **Total Credits** | **23** | |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19GE701 | Professional Ethics and Human Values | 3 | 0 | 0 | 3 | 45 |
| 2 | U19CE702 | Construction Engineering Management | 3 | 0 | 0 | 3 | 45 |
| 3 | U19CE703 | Earthquake Resistant Structures | 3 | 0 | 0 | 3 | 45 |
| 4 | U19CE922 | **Professional Elective -** Bridge Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CE924 | **Professional Elective -** Prestressed Concrete Structures | 3 | 0 | 0 | 3 | 45 |
| **Open Elective** | | | | | | | |
| 6 | U19CS1001 | Big Data Analytics | 3 | 0 | 0 | 3 | 45 |
| | U19CS1002 | Cloud Computing | | | | | |
| | U19CS1003 | Internet of Things | | | | | |
| | U19CS1004 | Mobile Application Development | | | | | |
| | U19EE1005 | Electrification In Building Construction | | | | | |
| **Practical** | | | | | | | |
| 7 | U19CE704 | Estimation and quantity surveying | 0 | 0 | 4 | 2 | 60 |
| 9 | U19CE705 | Design Project | 0 | 0 | 4 | 2 | 60 |
| 9 | U19CE706 | Internship | 0 | 0 | 0 | 2 | 60 |
| 10 | U19CE707 | Industrial Lecture | 0 | 0 | 1 | 0 | 30 |
| | | | | | **Total Credits** | **24** | |

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|---|---|---|
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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester VIII Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Practical** | | | | | | | |
| 1 | U19CE801 | Project Work | 0 | 0 | 24 | 12 | 360 |
| | | | | | **Total Credits** | **12** | |

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**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)**
**Branch: Civil Engineering**

| S.No | Course Code | Course Title | L | T | P | C | Category |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19ENG101 | English for Engineers - I | 2 | 0 | 2 | 3 | HS |
| 2 | U19MAT102A | Linear Algebra and Calculus | 3 | 1 | 0 | 4 | BS |
| 3 | U19PHY103A | Physics for Civil Engineering | 3 | 1 | 0 | 4 | BS |
| 4 | U19CHE14A | Chemistry for Civil Engineering | 3 | 1 | 0 | 4 | BS |
| 5 | U19EGR106 | Engineering Graphics ** | 2 | 0 | 2 | 3 | ES |
| **Practical** | | | | | | | |
| 7 | U19PCL108A | Physics and Chemistry Laboratory-I # | 0 | 0 | 3 | 1.5 | BS |
| 8 | U19WPL112 | Workshop Practices Laboratory | 0 | 0 | 2 | 1 | ES |
| 9 | U19GE101 | Basic Aptitude-I | 0 | 0 | 2 | 0 | EEC |
| **Total Credits** | | | | | | | |
| **Optional Language Elective*** | | | | | | | |
| 11 | U19OLE1101 | French | 0 | 0 | 2 | 1 | HS |
| 12 | U19OLE1102 | German | | | | | |
| 13 | U19OLE1103 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

# Laboratory classes on alternate weeks for physics and chemistry. The lab examination will be conducted separately for 50 marks each with 2 hours durations.

** The examination will be conducted for 3 hours through CAD software and manual drafting

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## U19ENG101 - ENGLISH FOR ENGINEERS – I

### Common to Civil Engineering

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Outcome: At the end of course, the students will be able to**

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

**UNIT - I**

- General Vocabulary, Parts of speech
- Self-introduction – personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email – fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – describing – defining – providing examples or evidences

**UNIT - II**

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing - business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations, detailed project report

**UNIT - III**

- Prefixes and Suffixes
- Mini presentation in small groups of two or three, on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising, applying for financial assistance, applying for a job, team work, discussion, presentation.
- Job application letter and resume, recommendations

**UNIT - IV**

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal, drafting circulars

**UNIT - V**

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing - feasibility reports, accident report, survey report
- Preparing abstracts for technical articles

**TOTAL: 60 hours**

**Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.**

**TEXT BOOK**

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

**EXTENSIVE READING**

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

**REFERENCE**

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

## U19MAT102A - LINEAR ALGEBRA AND CALCULUS
## Common to CIVIL, MECH, EEE, CSE, IT and MCT

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes: At the end of the course, the students will be able to**

- find the rank of the matrix and solve linear system of equations by direct and indirect methods
- apply the concepts of vector spaces and linear transformations in real world applications
- apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
- find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
- apply appropriate techniques of multiple integrals to find the area and volume.

**UNIT I - LINEAR SYSTEM OF EQUATIONS** **12**

Rank of a matrix – Solution of linear system of equations by matrix method, Gauss elimination, Gauss-Jordan, Gauss-Jacobi and Gauss-Seidel methods.

**UNIT II - VECTOR SPACES** **12**

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

**UNIT III - EIGEN VALUES AND EIGEN VECTORS** **12**

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

**UNIT IV - MULTIVARIABLE CALCULUS** **12**

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.

**UNIT V - MULTIPLE INTEGRALS** **12**

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

**Theory: 45 hours; Tutorial: 15 hours**

**TOTAL: 60 Hours**

**TEXT BOOKS**

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

**REFERENCE BOOKS**

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

## U19PHY103A - PHYSICS FOR CIVIL ENGINEERING
## (For B.E Civil Engineering)

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes: At the end of the course, the students will be able to,**

1. Discuss the dual nature of matter and radiation.
2. Describe the basic components of lasers.
3. Analyze the relation between arrangement of atoms and properties of solids.
4. Evaluate the factors affecting architectural acoustics of buildings.
5. Elucidate the different modes of heat transfer.

### UNIT I - QUANTUM PHYSICS 12

Origin of quantum mechanics – Limitations of classical theory - Dual nature of matter and radiation.

**Particle nature of radiation** - Compton Effect –Explanation based on quantum theory- Expression for Compton shift (no derivation).

**Wave nature of matter** - de Broglie waves - Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box.

**Application of wave nature of particles** - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope – Transmission electron microscope-Limitations of electron microscope.

### UNIT II - LASERS 12

**Basic terms** - Energy level - normal population - induced absorption (pumping) - population inversion - meta stable state - spontaneous emission - stimulated emission.

**Basic** components **of a laser -** Active medium - pumping technique - optical resonator **Einstein's theory** - Stimulated absorption - spontaneous emission and stimulated emission.

**Types of lasers** - Solid lasers ( Nd:YAG) - Gas lasers ($CO_2$ laser) - semiconductor laser (homojunction and hetero junction laser).

**Applications** - Holography - Construction and reconstruction of hologram - Applications of lasers in science and Engineering.

### UNIT III - CRYSTAL PHYSICS 12

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice –space lattice - unit cell - lattice parameters – basis - crystallographic formula) - Seven crystal systems and fourteen Bravais lattices – Lattice planes and Miller indices – Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per

unit cell - Atomic radius - Coordination number and Atomic Packing factor for SC, BCC, FCC and HCP Structures - Polymorphism and allotropy.

**Crystal imperfections -** Point, line and surface defects - Burger vector.

**Crystal Structure –** Graphite Structure, Diamond Structure.

**UNIT IV - ARCHITECTURAL ACOUSTICS** **12**

**Classification of sound waves:** Audible sound waves, Infrasonic waves, Ultrasonic waves- Noise and musical sound-Weber – Fechner law-Loudness level and intensity.

**Basic requirements for the acoustically good halls**- Reverberation -Sabine's law and its importance (no derivation)-absorption co-efficient-Factors affecting the acoustics and their remedies.

**Sound insulation**: Noise classification-Transmission loss-Sound insulation between individual rooms.

**UNIT V - THERMAL PHYSICS** **12**

**Heat and temperature** - Modes of heat transfer (Conduction, convection and radiation) - Specific heat capacity - thermal capacity and coefficient of linear thermal expansion. **Thermal conductivity** - Measurement of thermal conductivity of good conductor - Forbe's method - Measurement of thermal conductivity of bad conductor - Lee's disc method - Radial flow of heat - Cylindrical flow of heat - Practical applications of conduction of heat – Thermal insulation in buildings.

**Thermal radiations** - Properties of thermal radiations - Applications of thermal radiations.

**TOTAL: 60 Hours**

**TEXT BOOKS**


- B. K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning India Pvt. Ltd., Delhi, 2012.
- Dr. B.C. Punmia et al, "Building construction", Laxmi publications Pvt. Ltd., New Delhi 2008.


**REFERENCES**


- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018 ).
- Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
- Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)

## U19CHE104A - CHEMISTRY FOR CIVIL ENGINEERING

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes:** At the end of the course, the students will be able to

1. Analyze the impurities of water, their removal methods and explain the conditioning methods for domestic and industrial uses.
2. Outline the principles, applications of electrochemistry, types of corrosion and its control methods.
3. Compare the types of polymerization reactions, techniques and fabrication methods of polymers.
4. Analyze the composition, properties and industrial applications of engineering materials.
5. Describe the ingredients, manufacture, properties and applications of construction materials.

### UNIT I - WATER TECHNOLOGY 12

Introduction - Characteristics – hardness – estimation of hardness by EDTA method, alkalinity and its estimation - Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – external conditioning – zeolite process, demineralization process, desalination of brackish water by reverse osmosis - Domestic water treatment – screening, sedimentation, coagulation, aeration, sand filtration and disinfection methods - Chlorination, ozonation and UV treatment.

### UNIT II - ELECTROCHEMISTRY AND CORROSION 12

Electrode potential – Nernst Equation – derivation and problems based on single electrode potential calculation – reference electrodes – standard hydrogen electrode – calomel electrode – Ion selective electrode – glass electrode – measurement of pH – electrochemical series – significance – electrolytic and electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – potentiometric titrations (redox – $Fe^{2+}$ vs dichromate) – conductometric titrations (acid-base – HCl vs NaOH) – Corrosion – types – dry and wet corrosion – examples – Corrosion control methods – Sacrificial anode and impressed cathode current method.

### UNIT III - POLYMER CHEMISTRY 12

Nomenclature of Polymers - classification of Polymers – functionality – types of polymerization-addition-condensation and copolymerization – Free Radical mechanism of addition Polymerization – Properties of Polymers – glass transition temperature, Tg - Methods of Polymerization-bulk-solution-emulsion and suspension – Plastics – Moulding constituents of plastic – Moulding of plastics into articles-

Injection-Compression and Blow moulding – Thermoplastic and Thermosetting resins – Engineering Plastics-Nylon 6,6-Polycarbonate and Polyurethane-preparation-properties and applications – Rubbers-types-applications-vulcanization of rubber.

**UNIT IV - CHEMISTRY OF ENGINEERING MATERIALS 12**

**Refractories** – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling). **Abrasives** – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. **Lubricants** – mechanism of lubrication, liquid lubricants, - properties – (viscosity index, flash and fire points, cloud and pour points, oiliness) – solid lubricants – graphite and molybdenum sulphide. **Composites –** definition, constituents of composites – composition, properties and applications of various fibre reinforced polymer (FRP) composites.

**UNIT V - CHEMISTRY OF BUILDING MATERIALS 12**

Lime – classification – manufacture and properties of lime – Cement – classification – Portland cement – chemical composition – manufacture of Portland cement by wet method – setting and hardening – analysis of cement – concretes – hot and cold weathering of concrete, cement and its prevention methods – special cements - gypsum – plaster of Paris – Glass - manufacture, types, properties and uses – Recent trends in construction materials – special paints and their applications in construction sector.

**TOTAL: 60 hours**

**TEXT BOOKS**


- P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi , 17th Edition, 2018.
- S. Kalaiarasan et al, "Chemistry For Civil Engineering" Sonaversity, Sona College of Technology, Salem, 2019.


**REFERENCE BOOKS**


- O G Palana, Engineering Chemistry", Tata McGraw Hill Education (India) Private Limited, Chennai, Second Edition, 2017.
- B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).
- B.K. Sharma, "Engineering Chemistry", Krishna Prakasan Media (P) Ltd., Meerut (2001).
- N. Krishnamurthy, K. Jeyasubramanian and P. Vallinayagam, "Applied Chemistry", Tata McGraw-Hill Publishing Company Limited, New Delhi (1999).

## U19EGR106 - ENGINEERING GRAPHICS

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Outcomes: Upon completion of this course the students will be able to**

**CO1** Predict the construction of various curves in civil elevation, plan and machine components.

**CO2** Analyze the principles of projection of various planes by different angle to project points, lines and planes.

**CO3** Draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.

**CO4** Understand the interior details of complex components, machineries by sectioning the solid body. Study the development of surfaces for prisms and pyramids.

**CO5** Draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

**CONCEPTS AND CONVENTIONS (Not for Examination)** **L 3**

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

**COMPUTER AIDED DRAFTING (Not for Examination)** **L 3**

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

**UNIT I - PLANE CURVES (Manual drafting)** **L 6**

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

**UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD Software)** **L 12**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

**UNIT III - PROJECTION OF SOLIDS L 12**

**(CAD Software)**

Creation of 3D CAD models of pyramids, prisms and solids of revolutions- Sectional views - **(Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

**UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES L 12**

**(CAD Software)**

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids –cylinders and cones.

**UNIT V - CONVERSION OF ISOMETRIC VIEWS TO ORTHOGRAPHIC VIEWS L 12**

**(Manual drafting)**

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**TOTAL: 60 Hours**

**TEXT BOOKS**


- P. Suresh et al., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
- K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.


**REFERENCE BOOKS**


- Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
- Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
- K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
- Bertoline& Wiebe fundamentals of graphics communication III edition McGrawhill 2002.

## U19PCL108A - PHYSICS CHEMISTRY LABORATORY - I
## PHYSICS PART
## (FOR B.E. CIVIL ENGINEERING)

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Outcomes: At the end of the course, the students will be able to,**

1. Demonstrate an experimental setup to form interference fringes and use it to determine the thickness of the thin wire.
2. Study the change in properties of ultrasonic waves in a liquid medium and determine the characteristics of the liquid.
3. Demonstrate by means of an appropriate experiment the poor thermal conductivity of a given bad conductor
4. Apply the principle of spectrometry to determine the properties of a given prism.
5. Demonstrate the applications of a diode laser to determine the wave length, particle size in the given powder (Lycopodium) and the characteristics of a given optical fibre.
6. Investigate the non – uniform bending behavior of a given material.

**List of Experiments**

1. Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2. Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3. Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.
4. Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
5. Determination of laser wavelength and particle size (lycopodium powder), acceptance angle and numerical aperture of an optical fibre using diode laser.
6. Determination of the Young's modulus of the given material by non-uniform bending method.

**TOTAL: 45 Hours**

## U19PCL108A - PHYSICS CHEMISTRY LABORATORY - I
## CHEMISTRY PART
## (FOR B.E. CIVIL ENGINEERING)

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Outcomes: At the end of the course, the students will be able to,**

- Estimate the amount of total, temporary and permanent hardness in the given water sample
- Analyse the different types of alkalinity and determine their amount in the given water sample
- Estimate the amount of hydrochloric acid present in the given solution using conductivity meter.
- Estimate the amount of hydrochloric acid present in the given solution using pH metry.
- Describe the estimation of ferrous iron present in the given solution using potentiometer.
- Evaluate the iron content of the water by spectrophotometry.

**List of Experiments (Chemistry part)**

1. Estimation of hardness of water sample by EDTA method.
2. Estimation of alkalinity of water sample by indicator method.
3. Estimation of HCl by conductometry. (HCl vs NaOH)
4. Estimation of HCl by pH metry.
5. Estimation of ferrous ion by potentiometric titration.
6. Determination of iron content in water by spectrophotometric method.

**Total: 45 Hours**

## U19WPL112 - WORKSHOP PRACTICE

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes: Upon completion of this course the students will be able to**

**CO1** Familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.

**CO2** Fabricate the different simple products in above trades.

**CO3** Produce different joining of metals.

**LIST OF EXPERIMENTS**

**SECTION 1: FITTING**

Tools and Equipment's- Practice in filling.

Making of Vee joint and square (T-fitting) joint.

**SECTION 2: SHEET METAL**

Tools and Equipment's- Practice

Making of Dust Pan and Funnel.

**SECTION 3: WELDING**

Tools and Equipment's – Practice

Arc welding of Butt joint and Lap Joint.

**SECTION 4: CARPENTRY**

Tools and Equipment's- Planning Practice

Making of Half Lap joint and Dovetail Joint.

**TOTAL: 30 hours**

**U19GE101 - BASIC APTITUDE – I**
**(Common to All Departments)**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 0 |

**Course Outcomes: At the end of course, the students will be able to**

1. Solve fundamental problems in specific areas of quantitative aptitude
2. Solve basic problems in stated areas of logical reasoning
3. Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

**1. Quantitative Aptitude and Logical Reasoning**

**Solving simple problems with reference to the following topics:**

a. Numbers – HCF & LCM
b. Decimal fractions
c. Square roots & cube roots
d. Surds & Indices
e. Logarithms
f. Percentage
g. Averages
h. Coding and Decoding & Visual language

**2. Verbal Aptitude**

**Demonstrating plain English language skills with reference to the following topics:**

a. Synonyms
b. Antonyms
c. Verbal analogy
d. Editing passages
e. Sentence filler words

**TOTAL: 30 hours**

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)**
**Branch: Civil Engineering**

| S.No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Category |
|---|---|---|---|---|---|---|---|
| | | **Theory** | | | | | |
| 1 | U19ENG201A | English for Engineers -II | 2 | 0 | 2 | 3 | HSMC |
| 2 | U19MAT202A | Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 | BSC |
| 3 | U19PPR205 | Problem Solving using Python Programming | 3 | 0 | 0 | 3 | BSC |
| 4 | U19BEE206 | Basics of Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | ESC |
| 5 | U19CE201 | Basics of Engineering Mechanics | 3 | 1 | 0 | 4 | BSC |
| | | **Practical** | | | | | |
| 6 | U19BEE207 | Basics of Electrical Engineering Laboratory | 0 | 0 | 2 | 1 | ESC |
| 7 | U19PCL208A | Physics and Chemistry Laboratory-II | 0 | 0 | 3 | 1.5 | BSC |
| 8 | U19PPL211 | Python Programming Laboratory | 0 | 0 | 2 | 1 | ESC |
| 9 | U19GE201 | Basic Aptitude-II | 0 | 0 | 2 | 0 | EEC |
| | | | | | **Total Credits** | **20.5** | |
| | | **Optional Language Elective*** | | | | | |
| 10 | U19LE1201 | French | 0 | 0 | 2 | 1 | HSMC |
| 11 | U19LE1202 | German | | | | | |
| 12 | U19LE1203 | Japanese | | | | | |

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

**Approved By**

| Chairperson, Science and Humanities BoS | Chairperson, Civil Engineering BoS | Member Secretary, Academic Council | Chairperson, Academic Council & Principal |
|---|---|---|---|
| Dr.M.Renuga | Dr.R.Malathy | Dr.R.Shivakumar | Dr.S.R.R.Senthil Kumar |

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

## U19ENG201A - ENGLISH FOR ENGINEERS – II

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Outcome: At the end of the course, the students will be able to**

1. frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. develop and demonstrate listening skills for academic and professional purposes.
3. draw conclusions on explicit and implicit oral information.
4. develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. read for gathering and understanding information, following directions and giving responses.

**UNIT - I**

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment
- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

**UNIT - II**

- Prepositions and dependent prepositions
- Understanding short conversations or monologues,
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

**UNIT - III**

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text

**UNIT - IV**

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

**UNIT - V**

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- Gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions
- Short reading passages for sentence matching exercises, picking out specific information in a short text

**TOTAL: 45 Hours**

**The listening test will be conducted for 20 marks and reading for 20 marks internally and evaluated along with English for Engineers II in the End Semester Valuation.**

**TEXT BOOK**

1. Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

**EXTENSIVE READING**

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons
2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd

**REFERENCES**

1. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2. A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

## U19MAT202A - DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes: At the end of the course, the students will be able to**

1. apply the classical methods to solve linear ordinary differential equations.
2. apply the appropriate numerical methods to solve ordinary differential equations.
3. apply the Laplace transforms technique to solve ordinary differential equations.
4. apply the classical method to solve partial differential equations.
5. apply the concepts of vector differentiation and integration to determine the line, surface and volume integrals.

**UNIT I - ORDINARY DIFFERENTIAL EQUATIONS** **12**

Linear higher order ordinary differential equations with constant coefficients – Cauchy's and Legendre's homogeneous linear ordinary differential equations – Method of variation of parameters.

**UNIT II - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS** **12**

**Single Step Methods:** Taylor's series – Euler and Modified Euler methods – Fourth order Runge – Kutta method for solving first and second order ordinary differential equations.

**Multi Step Methods:** Milne's and Adam's predictor-corrector methods.

**UNIT III - LAPLACE TRANSFORMS** **12**

**Laplace transform:** Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions.

**Inverse Laplace transform:** Standard results – Statement of convolution theorem and its applications – Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.

**UNIT IV - PARTIAL DIFFERENTIAL EQUATIONS** **12**

Formation of partial differential equations – Lagrange's linear equation – Solution of standard types of first order partial differential equations – Linear partial differential equations of second and higher order with constant coefficients.

**UNIT V - VECTOR CALCULUS** **12**

**Vector differentiation:** Scalar and vector valued functions – Gradient, directional derivative, divergence and curl – Scalar potential.

**Vector integration:** Line, surface and volume integrals – Statements of Green's, Stoke's and Gauss divergence theorem – Simple applications involving squares, rectangles, cubes and rectangular parallelopiped.

**TOTAL: 60 Hours**

**TEXT BOOKS**


1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.


**REFERENCES**


1. J. Stewart, "Calculus", Cengage Publishers, 8th Edition, 2016.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. E. Kreyszig., "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
4. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
5. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.

## U19PPR205 - PROBLEM SOLVING USING PYTHON PROGRAMMING

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes: At the end of the course, the students will be able to**

1. develop algorithmic solutions to simple computational problems
2. write simple Python programs
3. write programs with the various control statements and handling strings in Python
4. develop Python programs using functions and files
5. analyze a problem and use appropriate data structures to solve it.

**UNIT I - ALGORITHMIC PROBLEM SOLVING** **9**

Need for computer languages, Generation and Classification of computers - Basic organization of a computer, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

**UNIT II - BASICS OF PYTHON PROGRAMMING** **9**

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

**UNIT III - CONTROL STATEMENTS AND STRINGS** **9**

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

**UNIT IV - FUNCTIONS AND FILES** **9**

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local and global scope, recursion, lambda functions. Files -Text files, reading and writing files.

**UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9**

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

**TOTAL: 45 Hours**

**REFERENCES**


1. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education, 2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
6. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

## U19BEE206 - BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes: At the end of the course, the students will be able to**

1. analyze the various DC & AC circuits and find the circuit parameters.
2. discuss the construction and working principle of DC machines.
3. discuss the construction and working principle of Transformer & AC machines.
4. describe the various types of measuring techniques.
5. discuss the electrical systems in buildings and electrical standards for various devices.

**UNIT I - DC & AC CIRCUITS** **9**

***DC circuits:*** Definition of voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchhoff's Law & its applications - Series and Parallel circuits- Star-delta transformation.

***AC Circuits:*** Generation of alternating emf - RMS value, Average value, Peak factor and Form factor for sinusoidal AC waveform - Series RLC circuits - Introduction to three-phase system.

**UNIT II - DC MACHINES** **9**

***DC Generator:*** Construction of DC generator – Working principle of DC generator – EMF equation – Types of DC generator- Applications.

***DC Motor:*** Working principle of DC motor – Back EMF- Types of DC motor- Applications.

**UNIT III - TRANSFORMER & AC MACHINES** **9**

***Transformer:*** Construction and working principle of transformer – EMF equation – Types of transformers- Transformation ratio.

***AC machines:*** Construction and working principle of single phase & three phase induction motor- Applications.

**UNIT IV - MEASURING TECHNIQUES** **9**

Strain measuring techniques using electrical strain gauges- Measurement of Resistance, Inductance and Capacitance using Wheatstone, Anderson and Schering bridges- Measurement of energy using single phase induction type energy meter –Load cells.

**UNIT V - ELECTRICAL SYSTEMS IN BUILDINGS**

Protective devices in electrical installations- Earthing for safety- Types of earthing- ISI specifications- Types of wires, wiring systems and selection criteria - Planning electrical wiring for building- Main and distribution boards- Layout of a substation.

**TOTAL: 45 Hours**

**TEXT BOOKS**


1. B.L. Theraja, "Fundamentals of Electrical Engineering & Electronics", S. Chand & Co Ltd, 2015.
2. S. Padma, "Basic Electrical and Electronics Engineering", Sonaversity, Revised edition 2016.


**REFERENCES**


1. S.K. Bhattacharya, "Electrical Machines", Tata MC Graw Hill Publishing company ltd., 3rd Edition, 2009.
2. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", 3rd Edition 2007, Tata McGraw-Hill publishing company limited.
3. A.K.Sawheny, "A course in Electrical and Electronics Measurement & Instrumentation ", DhanpatRai and Co, 9th Edition, 2012

## U19CE201 - BASICS OF ENGINEERING MECHANICS

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Outcomes: At the end of the course, the students will be able to**

1. apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2d and 3d.
2. apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2d equilibrium. reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2d.
3. apply the concepts of locating centroids / center of gravity of various sections/ volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

### UNIT I - STATICS OF PARTICLES 9+3

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

### UNIT II - EQUILIBRIUM OF RIGID BODIES 9+3

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple-Further Reduction of a System of Forces, Equilibrium in Two - Reactions at Supports and Connections.

### UNIT III - PROPERTIES OF SURFACES AND SOLIDS 9+3

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Hollow section by using standard formula Second and product moments of plane area –

Rectangle, triangle, circle from integration – T section, I section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia.

**UNIT IV - FRICTION** **9+3**

Frictional force – Laws of Coulomb friction – Angle of friction – cone of friction – Equilibrium of bodies on inclined plane – Ladder friction.

**UNIT V - DYNAMICS OF PARTICLES** **9+3**

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics-Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force , Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact.

**TOTAL: 60 Hours**

**TEXT BOOKS**


1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11th Edition, 2017.
2. Hibbeler, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2017).
3. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.


**REFERENCES**


1. K.L. Kumar, "Engineering Mechanics" Tata McGraw-hill, 2017, 4th Edition
2. S.S. Bhavikatti, " Engineering Mechanics", New Age International Publishers, 2006
3. R. S. Khurmi, " Engineering Mechanics", S. Chand Publishers, 2018.
4. Dr. N. Kotteswaran, "Engineering Mechanics – Statics & Dynamics", Sri Balaji Publications 2004.

## U19BEE207 - BASIC OF ELECTRICAL ENGINEERING LAB

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes: At the end of the course, the students will be able to**

1. apply basic circuit laws for calculating electric parameters of DC & AC circuits.
2. determine and draw the mechanical, electrical and performance characteristics of electrical machines.
3. determine the value of Resistance, Inductance and Capacitance using various bridges.

**List of Experiments**

1. Verification of Ohm's law
2. Verification of Kirchhoff's laws
3. Measurement of power and power factor for series RLC circuit
4. Load characteristics of DC shunt motor
5. Speed control of DC shunt motor
6. Load test on single phase transformer
7. Speed control of three phase induction motor
8. Measurement of DC resistance by Wheatstone bridge.
9. Measurement of inductance using Anderson bridge
10. Measurement of capacitance using Schering bridge
11. Measurement of earth pit resistance using megger

**TOTAL: 30 Hours**

## U19PCL208A - PHYSICS AND CHEMISTRY LABORATORY – II

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Outcomes: At the end of the course, the students will be able to**

1. apply the principles of optics, electricity and elasticity to determine the Engineering properties of materials.
2. analyse the two given brass samples and find which one possesses more copper content in the brass samples and estimate the amount of calcium oxide in cement.
3. determine the resistivity of the given fuse wire used for house hold applications. Analyse the two given water samples and find which one possesses more dissolved oxygen and analyse the two given waste waters and find which one possesses more chromium content.

**Physics Part - List of Experiments**

1. Determination of rigidity modulus of the material of wire using torsion pendulum
2. Determination of specific resistance of a given wire using Carey Foster's bridge.
3. Determination of coefficient of viscosity of liquid by Poiseuille's method.
4. Determination of wavelength of prominent colors in mercury spectrum using a spectrometer.
5. Determination of the Young's modulus of the given material by uniform bending method.
6. Determination of bandgap of a semiconductor diode.

**Chemistry Part - List of Experiments**

1. Estimation of copper in brass by EDTA method.
2. Estimation of calcium oxide in cement by EDTA method.
3. Determination of dissolved oxygen of water by Winkler's method
4. Estimation of chromium in waste water.
5. Determination of molecular weight of a polymer by viscosity measurements.
6. Estimation of chloride ion present in the sample water by argentometric method.

**TOTAL: 45 Hours**

## U19PPL211 - PYTHON PROGRAMMING LABORATORY

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes: At the end of the course, the students will be able to**

1. implement the algorithms using basic control structures in python
2. develop python programs to use functions, strings and data structures to solve different types of problems
3. implement persistent storing information through file operations

**List of Experiments**

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

**TOTAL: 30 Hours**

## U19GE201 - BASIC APTITUDE - II

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 0 |

**Course Outcomes: At the end of the course, the students will be able to**

**CO1** solve more elaborate problems than those in BA-I in specific areas of quantitative aptitude.

**CO2** solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.

**CO3** demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

**List of Experiments**

**1. QUANTITATIVE APTITUDE AND LOGICAL REASONING**

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

a. Ratio and proportion
b. Partnership
c. Chain rule
d. Ages
e. Profit, loss and discount
f. Geometry
g. Area and volume
h. Data arrangement

**2. VERBAL APTITUDE**

Demonstrating verbal aptitude skills in English with reference to the following topics:

a. Jumbled sentences
b. Reconstructions of sentences (PQRS)
c. Sentence fillers two words
d. Idioms and phrases
e. Spotting errors
f. Writing captions for given pictures

**TOTAL : 24 Hours**

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester III under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | U19MAT301A | Fourier Analysis and Statistics | 3 | 1 | 0 | 4 |
| 2 | U19CE301 | Mechanics of Fluids | 2 | 1 | 0 | 3 |
| 3 | U19CE302 | Strength of Materials -I | 2 | 1 | 0 | 3 |
| 4 | U19CE303 | Construction Materials and Practices | 3 | 0 | 0 | 3 |
| 5 | U19CE304 | Surveying | 3 | 0 | 0 | 3 |
| 6 | U19GE302 | **Mandatory Course :** Environment and Climate Science | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | U19CE305 | Materials Testing Laboratory | 0 | 0 | 2 | 1 |
| 8 | U19CE306 | Survey Laboratory | 0 | 0 | 2 | 1 |
| 9 | U19ENG301 | Communication Skill Laboratory | 0 | 0 | 2 | 1 |
| 10 | U19GE301 | Soft Skills and Aptitude-I | 0 | 0 | 2 | 1 |
| | | | | | **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 Engineering, Third Semester BE Civil Students and Staff, COE

| U19MAT301A | FOURIER ANALYSIS AND STATISTICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 |

**COURSE OUTCOMES (**At the end of the course, the students will be able to)

1 Express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
2. Apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
3. Represent the data in the form of diagram and graph and analyze them
4. Apply the concepts of measure of central tendency, dispersion and skewness to the given data and analyze the results
5. Apply the concepts of correlation and regression to the data and analyze the result.

**UNIT – I FOURIER SERIES 12**

General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.

**UNIT – II FOURIER TRANSFORMS 12**

Fourier transform pair – Properties – Fourier sine and cosine transforms pair – Properties –Transforms of simple functions – Parseval's identity.

**UNIT – III COLLECTION AND REPRESENTATION OF DATA 12**

Collection of data – Primary and secondary data – Diagramatic representation – Simple, subdivided, multiple and bar diagram – Pie diagram – Pictograph – Graphs of frequency distribution – Histogram – Frequency polygon – Frequency curve – Cumulative frequency curve.

**UNIT – IV MEASURES OF CENTRAL TENDENCY AND DISPERSION 12**

Measure of central tendency (Simple arithmetic mean, median, mode) – Quartile's – Measure of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation).

**UNIT – V CORRELATION AND REGRESSION 12**

Simple and rank correlations – Multiple and partial correlations – Linear regression – Curve fitting (straight line and parabola).

Theory: **45 Hours** Tutorial: **15 Hours** Total**: 60 Hours**

**TEXT BOOKS:**


1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15th Edition, 2012.


**REFERENCE BOOKS:**


1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
2. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
3. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
4. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
5. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.

| U19CE301 | MECHANICS OF FLUIDS | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 1 | 0 | 3 |

**COURSE OBJECTIVES**(On completion of the course, the students will be able to):

1. Measure the basic properties of fluid.
2. Understand the concepts of statics and dynamics of fluid flow.
3. Compute the major and minor losses occurring in pipe flow.
4. Understand the concepts of boundary layer problem.
5. Physical laws in addressing problems in hydraulics

**UNIT-I FLUID PROPERTIES AND FLUID STATICS 9**

Definitions-Fluid and fluid mechanics-Dimensions and units-Fluid properties: Density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension-Continuum concept of system and control volume. Fluid statics: concept of fluid static pressure, absolute, gauge, atmosphere and vacuum pressures - Measurements of pressure. Hydrostatic forces on surfaces -forces on planes – centre of pressure.

**UNIT-II FLUID KINEMATICS AND DYNAMICS 9**

. Fluid Kinematics: Classification and types of flow - continuity equation (one dimensional differential forms)-velocity field and acceleration- Velocity potential function and stream function-Equipotential line- Flow net. Fluid Dynamics : Equations of motion -Euler's equation of motion-Bernoulli's equation: Applications:- Venturi meter-Orifice meter and Velocity measurement (Pitot tube, Current meter, Hot wire and hot film anemometer, Float technique, Laser Doppler velocimetry)- linear momentum equation and its application to pipe bend.

**UNIT-III FLOW THROUGH PIPES AND CHANNEL 9**

Flow through Orifices and Mouth pieces. Reynold’s experiment -Laminar flow through circular pipe (Hagen poiseulle's). Flow through pipes -Losses of energy in pipes- Major Energy losses (Darcy - Weisbach's and Chezy’s Formula)- Minor Energy losses-Hydraulic gradient and total energy line- Flow through compound: Pipes in series and in parallel-Power transmission through pipes- Measurement of flow through notches and weir.

**UNIT-IV BOUNDARY LAYER 9**

Boundary layer - Definition- boundary layer on a flat plate - Laminar and turbulent boundary layer- Displacement, energy and momentum thickness - Momentum integral equation-Boundary layer separation and control - Drag on flat plate.

**UNIT-V DIMENSIONAL ANALYSIS AND MODEL STUDIES 9**

Fundamental dimensions - Dimensional homogeneity- Method of dimensional analysis: Rayleigh’s method and Buckingham π- theorem-Model analysis-Similitude- Types of similarities-Types of forces acting in moving fluid-Dimensionless numbers-Model Laws-Classification of models: Undistorted and distorted models.

**TOTAL (L:30+T:15): 45 PERIODS**

**TEXT BOOKS:**


1. Bansal R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2017.
2. Rajput R.K., “Fluid Mechanics and Hydraulic Machines”, S. Chand Publishing Ltd, New Delhi, 2013.


**REFERENCES:**


1. Kumar K.L, “Engineering Fluid Mechanics”, Eurasia Publishing House Pvt. Ltd, New Delhi, 1995.
2. Modi P.N and Seth, “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House New Delhi. 2004.
3. Subramanya K, “Fluid Mechanics and Hydraulic Machines-Problems and Solutions”, Tata McGraw Hill Education, New Delhi, 2010.

| U19CE302 | STRENGTH OF MATERIALS - I | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 1 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Comprehend the state of stresses and strains in various structural components under all types of forces.
2. Determine principal stresses and planes for an element in two and three dimensional state of stress.
3. Draw the Shearing force and bending moment diagrams for beams subjected to all the types of loading.
4. Calculate bending and shearing stresses of beam under flexure and shear.
5. Ideas of torsional stresses and how to evaluate it in circular sections and its applications in spring analysis.

**UNIT-I SIMPLE STRESSES** **9**

Simple Stresses and strains -Elastic constants -Volumetric strain- Relationship between elastic constants-Stress Strain diagram for ductile and brittle materials-Analysis of axially loaded members-Composite Bars-Thermal Stresses.

**UNIT-II COMPLEX STRESSES** **9**

State of Stress in two dimensions-Stresses on inclined planes-Principal Stresses and Principal Planes-Maximum shear stress - Mohr's circle method. State of stree in three dimensions-Stress invariants - Determination of principal stresses and principal planes.

**UNIT-III SHEARING FORCE AND BENDING MOMENT** **9**

Types of loads, supports, beams-Concept of shearing force and bending moment - Relationship between intensity of load, Shearing Force and Bending moment - Shearing Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment.

**UNIT-IV STRESSES IN BEAMS** **9**

Theory of simple bending-Assumptions and derivation of simple bending equation-Flexural rigidity- Bending and shearing stress distribution diagrams- Composite beams.

**UNIT-V TORSION** **9**

Theory of Torsion- Assumptions and derivation of torsional equation-Power transmitted-Stresses and Deformations in Solid and Hollow Circular Shafts- Compound shaft- Combined bending and torsion of shafts- Shaft in series and parallel. Open and Closed coiled helical springs- laminated springs - Springs in series and parallel. Design of buffer springs.

**TOTAL (L:3+T:15): 45 PERIODS**

**TEXT BOOKS:**


1. Rajput R.K, “Strength of Materials”, S.Chand and Co, New Delhi, 2014.
2. Bansal R.K, “Strength of Materials”, Laxmi Publications, New Delhi, 2017.


**REFERENCES:**


1. Chandramouli P.N, “Fundamentals of Strength of Materials”, PHI Learning Private Limited, New Delhi, 2013.
2. Subramanian R, “Strength of Materials”, Oxford University Press, New Delhi, 2010.

| | | L | T | P | C |
|---|---|---|---|---|---|
| U19CE303 | CONSTRUCTION MATERIALS AND PRACTICES | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Familiarize the Building components and its function.
2. Choose effective brick, timber, roofing materials in the field.
3. Select suitable type of concrete making materials.
4. Practice various construction techniques in the field.
5. Understand the Function and location of doors, windows and stair case.

**UNIT-I INTRODUCTION TO BUILDING CONSTRUCTION 9**

General: Definition of Civil Engineering-Function of Civil Engineer-Division of Civil Engineering- Types of structure : Load Bearing Structure - Framed Structure. Components of building and its function. Site planning: Precaution in selection of sites-Situations and surrounding of site for various types of building-Procedure for site analysis. Sub structure: Functional requirement of a foundation- Bearing capacity of soil- Types of foundation and their construction-Suitability.

**UNIT-II BUILDING MATERIALS 9**

Bricks- Manufacturing process-Classification-Testing- Bricks for special use-Refractory bricks. Stone as building material-Criteria for selection-Tests on stones-Application. Timber- Market forms and Industrial forms-Properties-Seasoning and Preservative treatment - Structural steel-Shapes-Applications. Flooring and roofing: Materials-Suitability-Types. Pipes: Types-Sizes-Application. Paints - Varnishes - Distempers - Bitumens. Concrete blocks – Lightweight concrete blocks.

**UNIT-III CONCRETE MAKING MATERIALS 9**

Lime – Preparation of lime mortar. Cement - Ingredients - Manufacturing process - Types and Grades - Properties of cement and Cement mortar - Hydration - Compressive strength - Tensile strength - Fineness- Soundness and consistency - Setting time-Storage of cement. Aggregate: Classification-Fine aggregates - River sand – Artificial sand - Properties -Bulking of sand-Fineness modulus. Coarse Aggregates - Crushing strength - Impact strength - Flakiness Index - Elongation Index - Abrasion Resistance-Grading.

**UNIT-IV CONSTRUCTION PRACTICES 9**

Introduction about NBC-Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - Masonry: Bonds - Brick masonry-Stone masonry - concrete hollow block masonry - Flooring - Damp proof courses - Construction joints - Movement and expansion joints - Pre cast pavements - Fabrication and erection of steel trusses - Frames - Braced domes - Laying brick -Weather and water proof - Rroof finishes - Acoustic and fire protection.

**UNIT-V CONSTRUCTION TECHNIQUES 9**

Lintel: Functions of lintel and sunshade-Types of lintel; Arches: Construction-Elements-Classification. Doors and Windows: Technical terms-Types and their suitability. Stair and stair cases:Terminology-Location and classification of stairs-Requirement of good stair. Form works: Centering and shuttering - Scaffoldings, shoring and underpinning - Slip forms.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Rajput R K., “Engineering Materials”, S Chand and Company Ltd, 2014.
2. Arora S.P and Bindra S.P, “Building Construction”, Dhanpat Rai Publications (P) Ltd, 2015.


**REFERENCES:**


1. Shetty M.S, “Concrete Technology Theory and Practice”, S. Chand and Company Ltd, New Delhi, 2014.
2. Punmia B.C, “Building Construction”, Laxmi Publication, New Delhi, 2016.
3. Sahu G.C., Joygopal Jena., “Building Materials and Construction”, Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.

| U19CE304 | SURVEYING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Conduct linear and angular measurement survey with the help of chain, tape and compass.
2. Determine the horizontal and vertical distance by traversing using theodolite and measure difference in elevation and produce reduced level of the given points.
3. Describe the methods of setting out curves in the field and to determine the area and volume of structures.
4. Handle total station instrument for making the horizontal and vertical measurements
5. Conduct the global positioning system for determining geographical location of the site.

**UNIT-I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING 9**

Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Bearing - Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling - Datum- Bench Marks - Temporary and Permanent Adjustments- Methods of Levelling- Booking - Reduction - Sources of errors in Levelling - Curvature and refraction.

**UNIT-II THEODOLITE AND TRIGNOMETRIC LEVELLING 9**

Introduction- Classification of theodolite- Temporary and permanent adjustments –Measurements of horizontal and vertical angles- Theodolite traversing-Traversing computation-Balancing of traversing-Introduction to omitted measurements. Trignometrical leveling: Heights and distances - Base of the object accessible and inaccessible.

**UNIT-III TACHEOMETRIC SURVEYING AND CONTOURS 9**

Introduction-Instruments-Different systems of tachometric measurements- Tacheometer -Stadia Constants - Analytic Lens - Tangential and Stadia Tacheometry surveying-Substense method: Vertical and horizontal measurements. Contour - Contouring - Characteristics of contours - Methods of contouring- Direct method-Indirect method- Contour gradient -Uses of contour plan and map- Measurements of area and volume.

**UNIT-IV CURVES AND TRIANGULATION 9**

Curves-Classifications-Elements of curves-Designation of curves-Setting out of simple curves: Linear and instrument method. Triangulation- Classification-Basic systems-Operation-Signals and towers-Satellite station.

**UNIT-V ADVANCED SURVEYING 9**

Total station: Features-Recording-Advantages-Fields procedure. Photogrammetry: Aerial photogrammetry-Application. Remote sensing: Classification-principles- Resolution-Sensors-Methods of remote sensing-Image interpretation-Application- Remote sensing in India. Geographic Information Systems: Scope- Purposes- Hardware of GIS-Applications. Global Positioning Systems: GPS elements- Application and uses- Advantages. Introduction about Drone surveying

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Punmia B.C, "Surveying, Vol. I and II", Laxmi Publications, 2016.
2. Basak N.N, "Surveying and Levelling", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2014.
3. Kumar S., " Basics of Remote Sensing and GIS", Laxmi Publication (P) Ltd,2015


**REFERENCES:**


1. Arora K. R, "Surveying Vol. I and II", Standard Book House, 2015.
2. Duggal S.K, "Surveying Vol. I and II", Tata McGraw Hill, New Delhi, 2013.
3. Kanetkar T.P, "Surveying and Levelling Vols. I and II", United Book Corporation, Pune, 2014.

| U19CE305 | SURVEY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Use conventional surveying tools such as chain/tape, compass, dumpy level, theodolite in the field of civil engineering applications such as structural plotting and highway profiling.
2. Use modern surveying instruments like total station and GPS.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

**COURSE CONTENT S**

**Chain Survey**

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset

**Compass Survey**

2. Compass Traversing – Measuring Bearings & arriving included angles

**Levelling - Study of levels and levelling staff**

3. Reduction of levels (Check and Fly leveling) - Height of collimation and Rise and Fall method.

**Theodolite - Study of Theodolite**

4. Measurements of horizontal angles by reiteration and repetition and vertical angles
5. Determination of elevation of an object using single plane method when base is accessible/inaccessible

**Tacheometry – Tangential system – Stadia system**

6. Measurement of height and distance using stadia and tangential system of tachometry.

**Curve Setting**

7. Setting out of a simple curve using linear method.

**Total Station -** Study of Total Station, Measuring Horizontal and vertical angles

8. Measurement of angles and height
9. Traverse using Total station and Area of Traverse
10. Determination of distance and difference in elevation between two inaccessible points using Total station

**Global Positioning Systems**

11. Calculation of latitude and longitude using GPS.

Drones

12. Advance surveying using Drones

**Setting out works**

13. Centre line marking for single Room and Double Room

| U19CE306 | MATERIAL TESTING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Determine the physical properties of given cement, fine aggregates coarse aggregates and wooden sample.
2. Evaluate Modulus of elasticity, torsional strength, hardness and tensile strength of given specimens.
3. Apply the technical concepts and ways to solve engineering problems through conducting experiments.

**COURSE CONTENT S**

**Brick/Building blocks:** Shape and Size-Efflorescence-Compressive strength-Water absorption- Field test.

**Wood**: Compressive strength.

**Cement:** Specific gravity test- Fineness -Consistency test- Setting time- Soundness -Compressive strength of cement mortar cubes- Field test.

**Fine aggregate:** Specific gravity test- Bulking of sand-Sive Analysis-Fineness modulus.

**Coarse aggregate:** Specific gravity test-Crushing strength-Impact strength-Shape test-Water absorption- Sive Analysis-Fineness modulus.

**Steel:** Stress-strain characteristics - Modulus of elasticity -Hardness -Impact strength-Shear strength.

Evaluation of Stiffness on helical spring.

Stiffness and modulus of rigidity of the specimen using torsion testing machine.

Deflection test on cantilever and simply supported beam.

| Semester-III | U19 GE301- SOFT SKILLS AND APTITUDE – I | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 | 100 |

**Course Outcomes**

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

1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics

| | |
|---|---|
| **1.Soft Skills** | **Demonstrating soft-skill capabilities with reference to the following topics:**<br>a. Attitude building<br>b. Dealing with criticism<br>c. Innovation and creativity<br>d. Problem solving and decision making<br>**e.** Public speaking<br>**f.** Group discussions |
| **2. Quantitative Aptitude and Logical Reasoning** | **Solving problems with reference to the following topics:**<br>a. **Vedic Maths:** Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification.<br>b. **Numbers:** Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power.<br>c. **Averages:** Basics of averages and weighted average.<br>d. **Percentages**: Basics of percentage and Successive percentages.<br>e. **Ratio and proportion:** Basics of R &P, Alligations, Mixture and Partnership.<br>f. **Profit ,Loss and Discount**: Basic & Advanced PLD<br>g. **Data Interpretation**: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation.<br>h. **Syllogism:** Six set syllogism using Venn diagram and tick and cross method |
| **3. Verbal Aptitude** | **Demonstrating English language skills with reference to the following topics:**<br>a. Verbal analogy<br>b. Tenses<br>c. Prepositions<br>d. Reading comprehension<br>e. Choosing correct / incorrect sentences<br>f. Describing pictures<br>g. Error spotting |

Department of Placement Training
Sona College of Technology.
Salem-636 005.

Sona College of Technology, Salem — Department of Sciences (Chemistry)

**SEMESTER – III**

**MANDATORY COURSE**

# U19GE302 - ENVIRONMENT AND CLIMATE SCIENCE

**(Common for CSE, CIVIL, EEE, MECH)**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 0 |

**Course Outcomes:**

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

1. state the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. explain environmental based pollution their causes, effects and their remedial measures
4. discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. describe the effect of climate change due to pollution

**UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** 6

Definition, Scope and Importance Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems–Role of an Individual in Conservation of Natural Resources.

**UNIT II ECOSYSTEMS AND BIODIVERSITY** 6

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

**UNIT III ENVIRONMENTAL POLLUTION** 6

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,– Role of an Individual in Prevention of Pollution..

20.05.2020 — B.E. / B.Tech. Regulations 2019

**UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT** 6

Sustainable Development- - Climate Change- Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy - Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion - mechanism, effects and control measures- Montreal Protocol to protect ozone layer depletion - Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi

**UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION** 6

Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

**TOTAL: 30 HOURS**

**Text Books:**

1. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

**References:**

1. S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd.,Ahmedabad, India.
4. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

20/5/20
**Dr. M. Raja**
Course Coordinator / Sciences

20.5.2020
**Dr. C. Shanthi**
HOD / Sciences

20/5
**Dr. M. Renuga**
Chairperson BOS,
Science and Humanities

**20.05.2020**

**B.E. / B.Tech. Regulations 2019**

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester IV under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | U19CE401 | Environmental Engineering | 3 | 0 | 0 | 3 |
| 2 | U19CE402 | Strength of Materials-II | 2 | 1 | 0 | 3 |
| 3 | U19CE403 | Transportation Engineering | 3 | 0 | 0 | 3 |
| 4 | U19CE404 | Concrete Technology | 3 | 0 | 0 | 3 |
| 5 | U19CE903 | **Professional Elective -** Elements of Building Planning | 3 | 0 | 0 | 3 |
| 6 | U19CE904 | **Professional Elective -** Energy Efficiency and Green Building Professional | 3 | 0 | 0 | 3 |
| 7 | U19GE403 | **Mandatory Course** : Essence of Indian Traditional Knowledge | 2 | 0 | 0 | - |
| **Practical** | | | | | | |
| 8 | U19CE405 | Fluid Mechanics Laboratory | 0 | 0 | 2 | 1 |
| 9 | U19CE406 | Concrete and Highway Laboratory | 0 | 0 | 2 | 1 |
| 10 | U19CE407 | Environmental Engineering Laboratory | 0 | 0 | 2 | 1 |
| 11 | U19GE401 | Soft Skills and Aptitude-II | 0 | 0 | 2 | 1 |
| | | | | | **Total Credits** | **19** |

**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 Engineering, Fourth Semester BE Civil Students and Staff, COE

| U19CE401 | ENVIRONMENTAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Identify the quantity and quality of water from various sources and the processes involved in the water conveyance systems.
2. Infer the design principles of unit operations and processes for water treatment.
3. Illustrate the design concepts and implementation of sewage transmission systems.
4. Design various sewage treatment systems.
5. Justify the suitable advanced treatment techniques for water and wastewater treatment..

| UNIT-I | WATER SUPPLY SYSTEM - SOURCE AND CONVEYANCE | 9 |
|---|---|---|

Objectives- Design period - Population forecasting-Water demand -Sources of water and their Characteristics – Selection of water source- Drinking Water quality standards-Intake structures. Conveyance- Laying, jointing & testing of pipes-selection of pump and pipe materials – pipe joints -Distribution System of water supply.

| UNIT-II | DESIGN PRINCIPLES OF WATER TREATMENT | 9 |
|---|---|---|

Objectives-Selection of unit operations and process-Principles of screening, flocculation, sedimentation, filtration, disinfection – water softening-miscellaneous water treatments (Aeration-Iron & Manganese removal- Defluoridation)-Operation and maintenance aspects.

| UNIT-III | SEWERAGE SYSTEM:COLLECTION AND TRANSMISSION | 9 |
|---|---|---|

Common terms used in sanitary engineering- wastewater characteristics -Quantity of sanitary sewage: Sources of wastewater. Quantity of storm sewage: factors affecting storm sewage - Quantity of storm-water. Design of sewers - laying, jointing and testing of sewers-sewer appurtenances- sewer materials and joints.

| UNIT-IV | SEWEAGE TREATMENT AND DESIGN PRINCIPLES | 9 |
|---|---|---|

Objectives-types of treatments and processes- layout of sewage treatment plants -Design principles of screen chamber, grit chamber, primary sedimentation tank, activated sludge process-Modified activated sludge process-miscellaneous water treatments (oxidation ditch- chlorination-oxidation ponds-aerated lagoons)

| UNIT-V | SEWAGE DISPOSAL AND RURAL SANITATION | 9 |
|---|---|---|

Waste water disposal methods -Sewage farming - Oxygen sag curve-Streeter Phelps model-Role of IOT in Wastewater reclamation -Sanitary fittings: one pipe and two pipe system-general layout of house drainage connection.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Garg S.K, "Environmental Engineering Vol.I& II", Khanna Publishers, New Delhi, 2010 & 2015.
2. Punmia, B.C.,Ashok Jain and Arun Jain, "Water Supply Engineering", Laxmi Publications (P) Ltd., New Delhi, 2010.
3. Birdie G.S, Birdie J.S, "Water Supply & Sanitary Engineering", Dhanpat Rai Publishing Company (P) Ltd. New Delhi, 2013.
4. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.


**REFERENCES:**


1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
3. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.

| U19CE402 | STRENGTH OF MATERIALS II | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 1 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Establish the slope and deflection in beams by using various methods.
2. Determine the forces in plane truss members
3. Familiarize the behavior of column under axial and eccentric loads.
4. Examine the problems related to thin and thick cylinders subjected to fluid pressureand and study the various theories of failures.
5. Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams.

| UNIT-I | DEFLECTION OF DETERMINATE BEAMS | 6+3 |
|---|---|---|

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

| UNIT-II | ANALYSIS OF TRUSSES | 6+3 |
|---|---|---|

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient method – Analysis of Space trusses by tension coefficient method.

| UNIT-III | COLUMNS | 6+3 |
|---|---|---|

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - Middle fourth rule. - Core of a section. Combined axial and bending stresses

| UNIT-IV | CYLINDERS AND THEORIES OF FAILURES | 6+3 |
|---|---|---|

Thin cylindrical and spherical shells – stresses , change in dimensions and volume -Thick cylinders – lame's theory – Compound cylinders – shrinking on stresses. Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

| UNIT-V | ADVANCED TOPICS | 6+3 |
|---|---|---|

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – Stresses in hooks.

**TOTAL (L:30+T:15): 45 PERIODS**

**TEXT BOOKS:**


1. Rajput R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2014.
2. Bansal R.K, "Strength of Materials", Laxmi Publications, New Delhi, 2017.
3. tan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.


**REFERENCES:**


1. Chandramouli P.N, "Fundamentals of Strength of Materials", PHI Learning Private Limited, New Delhi, 2013.
2. Subramanian R, "Strength of Materials", Oxford University Press, New Delhi, 2010.

| U19CE403 | TRANSPORTATION ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Explain the various highway development and design cross section elements.
2. Determine the characteristics of pavement materials and design of pavement as per IRC.
3. Design of pavement as per IRC.
4. Apply the concepts of railway planning while designing the permanent way.
5. Plan the locations and design of the airport components.

| UNIT-I | INTRODUCTION TO HIGHWAY | 9 |
|---|---|---|

Introduction to Highway, classification of roads, highway planning-Road cross section-Camber, gradient, super elevation- Sight distance: PIEV theory-Stopping sight distance-Over taking sight distance-Intermediate sight distance. Horizontal curves: Super elevation-Widening of pavements –Introduction to Vertical curves and Transition curves. Types of gradients -grade compensation on curves.

| UNIT-II | HIGHWAY MATERIALS | 9 |
|---|---|---|

Pavement Materials: Desirable properties and testing of highway materials-Soil: California bearing ratio test, Benkelman Beam test, field density test; Aggregate: Crushing, abrasion, impact, water absorption, flakiness and elongation indices and stone polishing value test; Bitumen: Penetration, ductility, viscosity and softening point test.

| UNIT-III | PAVEMENT DESIGN | 9 |
|---|---|---|

Pavement Design: Rigid and flexible pavements- Components and their functions- Factors affecting the design of pavements; Design practice for flexible pavements (IRC method and recommendations-problems)-Design practice for rigid pavements (IRC recommendations - concepts only). Types of road constructions: Water Bound Macadam, bituminous, Granular based Macadam and cement concrete road.

| UNIT-IV | RAILWAY ENGINEERING | 9 |
|---|---|---|

Recent Trends in Indian railways for national development- Permanent way, its components and function: Rails, sleepers and ballast- types of rails, rail fastenings, Gauges, coning of wheels, creeps and kinks. Geometric design of railway tracks-Gradients and grade compensation, super-elevation, widening of gauges in curves (Concepts only) - Points and crossings -Railway stations and yards - Signalling and interlocking, Railway Tunnels

| UNIT-V | AIRPORT ENGINEERING | 9 |
|---|---|---|

Introduction to air transport –Site selection- Airport obstructions and zoning. Components of airport- Runway: Orientation-Wind rose diagrams (theory only)-Runway length-Runway configuration and drainage-Preventive measures in runway, Taxiway -Aircraft parking configuration and parking system - Visual aids.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Khanna K, and Justo C E G, "Highway Engineering", 10th Edition, Khanna Publishers, Roorkee, 2018.
2. SaxenaSubhash C, and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2020.
3. Khanna S K, Arora M G, and Jain S S, "Airport Planning and Design", Revised 10th edition, Nemchand and Brothers, Roorkee, 2015.


**REFERENCES:**


1. Kadiyali L.R, "Principles and Practice of Highway Engineering", Khanna Technical Publications, New Delhi, 2013.
2. Rangwala, "Railway Engineering", Charotar Publishing House, 2017.
3. Rangwala, "Airport Engineering", Charotar Publishing House, 2017.

| U19CE404 | CONCRETE TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Determine the properties of fresh and hardened concrete.
2. Apply a suitable admixture in the required field conditions.
3. Design the concrete mix using ACI and IS code methods.
4. Evaluate the properties and applications of special concretes.
5. Diagnose the strength and durability of concrete structures with different testing methods.

| UNIT-I | FRESH AND HARDENED CONCRETE | 9 |
|---|---|---|

Fresh concrete: Mechanism of hydration-Water-Cement ratio-Factors affecting strength of the concrete-Workability - Concepts and tests as per Indian codal specifications. Concrete manufacturing stages: Batching - Mixing -Transportation - Placing of concrete -Curing of concrete.Water: Quality of water for mixing and curing - Use of sea water for mixing Concrete. Hardened concrete: Properties and tests-Strength of concrete - Temperature effects - Creep of concrete - Thermal properties of concrete - Micro cracking of concrete.

| UNIT-II | ADMIXTURES | 9 |
|---|---|---|

Admixtures -Necessity-Types-Chemical admixtures with specific properties - Accelerators - Retarders -Plasticizers and super plasticizers - Air entraining admixtures-Water proofers -Coloring agent. Mineral admixtures-Fly ash-Slag-Metakaolin-Rice husk ash-Micro and nano silica-Mineral additives and fillers.

| UNIT-III | MIX DESIGN | 9 |
|---|---|---|

Mix Design-Factors influencing mix proportion-Variability in test results -Quality control -Sampling and acceptance criteria- Design Mix and Nominal Mix- Mix design by ACI method and IS method using IS 10262-2019.

| UNIT-IV | SPECIAL CONCRETES AND CONCRETING METHODS | 9 |
|---|---|---|

Special concretes: Light weight concrete – Recycled aggregate concrete - Fibre reinforced concrete - Polymer concrete - Ferrocement - Ready mix concrete- Self compacting concrete - High strength concrete – Geopolymer concrete - High performance concrete-Pervious concrete – Self curing concrete-Bio and bacterial concrete - Smart concrete; Concrete methods: Extreme weather concreting - Vacuum concrete - Underwater concreting - Guniting and shotcreting

| UNIT-V | NON-DESTRUCTIVE TEST AND DURABILITY OF CONCRETE | 9 |
|---|---|---|

Non destructive tests: Rebound hammer-Ultra sonic pulse velocity test. Durability of concrete-Mechanism of corrosion - Causes and effects-Permeability of concrete-Shrinkage-Plastic shrinkage -Drying shrinkage-Chemical attack-Sulfate attack of concrete structures - chloride attack- Remedial measures Application of IoT in smart curing system for concrete.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Shetty, M.S., “Concrete Technology”, Theory & Practice, S.Chand and Co, 2019.
2. Bhavikatti S S, “Concrete Technology”, I.K. International Publishing House Pvt. Limited, 2015.
3. Gupta.B.L., Amit Gupta, Concrete Technology, Jain Book Agency, 2010.


**REFERENCES:**


1. Kumar Mehta P, Paulo, and Moteiro J. M, “Concrete-Micro Structure, Properties and Materials”, 3rd Edition, Mcgraw Hill, 2006
2. Santhakumar A.R., “Concrete Technology”, Oxford University Press, New Delhi, 2018.
3. Job Thomas, “Concrete Technology”, Cengage learning India Pvt Ltd 2015.
4. Gambhir M.L, “Concrete Technology”, Tata McGraw Hill, 2012.
5. Nevile.A.M., “Properties of Concrete”, Longman Publishers, 2008.

| U19CE405 | Fluids Mechanics Laboratory | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Measure the flow, discharge and energy loss in pipes and open channel.
2. Demonstrate the characteristics curves of pumps and turbines.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

**List of experiments**

1. Flow through venturey meter and orifice meter
2. Flow through variable duct area - Bernoulli's experiment
3. Flow through orifice, mouthpiece and notches
4. Determination of friction coefficient in pipes
5. Determination of minor losses
6. Performance characteristics of centrifugal pumps (Constant speed / Variable speed)
7. Performance characteristics of reciprocating pump
8. Characteristics of pelton wheel turbine
9. Characteristics of francis turbine
10. Characteristics of kaplan turbine
11. Study of impact of jet on flat plate (normal / inclined)

**TOTAL: 30 PERIODS**

**REFERENCES:**


| | |
|---|---|
| 1. | Modi, P.N and Seth, S.M., Hydraulics and Fluid Mechanics, Standard Book House, Delhi, 2010 |
| 2. | Dr. R. K. Bansal, A Text book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications Pvt Ltd, Ninth Edition, 2015. |

| U19CE406 | CONCRETE AND HIGHWAY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Analyze the various properties of concrete.
2. Characterize the aggregate and bitumen used for road construction.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

**TESTS ON FRESH CONCRETE**

a) IS methods ( 10262-2019)
b) Slump cone test
c) Compaction factor test
d) Self compacting concrete test

**TESTS ON HARDENED CONCRETE**

a) Compressive Strength test
b) Split tensile strength test
c) Flexural strength test
d) Modulus of Elasticity test
e) Rebound hammer (Demonstration)
f) UPV test (Demonstration)

**TEST ON AGGREGATES**

a) Los Angeles Abrasion Test

**TEST ON BITUMEN**

a) Specific Gravity of Bitumen
b) Penetration Test
c) Viscosity Test
d) Softening Point Test
e) Ductility Test

**TOTAL: 30 PERIODS**

**REFERENCE BOOKS:**


1. Shetty, M.S., “Concrete Technology”, Theory & Practice, S.Chand and Co, 2019.
2. S. K. Khanna, C. E. G. Justo., “Highway Engineering”, Nem Chand & Bros, New Delhi, 2018,Revised 10th Edition
3. IS 10262 : 2019, Concrete Mix Proportioning — Guidelines( Second Revision ), January 2019
4. Concrete Mix Design ACI 211.1-91

| U19CE407 | Environmental Engineering Laboratory | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Test the water and waste water and their difference characteristics as per standard.
2. Recommend the degree of treatment required for the water and waste water.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

**List of experiments**

1. Sampling and preservation methods and significance of characterization of water and waste water(Study experiment).
2. Determination of pH,TDS and EC
3. Determination of Chlorides
4. Determination of Hardness
5. Determination of Total Solids, Suspended solids, Volatile and Fixed solids
6. Determination of Optimum Coagulant Dosage
7. Determination of Residual Chlorine & Determination of Available Chlorine in Bleaching powder
8. Determination of Dissolved Oxygen
9. Determination of B.O.D.
10. Determination of C.O.D.
11. Introduction to Bacteriological Analysis (Study experiment).

**TOTAL: 30 PERIODS**

**REFERENCES:**


1. Standard methods for the examination of water and wastewater, APHA, 23rd Edition, Washington, 2017.
2. Garg S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi, 37th Edition 2019.
3. Modi P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6, 16th Edition 2018.

| U19CE903 | ELEMENTS OF BUILDING PLANNING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. Plan the residential building as per function requirements.
2. Design various elements of the building.
3. Comprehend the provisions and standards of housing elements.
4. Explain the different green building rating systems with real time examples.
5. Formulate and design the housing layouts by various standards of the building.

| UNIT-I | BUILDING FUNCTIONAL ELEMENTS | 9 |
|---|---|---|

Introduction-Nomenclature of building planning and constructionClassification of building-Site selection for residential building; Elements of climate-Directions and their characteristics-Orientation of buildings -Factors affecting orientation.Building Bye-Laws - Guidelines for planning and drawing of buildings.

| UNIT-II | REQUIREMENTS OF BUILDING | 9 |
|---|---|---|

Principles of planning of buildings:Aspect-Prospect-Privacy- Sizes of the Rooms-Roominess-Grouping-Circulation-Sanitation-Elegance- Economy,Principles on minimum plot sizes and building frontage.Minimumstandard dimensions of building elements-Provisions for: lighting, ventilation, fire, means of access and parking.

| UNIT-III | PLANNING OF RESIDENTIAL BUILDING | 9 |
|---|---|---|

Introduction-House-Home-Rooms meant for the various activities: Purposes and requirements; Economical measures in building construction- Types of Structural frames - Load bearing structures-Framed structures-Prefabricated structures. Introduction to intelligent building. Fixing the position of various building components and justification

| UNIT-IV | GREEN BUILDING | 9 |
|---|---|---|

Principles- Design criteria-Site sustainability-Efficiency: Water use- Energy-Indoor environmental quality- Green building materials-Cost of construction- Comparisons of green building with conventional building- Assessment and evaluation of green building- Green building certification-Green buildings in India.

| UNIT-V | BUILDING DRAWING | 9 |
|---|---|---|

Introduction to building drawing-Preparation of drawing-Working drawing. Building plans approval procedure as per NBC.- Documents to be submitted for approval of proposed building to the sanction authority. Conventional symbols-Preparation of site plan, plan, elevation and sectional drawing- Interpretation of Structural, Architectural and services drawings.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Kumara Swamy N. "Building Planning and Drawing", Charator Publishing House Pvt.Ltd, 8th edition 2015.
2. Sahu G.C, Joygopal Jena, "Building Material s and Construction", McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2015.


**REFERENCES:**


1. Shah M.G. Kalec. M. and Patki SY, "Building Drawing", Tata Mcgraw Hill, New Delhi, 2012.

| U19CE904 | ENERGY EFFICIENCY AND GREEN BUILDING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES** (On completion of the course, the students will be able to):

1. To describe the importance of energy resources, its availability and conservation. To gain knowledge about heat loss & gain and air quality requirements in buildings.
2. To study and identify the methods adopted to make the building as energy efficient.
3. To gain knowledge about Environmental impact assessment due to buildings and construction materials.
4. To study about different green building rating systems with real time examples.
5. To create awareness about clean development mechanism and the role of UNFCCC.

| UNIT-I | INTRODUCTION | 9 |
|---|---|---|

Definition and concepts, Energy and water as a resource - Criticality of resources - Needs of modern living - Heat loss and heat gain in buildings- thermal comfort improvement methods - other building comforts -indoor air quality requirements -electrical energy conservation.

| UNIT-II | ENERGY EFFICIENT BUILDINGS | 9 |
|---|---|---|

Zero Energy Building (ZEB) - Nearly Zero Energy Building (NZEB) - energy consumption - defining low energy buildings- opportunities and techniques for energy conservation in buildings - water conservation - water management system - water efficient landscaping - green roofing - rainwater harvesting - sanitary fixtures and plumbing systems - wa4stewater treatment and reuse - process water strategies - adoption to sustainable resources, process and technologies- Energy Conservation Opportunities in Public and Private Buildings.

| UNIT-III | CONSTRUCTION MATERIALS AND PRACTICES | 9 |
|---|---|---|

Construction materials - Embodied energy, carbon content, and emission of $CO_2$ ,$SO_2$ and $NO_x$ of building materials, elements and construction process- Current practice and low environmental impact alternatives.

| UNIT-IV | BUILDING ASSESSMENT SCHEMES | 9 |
|---|---|---|

Energy efficiency ratings & ECBC - 2007 - Various energy efficiency rating systems for buildings - LEED, BEE, & GRIHA - case studies -Introduction to BIM.

| UNIT-V | CLEAN DEVELOPMENT MECHANISM | 9 |
|---|---|---|

Clean Development Mechanism - CDM Benefits for energy conservation methodology and procedure - Eligibility Criteria - UNFCCC - role of UNFCCC and Government of India - Energy analysis using Equest software, day light analysis, insulation materials, sunpath and grid analysis - calculation of embodied energy for residential building as case study

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Sustainable Building, Design Manual: Published by The Energy and Resources Institute, Darbari Seth block, IHC Complex, Lodhi Road, New Delhi-110003.
2. KILBERT, Charles , (2016) Sustainable construction : Green Building Design and Delivery John Wiley and Sons.
3. BROWN, G.Z. and DEKAY, Mark, 2001. Sun, Wind & Light - Architectural Design Strategies, Second Edition , John Wiley & sons, Inc.


**REFERENCES:**


1. ECBC Code 2007 ( Edition 2008) published by Bureau of Energy Efficiency, New Delhi
2. Bureau of Energy Efficiency Publications - rating System, TERI PUBLICATIONS .
3. GRIHA Rating System, LEED Publications

| Semester – IV | U19GEL401 SOFT SKILLS AND APTITUDE – II | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 | 100 |

**Course Outcomes**

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

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests

| | |
|---|---|
| **1.Soft Skills** | **Demonstrating soft-skill capabilities with reference to the following topics:**<br>a. SWOT<br>b. Goal setting<br>c. Time management<br>d. Stress management<br>e. Interpersonal skills and Intrapersonal skills<br>f. Presentation skills<br>g. Group discussions |
| **2. Quantitative Aptitude and Logical Reasoning** | **Solving problems with reference to the following topics:**<br>a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages.<br>b. Logarithms, Inequalities and Modulus<br>c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series.<br>d. Time and Work: Pipes & Cistern and Work Equivalence.<br>e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators.<br>f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection.<br>h. Binary number System.- Binary to decimal, Octal, Hexadecimal |
| **3. Verbal Aptitude** | **Demonstrating English language skills with reference to the following topics:**<br>a. Critical reasoning<br>b. Theme detection<br>c. Verbal analogy<br>d. Prepositions<br>e. Articles<br>f. Cloze test<br>g. Company specific aptitude questions |



Department of Placement Training

## SEMESTER – IV

## MANDATORY COURSE

## U19GE403 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

**(Common for EEE, CIVIL, MECH and CSE)**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 0 |

**Course Outcomes**

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

1. understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
2. show an ability to comment critically on curriculum proposals that aim to promote science citizenship/scientific literacy
3. communicate using common medical and psychological terminology, including the skill to discuss commonly used medications, supplements, and surgical procedures
4. use effective oral and written language skills to communicate scientific data and ideas
5. describe the fundamentals of yoga and its importance

**Unit I**

- Introduction to Vedas 6
- Traditional methodology of Veda – Sat Angas
- Types of Vedas and their application
- Sub Veda – Ayurveda - their modern day application

**Unit II**

- Basics of Applied Vedic Science 6
- Modern day application of Vedas and procedure
- Ancient Indian Scientific thoughts
- Introduction to the Vedic language "Sanskrit"

**UNIT – III- Modern science 6**

- Introduction – modern science
- Objectives – modern science
- Architecture in ancient India

**UNIT – IV Technology**

- India's contribution to science and technology (from ancient to modern) 6
- Nobel laureates of Indian origin and their contribution
- India in space
- Latest achievement from Jan – 2017

**UNIT – V- Yoga and Holistic Health Care** 6

- Fundamentals of yoga and holistic health
- Human biology
- Diet and nutrition
- Life management
- Contemporary yogic models – case study

**References**


1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN 13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049


**Total: 30 HOURS**

| | | |
|---|---|---|
| 23/1/21 | 23/1/2021 | |
| **Dr. M. Raja** | **Dr. C. Shanthi** | **Dr. M. Renuga** |
| Course Coordinator / Sciences | HOD / Sciences | Chairperson BOS, Science and Humanities |

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester V Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19CE501 | Structural Analysis-I | 2 | 1 | 0 | 3 | 45 |
| 2 | U19CE502 | Soil Mechanics | 2 | 1 | 0 | 3 | 45 |
| 3 | U19CE503 | Design of Reinforced Concrete Elements | 2 | 1 | 0 | 3 | 45 |
| 4 | U19CE907 | **Elective** - Architecture and Town Planning | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CE908 | **Elective** -Building Services and Safety Regulations | 3 | 0 | 0 | 3 | 45 |
| 6 | noc21-ce71 | **Elective** -Introduction to Engineering Seismology | 3 | 0 | 0 | 3 | 45 |
| **Open Elective** | | | | | | | |
| 7 | U19CS1003 | Internet of Things | 3 | 0 | 0 | 3 | 45 |
| 8 | U19ME1004 | Renewable Energy Sources | 3 | 0 | 0 | 3 | 45 |
| 9 | U19ME1006 | 3D Printing | 3 | 0 | 0 | 3 | 45 |
| **Practical** | | | | | | | |
| 10 | U19CE504 | Survey Camp | 0 | 0 | 2 | 1 | 30 |
| 11 | U19CE505 | Computer Aided Civil Engineering Drawing | 0 | 0 | 2 | 1 | 30 |
| 12 | U19CE506 | Soil Mechanics Laboratory | 0 | 0 | 2 | 1 | 30 |
| 13 | U19GE501 | Soft Skills and Aptitude-III | 0 | 0 | 2 | 1 | 30 |
| | | | | | **Total Credits** | **22** | |

**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 Engineering, Fifth Semester BE Civil Students and Staff, COE

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE501 | STRUCTURAL ANALYSIS I | 2 | 1 | 0 | 3 |

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

| | |
|---|---|
| **1.** | To understand the concept of energy principles. |
| **2.** | To learn the concepts of indeterminacy and methods for calculating BM and SF on indeterminate beams. |
| **3.** | To study the use of influence lines diagram for determinate structure. |
| **4.** | To learn the concepts of influence lines diagram for indeterminate beams. |
| **5.** | To analyze the arches and suspension bridges. |

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

| | |
|---|---|
| **CO1** | Determine strain energy due to axial load, shear, flexure, Torsion and .compute deflection by using principle of virtual work virtual work**(K1)** |
| **CO2** | Apply Theorem of three moment equation to analyse of propped cantilever ,fixed and continuous beams **(K3)** |
| **CO3** | Draw influence lines for statically determinate structures and calculate critical stress resultants**(K1)** |
| **CO4** | Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.**(K2)** |
| **CO5** | Analyse three hinged, two hinged and fixed arches and Analyse the suspension bridges with stiffening (**K4**) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 3 | 2 | 2 | 2 | - | 1 | 1 | 2 | 1 | 3 | 2 | 3 | 2 |
| CO2 | - | 3 | 2 | 2 | 2 | - | - | 2 | 2 | - | 3 | 1 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | - | 2 | - | - | - | 3 | - | 3 | 2 |
| CO4 | - | - | 3 | 3 | 1 | - | 2 | - | - | - | 3 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | - | 2 | - | 2 | 3 | 2 | 3 | 2 |
| **CO (Avg)** | **1.8** | **2.4** | **2.2** | **2.2** | **1.4** | **0.4** | **1** | **1** | **0.8** | **0.6** | **3** | **1.2** | **3** | **2** |

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

| UNIT-I | ENERGY PRINCIPLES | 6+3 Hours |
|---|---|---|

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects – WilliotMohr's Diagram.

| UNIT-II | INDETERMINATE BEAMS | 6+3 Hours |
|---|---|---|

Concept of Analysis - Propped cantilever and fixed beams - Fixed end moments and reactions – Sinking and rotation of supports - Theorem of three moments – Analysis of continuous beams – Shearing force and bending moment diagrams.

| UNIT-III | INFLUENCE LINES FOR DETERMINATE BEAMS AND TRUSSES | 6+3 Hours |
|---|---|---|

nfluence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

| UNIT-IV | INFLUENCE LINES FOR INDETERMINATE BEAMS | 6+3 Hours |
|---|---|---|

Indeterminate beams: Muller Breslau's principle-Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

| UNIT-V | ARCHES AND SUSPENSION BRIDGES | 6+3 Hours |
|---|---|---|

Introduction-Classification of arches; Three and two hinged arch: Parabolic, circular arches and semi circular arches-Determination of bending moment- Horizontal reaction-Normal thrust-Radial shear-Temperature effects. Equilibrium of cable – Length of cable - anchorage of suspension cables – Stiffening girders - Cables with three hinged stiffening girders.

**TOTAL: 45 Hours**

**TEXT BOOKS:**


| | |
|---|---|
| 1. | Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, VikasPublishing House Pvt.Ltd.,NewDelhi-4, 2014. |
| 2. | Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publisers,2015. |

| REFERENCES: | |
|---|---|
| 1. | Negi L.S. &Jangid R.S., “Structural Analysis”, Tata McGraw Hill Publications, New Delhi, 2003. |
| 2. | Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, “Theory of structures”, Laxmi Publications Pvt. Ltd., New Delhi, 13th Edition 2017. |
| 3. | Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2014. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE502 | SOIL MECHANICS | 2 | 1 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Describe the nature of soil problems encountered in Civil Engineering and give an overall preview of the behaviour of soil. |
| **2.** | Studying primarily the dry soil behaviour since many aspects of soil behaviour can be understood by considering the interaction of soil without the presence of water. |
| **3.** | Describes the nature of soil, especially the transmission of stresses between soil particles. |
| **4.** | To impart knowledge on shear strength of soils |
| **5.** | To familiarize the students about the fundamental concepts of compaction and consolidation |

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

| | |
|---|---|
| **CO1** | Characterize the soil based on index and engineering properties. **(K1)** |
| **CO2** | Examine the soil water and water flow through soil. **(K3)** |
| **CO3** | Compute the stress distribution of soil under different loading conditions. **(K2)** |
| **CO4** | Determine shear strength parameters of soils. **(K5)** |
| **CO5** | Estimate the time rate of settlement due to consolidation.**(K4)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 2 | - | - | - | - | 3 | 2 | 1 | - | - | - | - | 2 | 3 |
| CO2 | 2 | - | - | - | 3 | - | - | - | 2 | - | - | - | 2 | 3 |
| CO3 | 3 | 3 | - | - | - | - | - | - | 2 | - | 2 | - | 2 | 3 |
| CO4 | 3 | 2 | - | - | - | 2 | - | - | - | - | 2 | - | 2 | 3 |
| CO5 | 3 | 3 | - | - | - | - | - | - | - | - | 2 | 2 | 2 | 3 |
| **CO (Avg)** | **2.6** | **1.6** | **-** | **-** | **3** | **5** | **0.4** | **0.2** | **0.8** | **-** | **1.2** | **0.4** | **2** | **3** |

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

| UNIT-I | SOIL CLASSIFICATION | 6+3 Hours |
|---|---|---|

Orgin of soil and rock-Soil formation-Geological classification-Soil description and classification for Engineering purposes their significance – soil parameters-Phase relationships-Index properties of soils - BIS Classification system-AASTHO Classification-Unified soil classification system Field identification and classification of soil-Selection of foundation-Inference of soil report

| UNIT-II | EFFECTIVE STRESS AND PERMEABILITY | 6+3 Hours |
|---|---|---|

Soil water-Static pressure in water – Effective stress concept in soil- Capillary stress-Darcy's law - Permeability measurement (Constant and Falling head) and field pumping in, pumping out tests-Factors influencing permeability of soils-Seepage-Introduction to flow nets-Piezoelectric analysis for flow nets.

| UNIT-III | VERTICAL STRESS DISTRIBUTION | 6+3 Hours |
|---|---|---|

Stress distribution in homogeneous and isotropic medium- Contact pressure distribution- Boussinesq's theory (point load, line load and UDL load)-Westergaard's analysis – Stratified deposits- Use of Newmark's influence chart.

| UNIT-IV | SHEAR STRENGTH | 6+3 Hours |
|---|---|---|

Shear strength of cohesive and cohesionless soils-Mohr's circle - Mohr-Coulomb failure theory-Measurement of shear strength: Direct shear, Tri-axial compression, Unconfined compressive strength Vane shear test; Pore pressure parameters – liquefaction potential-Plaxis application in shear strength.

| UNIT-V | COMPACTION AND CONSOLIDATION | 6+3 Hours |
|---|---|---|

Soil compaction-Theory, laboratory and field compaction methods- Factors influencing compaction behaviour of soils. Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory-Computation of rate of settlement -$\sqrt{t}$ and log t methods-e-log p relationship.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | Punmia B.C, "Soil Mechanics and Foundations", Laximi Publications Pvt. Ltd, New Delhi, 2019. |
| 2. | Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015 |
| **REFERENCES:** | |
| 1. | Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2017. |
| 2. | Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013 |
| 3. | McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE503 | DESIGN OF RC ELEMENTS | 2 | 1 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the basic design principles and design philosophy of RC sections. |
| **2.** | Impart the basic knowledge in the design of beams. |
| **3.** | Aware the basic Principle in the design and detail the slab and staircase. |
| **4.** | Develop the students to know the design and detail of columns. |
| **5.** | Interpret the students to design the footing and sketch the detailing for it. |

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

| | |
|---|---|
| **CO1** | Explain the various philosophies of design of concrete structures, related IS Codes **(K2)** |
| **CO2** | Design the structural element (beam) for a building for flexure, shear, bond and torsion **(K4)** |
| **CO3** | Know the design of slabs and staircase and their detailing **(K4)** |
| **CO4** | Gain knowledge of the design of columns and their detailing **(K4)** |
| **CO5** | Study the design of footings and their detailing **(K4)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 2 | 1 | 1 | 2 | 1 | - | - | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO (Avg)** | **2** | **2.6** | **1.8** | **2.8** | **1** | **-** | **-** | **3** | **2** | **2.2** | **3** | **3** | **3** | **3** |

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

| UNIT-I | INTRODUCTION | 6+3 Hours |
|---|---|---|

Material strength and properties – Stress- strain characteristics of concrete and steel -grades of concrete and steel. Types of loads and load combinations. Factor of Safety. Evolution of different design philosophies on design of RCC sections. Working Stress method – Design of Beams, Limit state method: Limit state-Characteristic strength - Loads and load combination- Partial safety factor

| UNIT-II | DESIGN OF BEAMS | 6+3 Hours |
|---|---|---|

Design of singly and doubly reinforced sections and flanged section subjected to flexure, shear and torsion- Flexural and anchorage bonds-Development length- Detailing of reinforcement.

| UNIT-III | DESIGN OF SLAB AND STAIR CASE | 6+3 Hours |
|---|---|---|

Introduction - Types of slab - Design of one way slab- Design of two way slabs with various boundary conditions - Design of cantilever slab-Check for shear and deflection-Detailing of reinforcement. Design of doglegged stair case-Detailing of reinforcement

| UNIT-IV | DESIGN OF COLUMN | 6+3 Hours |
|---|---|---|

Estimation of effective length of a column – Code requirements: Slenderness limits-minimum eccentricities and reinforcements; Compression members- Classification of columns-Design of short column and Long column: Axial and eccentric loading using interaction curve; Detailing of reinforcement.

| UNIT-V | DESIGN OF FOOTING | 6+3 Hours |
|---|---|---|

Introduction -Types of footing- Selection of footing- Soil pressures under isolated footings-General design considerations and Code requirements-Design of Isolated pad square and rectangular footing, footing for Walls - Detailing of reinforcement.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | GambhirM.L,"Fundamentals of Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd, New Delhi 2011 |
| 2. | SinhaS.N,"Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd, New Delhi 2002 |
| **REFERENCES:** | |
| 1. | VargheseP.C,"Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd, New Delhi 2010 |
| 2. | UnnikrishnaPillaiS,DevdasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd,New Delhi 2009 |
| 3. | Ashok Kumar Jain, "Reinforced Concrete Limit State Design", Nem Chand Brothers, 2012 |
| 4. | Krishna Raju N, Pranesh R N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi2018 |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE504 | SURVEY CAMP | 0 | 0 | 2 | 1 |

One-week Survey Camp will be conducted in the following activities outside of the campus in the following activities during first two weeks from the commencement of the semester.

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

| | |
|---|---|
| **1.** | To train the students in taking field observations pertaining to some of the real world problems such as triangulation, contouring, Total Station, Drones etc., |
| **2.** | To train the students to appreciate practical difficulties in surveying on the field. |
| **3.** | Providing an opportunity to the students to develop team spirit. |

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

| | |
|---|---|
| **CO1** | Calculate the horizontal, vertical angles by triangulation and trilateration method. **(K3)** |
| **CO2** | Determine the Reduced levels and area by theodolite and total station **(K5)** |
| **CO3** | Draw the contour maps and preparing the maps using drones. **(K2)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO | PSO2 |
| CO1 | 3 | - | - | - | - | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | - |
| CO2 | 3 | - | - | - | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | - | - | - | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO (Avg)** | **3** | - | - | - | **2** | **3** | **2** | **3** | **3** | **3** | **3** | **3** | **3** | **2** |

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

**LIST OF EXPERIMENTS:**

**Theodolite Surveying**

- Triangulation
- Trilateration

**Levelling**

- Block contouring
- Longitudinal and cross section

**Total Station**

- Calculation of Area using Total Station

**Drone Surveying**

- Preparation of Topography Map using Drones

**TOTAL: 30 Hours**

**TEXT BOOKS:**

| | |
|---|---|
| 1. | Punmia B.C, "Surveying, Vol. I and II", Laxmi Publications, 2016. |
| 2. | Basak N.N, "Surveying and Levelling", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2014 |
| 3. | Kumar S., " Basics of Remote Sensing and GIS", Laxmi Publication (P) Ltd,2015 |

**REFERENCES:**

| | |
|---|---|
| 1. | Arora K. R, "Surveying Vol. I and II", Standard Book House, 2015 |
| 2. | Duggal S.K, "Surveying Vol. I and II", Tata McGraw Hill, New Delhi, 2013. |
| 3. | Kanetkar T.P, "Surveying and Levelling Vols. I and II", United Book Corporation, Pune, 2014 |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE505 | COMPUTER AIDED BUILDING DRAWING LABORATORY | 0 | 0 | 2 | 1 |

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

| | |
|---|---|
| **1.** | Practice the students to draft the plan, elevation and sectional views of buildings. |
| **2.** | Incorporate the engineering in developing and satisfying orientation and functional requirements as per National Building Code. |
| **3.** | Provide orientation on recent technologies and industry practices. |

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

| | |
|---|---|
| **CO1** | Apply the principles of planning and use bylaws for building planning.**(K3)** |
| **CO2** | Draw plan, elevation and section for various types of buildings.**(K5)** |
| **CO3** | Analyze the problems and provide solutions with engineering concepts and emerging technologies.**(K4)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO2 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| COe3 | 3 | 2 | 3 | 1 | 2 | 1 | 2 | - | 1 | - | - | 1 | 1 | 2 |
| **CO (Avg)** | **3** | **1.67** | **3** | **1** | **1.67** | **1** | **2.67** | **0.33** | **1** | **-** | **-** | **1.6** | **1** | **2** |

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

**LIST OF EXPERIMENTS:**

Preparation of line sketches in accordance with functional requirements and rules for the following types of building as per National Building Code.

Draw the plan, elevation, sectional view of superstructure and substructure and other details for

a. Introduction to AutoCAD and its tools
b. Principles of planning, orientation and complete joinery details
c. Buildings with load bearing walls
d. Buildings with sloping roof
e. R.C.C. framed structures.
f. Industrial buildings – North light roof structures
g. Prefabricated Industrial Building
h. Plumbing and electric working drawing for residential building.
i. Rain water harvesting and septic Tank
j. Creation of 3D BIM model of a residential building.

**TOTAL: 30 Hours**

**TEXT BOOKS:**


| | |
|---|---|
| 1. | Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989. |
| 2. | Dr.N.Kumaraswamy, A KameswaraRoa, “Building planning and drawing” 9th Revision, Charotor Publishing house pvt ltd, 2019. |


**REFERENCES:**


| | |
|---|---|
| 1. | Sikka V. B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons,1998. |
| 2. | George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002 |
| 3. | Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2004. |
| 4. | Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008. |

| OURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE506 | SOIL MECHANICS LABORATORY | 0 | 0 | 2 | 1 |

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

| | |
|---|---|
| 1. | Students will able to identify physical and mechanical properties of soil in the field and laboratory settings. |
| 2. | Preparing soil samples for testing, performing the test, collecting and analysing data, interpreting the results and writing technical reports. |
| 3. | Student will be familiar with laboratory test standards and procedures based on IS Codes. |

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

| | |
|---|---|
| CO1 | Determine the index properties and consistency limit of soils. **(K5)** |
| CO2 | Apply the technical concepts and ways to solve engineering problems by conducting field and laboratory Experiments **(K3)** |
| CO3 | Determine the engineering properties and shear strength of soils.**(K5)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 1 | 3 |
| CO2 | 2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 1 | 3 |
| CO3 | 2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 1 | 3 |
| CO (Avg) | **2** | **3** | **-** | **-** | **-** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** |

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

| I-CYCLE | DETERMINATION OF INDEX PROPERTIES |
|---|---|

a. Specific gravity of soil
b. Grain size distribution – Mechanical sieve analysis
c. Grain size distribution –Sedimentation (Hydrometer) analysis
d. Atterberg's limits
e. Determination of free swell

| II-CYCLE | DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS |
|---|---|

a. In-situ density Test ( Sand replacement method and Core cutter method)
b. Determination of moisture – density relationship using standard proctor compaction test.

| III-CYCLE | DETERMINATION OF ENGINEERING PROPERTIES |
|---|---|

a. Permeability determination (constant head and falling head methods)
b. One dimensional consolidation test (Determination of co-efficient of consolidation only)
c. Direct shear test in cohesion less soil
d. Unconfined compression test in cohesive soil.
e. Tri-axial compression test (Demonstration only)
f. Standard penetration test (Demonstration only)
g. static cone penetration test (Demonstration only)
h. Plate load test (Demonstration only)

**TOTAL: 30 periods**

**REFERENCES:**


| | |
|---|---|
| 1. | Soil mechanics laboratory manual – Prepared by Department of Civil Engineering, Sona College of Technology, Salem. |
| 2. | Virtual lab e- manual, source IIIT-Hyderabad. |
| 3. | Soil mechanics laboratory manual, Braja .M. Das, Oxford university press, June-2019. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE907 | ARCHITECTURE AND TOWN PLANNING | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the architectural design and terms. |
| **2.** | Impart the basic knowledge in the Building bye-laws and site planning. |
| **3.** | Provide the basic knowledge of types of building and its design principles. |
| **4.** | Aware the students aboutclimate and environmental responsive design in the building. |
| **5.** | Provide basic knowledge in the town planning and urban renewal for the buildings. |

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

| | |
|---|---|
| **CO1** | Recognize the basic elements and principles of architectural design. **(K1)** |
| **CO2** | Explain about site planning, survey, site analysis and layout. **(K2)** |
| **CO3** | Identify the various rules and regulation of town planning and development authority **(K3)** |
| **CO4** | Interpret various aspects of environment and climate in civil engineering projects& illustrate the principles of landscape design **(K4)** |
| **CO5** | Evaluate the concepts related to town planning and Urban renewal **(K5)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | - | - | - | - | - | - | 2 | 1 | 1 | 1 | - | - | - | - |
| CO2 | 2 | - | 1 | 2 | - | - | - | - | - | - | 1 | 1 | 1 | 1 |
| CO3 | - | 2 | 1 | 2 | - | 3 | - | - | - | - | - | - | - | 1 |
| CO4 | - | - | - | - | - | - | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 |
| CO5 | - | - | - | - | - | 3 | - | 1 | 3 | 2 | - | 1 | - | - |
| **CO (Avg)** | **0.4** | **0.4** | **0.4** | **0.8** | **-** | **1.2** | **0.8** | **0.6** | **1.4** | **1** | **0.4** | **0.6** | **0.4** | **0.6** |

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

| | | |
|---|---|---|
| **UNIT-I** | **ARCHITECTURAL DESIGN** | **(9 Hrs)** |

Architectural design-Trinity of Architecture-An analysis- Integration of function and aesthetics-Introduction to basic elements and principles of design-Factors affecting Architectural Design.

| | | |
|---|---|---|
| **UNIT-II** | **SITE PLANNING** | **(9 Hrs)** |

Surveys-Site analysis-Building Bye Laws -objectives - Key/site plan -Development control- Layout - Zoning - Objective – PrinciplesAspects - NBC for deign of layout for residential building.

| | | |
|---|---|---|
| **UNIT-III** | **BUILDING TYPES** | **(9 Hrs)** |

Building types - Classification of residential, institutional, industries and public building - Planning concepts - Residential, institutional, commercial and Industrial - Application of anthropometry and space standards -Integration of Building services.

| | | |
|---|---|---|
| **UNIT-IV** | **CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN** | **(9 Hrs)** |

Man and environment interaction-Factors that determine climate-Characteristics of climate types-Design for various climate types Passive and active energy control-Green building concept- Fundamental - Requirements. Landscape - planning - purpose - principle.

| | | |
|---|---|---|
| **UNIT-V** | **TOWN PLANNING** | **(9 Hrs)** |

Town planning - objects - principles - necessity - forms - stages - requirement of new towns. Survey - collection of data - types of survey - methods adopted to collect data - Application of IOT in collecting data-Urban renewal - objects - Defects of Existing Town. Aspects of urban renewal projects.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | MuthuShoba Mohan G, “Principles of Architecture” Oxford University Press, New Delhi, 2010 |
| 2. | VRA. Saathappan and K. Yogeshwari, Principles of Architecture, Raamalingaa Publication, 2005 |
| **REFERENCES:** | |
| 1. | Rangwala S.C, “Town Planning” Charotar Publishing House, Anand, 2016 |
| 2. | Francis D.K.Ching, “Architecture: Form, Space and Order”, John Wiley & Sons, Inc. 2007. |
| 3. | Arvind Krishnan, Nick Baker, SimosYannas, and Szokolay S.V, “Climate Responsive Architecture- A Design Hand Book for Energy Efficient Building”, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2007. |
| 4. | National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005 |
| 5. | A.F.C. Sherratt, “Air-conditioning and Energy Conservation”, The Architectural Press, London, 2007. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE908 | BUILDING SERVICES AND SAFETY REGULATIONS | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the building electrification systems. |
| **2.** | Impart the basic knowledge in the design of lighting systems in the buildings. |
| **3.** | Provide the basic knowledge of providing air conditioning systems in the various types of buildings. |
| **4.** | Aware the students about fire safety regulations and installation systems in the building. |
| **5.** | Provide basic knowledge in the water supply and sewerage systems for the buildings. |

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

| | |
|---|---|
| **CO1** | Acquire the basics knowledge in electrical and wiring systems for the buildings. **(K1)** |
| **CO2** | Design the lighting system for the various buildings and disabled peoples. **(K3)** |
| **CO3** | Know the basic provisions for air conditioning systems for various types of buildings. **(K4)** |
| **CO4** | Plan to install the fire safety equipment system in the buildings by obeying the regulations. **(K3)** |
| **CO5** | Explain the various plumbing fittings in the water supply and rainwater harvesting system for buildings. **(K2)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO2 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| CO3 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| CO4 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | - | - | 2 | 2 | 2 |
| CO5 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 2 | - | - | 2 | 2 | 2 |
| **CO (Avg)** | **2.2** | **2** | **3** | **1.4** | **1.8** | **1.4** | **3** | **1** | **1.4** | **-** | **-** | **2** | **1.4** | **2** |

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

| UNIT-I | ELECTRICAL SYSTEMS IN BUILDINGS | 9 Hours |
|---|---|---|

Basics of electricity- Single / Three-phase supply- Protective devices in electrical installations- Earthing for safety- Types of earthing- ISI specifications- Types of wires, wiring systems, and their choice- Planning electrical wiring for building- Main and distribution boards- Transformers and switch-gears- Layout of substations.

| UNIT-II | PRINCIPLES OF ILLUMINATION & DESIGN | 9 Hours |
|---|---|---|

Visual tasks- Factors affecting visual tasks- Modern theory of light and colour- Synthesis of light- Additive and subtractive synthesis of colour- Luminous flux- Candela- Solid angle illumination- Utilisation factor- Depreciation factor- MSCP- MHCP- Lans of illumination- Classification of lighting- Artificial light sources- Spectral energy distribution- Luminous efficiency- Colour temperature- Colour rendering. Design of modern lighting- Lighting for stores, offices, schools, hospitals, and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

| UNIT-III | REFRIGERATION PRINCIPLES & APPLICATIONS | 9 Hours |
|---|---|---|

Thermodynamics- Heat- Temperature, measurement transfer- Change of state- Sensible heat- Latent heat of fusion, evaporation, sublimation- saturation temperature- Superheated vapour- Subcooled liquid- Pressure temperature relationship for liquids- Refrigerants- Vapour compression cycle- Compressors- Evaporators- Refrigerant control devices- Electric motors- Starters- Air handling units- Cooling towers- Window type and packaged air-conditioners- Chilled water plant- Fan coil systems- Water piping- Cooling load- Air conditioning systems for different types of buildings- Protection against fire to be caused by A.C. Systems

| UNIT-IV | FIRE SAFETY REGULATIONS AND INSTALLATION | 9 Hours |
|---|---|---|

Causes of fire in buildings- Safety regulations- NBC- Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes, and A.C. systems. Special features required for physically handicapped and elderly in building types- Heat and smoke detectors- Fire alarm system, snorkel ladder- Fire lighting pump and water storage- Dry and wet risers- Automatic sprinklers

| UNIT-V | WATER SUPPLY AND SEWERAGE SYSTEM FOR BUILDINGS | 9 Hours |
|---|---|---|
| Plumbing fixtures and fixture fittings- Water-conserving fittings- Overflows- Strainers and connectors- Prohibited fixtures- Special fixtures- Installation of water closet- Urinals - Flushing devices- Floor drains- Shower stall- Bathtub- Bidets- Minimum plumbing facilities- Rainwater harvesting systems- Necessity- Construction- Different types | | |
| | | **TOTAL: 45 Hours** |

| **TEXT BOOKS:** | |
|---|---|
| 1. | R. Udaykumar, "A text book on Building Services", Eswar Press, Chennai, ISBN13, 9788178740638. ISBN-10, 817874063X |
| 2. | David V. Chadderton , Building Services Engineering Taylor & Francis, 2000. |
| **REFERENCES:** | |
| 1. | Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2011. |
| 2. | Philips Lighting in Architectural Design, McGraw-Hill, New York, Latest edition. |
| 3. | R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1972. |
| 4. | William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988. |
| 5. | A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2007. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| noc21-ce71 | INTRODUCTION TO ENGINEERING SESIMOLOGY | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Know the origin of earthquakes |
| **2.** | Understand the concept of earthquake measuring instruments and recording |
| **3.** | Learn the seismic zonation and hazard analysis |
| **4.** | Study the seismic site characterization and its effects |
| **5.** | Analyze the seismic hazard parameters and zonation mapping |

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

| | |
|---|---|
| **CO1** | Familiarize the different types of hazards |
| **CO2** | Apply modern seismic measuring instruments |
| **CO3** | Understand the concept of seismic zonation |
| **CO4** | Explain the seismic site characterization and its effects |
| **CO5** | Acquire knowledge on the seismic hazard parameters and zonation mapping |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | - | - | - | - | - | - | 2 | 1 | - | - | - | - | - | - |
| CO2 | - | - | - | - | 3 | 2 | 2 | - | - | - | - | - | - | - |
| CO3 | - | 2 | - | 1 | 2 | 1 | 2 | 1 | 1 | 2 | - | - | - | - |
| CO4 | - | | - | 2 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - |
| CO5 | - | 2 | - | 1 | 2 | 1 | 2 | 1 | 1 | - | - | - | - | - |
| CO (Avg) | - | 0.8 | - | 0.8 | 1.8 | 1 | 1.8 | 0.8 | 0.6 | 0.4 | - | - | - | - |

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

**Week 1:**

Introduction to earthquake hazards- Global seismicity and Seismic risk, History of Engineering Seismology and Earthquake types

**Week 2:**

Elastic Rebound Theory; Earthquake sources; Plate tectonics, and Plate Boundaries: Continental Drift

**Week 3:**

Theory of Wave Propagation Seismic wave propagation, Types of seismic waves, Wave characteristics and Shadow zones

**Week 4:**

Concept of Earthquake Measurement, Seismic Intensity and Magnitudes Scales, Past earthquake Energy and Comparable Explosive tests

**Week 5:**

Earthquake Instruments, Sensors and Data Loggers, Mechanical and Digital sensors; Seismic Station

**Week 6:**

Interpretation of Seismic Records: Identification of made events and natural earthquake; Time and frequency domain characteristic of ground motion

**Week 7:**

Regional Seismicity, Earthquakes in India and Most important Global Earthquakes; Concept of Seismic Zonation and Methodology for Seismic microzonation

**Week 8:**

Predictive Models in Earthquake Engineering- Attenuation Relation; Intensity, Duration and Ground Motion Predictive Relations

**Week 9:**

Earthquake Catalog preparation, Source Map preparation; Homogenization and Declustering of earthquake data and preparation of Seismotectonic maps

**Week 10:**

| | |
|---|---|
| Seismic Hazard Parameters: a and b values, Recurrence relations and Maximum magnitude: Region Specific Approach for estimation Parameters and Selection of predictive equations<br>**Week 11:**<br>Seismic Hazard Analysis: Deterministic and Probabilistic Methods; Rupture based approach<br>**Week 12:**<br>Seismic Hazard Analysis Case studies and Worked examples | |
| | **TOTAL: 45 Hours** |
| **TEXT BOOKS:** | |
| 1. | Earthquake Geotechnical Engineering, Steven L. Kramer |
| **REFERENCES:** | |
| 1. | Earthquake Hazard Analysis: Issues and Insights, Leon Reiter |

B-E-V Sem
2019-Batch

| Semester –V | U19GE501 : SOFT SKILLS AND APTITUDE - III | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 | 100 |

**Course Outcomes**
**At the end of the course the student will be able to:**

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests

**1.SOFT SKILLS**

**Demonstrating soft-skill capabilities with reference to the following topics:**

a. **Career planning:** Importance; Exploring various career options, Field research, Social media management; Process, benefits and limitations of career planning; Mapping SWOT and GOALS to career planning; Self-evaluation

b. **Resume writing :** Build credentials and resume, Positioning yourself and your career, JD mapping, Video resume, Relevant resume phrases and components; Cover letter; Portfolio management and Social media cover

c. **Group discussion :** Skills needed for GD; Frequently Asked topics and Practice; Types of topics; Various framework and tools to handle GD; Practice and assessment

d. **Teamwork :** Definition and importance of team-building; Stages of team-building; Communication within a team; Various styles of teams and their analysis; Activities demonstrating a team

e. **Leadership skills :** Role of a leader; Difference between a manager and a leader; Various Leadership styles; Compelling qualities of a leader; Famous leaders and their impact to the world; Self-assessment

f. **Interview skills :** Process and types of interview; Appearance and grooming etiquette; Do's and Don'ts (Before – During interview); Brainstorming interview possible questions; Hot seat; Transactional Analysis for effective communication and handling interviewers; mock interviews and assessment parameters discussion

g. **Mock interviews :** Frequently Asked Questions practice and assessment; Discussion and demonstrations on Stress and Technical interviews; Group interview

h. **Mock GDs :** Frequently Asked Topics Practice; Assessment and feedback

| | |
|---|---|
| **2.QUANTITATIVE APTITUDE AND LOGICAL REASONING** | **Solving problems with reference to the following topics :**<br>a. **Geometry:** 2D, 3D, Coordinate Geometry, and Height & Distance.<br>b. **Permutation & Combinations :** Principles of counting, Circular Arrangements and Derangements.<br>c. **Probability:** Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem.<br>d. **Statistics :** Mean Median, Mode, Range and Standard Deviation.<br>e. **Interest Calculation :**Simple Interest and Compound Interest<br>f. **Crypto arithmetic:** Addition and Multiplication based problem.<br>g. **Logical Reasoning :**Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning.<br>h. Statement & Assumptions, Statements & Arguments, Inference.<br>i. **Company Specific Pattern :**Infosys and TCS company specific problems |
| **3. VERBAL APTITUDE** | **Demonstrating English language skills with reference to the following topics:**<br>a. Subject verb agreement<br>b. Selecting the best alternative for the stated parts of given sentences<br>c. Reading comprehension<br>d. Contextual synonyms<br>e. Sentence fillers<br>f. Writing a story for a given picture<br>g. Company specific aptitude questions |

**Dr.S.Anita**

**Head/Training**

Department of Placement Training
Sona College of Technology,
Salem-636 005.

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester VI Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19CE601 | Water Resources and Irrigation Engineering | 3 | 0 | 0 | 3 | 45 |
| 2 | U19CE602 | Structural Analysis-II | 2 | 1 | 0 | 3 | 45 |
| 3 | U19CE603 | Foundation Engineering | 3 | 0 | 0 | 3 | 45 |
| 4 | U19CE604 | Limit State Design of Steel Structures | 3 | 1 | 0 | 4 | 60 |
| 5 | U19CE916 | **Professional Elective** - Repair and Rehabilitation of Structures | 3 | 0 | 0 | 3 | 45 |
| 6 | U19CE917 | **Professional Elective** - Prefabricated Structures | 3 | 0 | 0 | 3 | 45 |
| | U19CE920 | **Professional Elective** - Traffic Engineering and Management | | | | | |
| **Practical** | | | | | | | |
| 7 | U19CE605 | Civil Engineering Software Applications Laboratory | 0 | 0 | 4 | 2 | 60 |
| 8 | U19CE606 | Innovative Projects | 0 | 0 | 2 | 1 | 30 |
| 9 | U19GE602 | Professional Development Skills | 0 | 0 | 2 | 1 | 30 |
| | | | | | **Total Credits** | **23** | |

**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 Engineering, Sixth Semester BE Civil Students and Staff, COE

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE601 | WATER RESOURCES AND IRRIGATION ENGINEERING | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| 1 | Define the basic components of the hydrological cycle, interpreting rainfall data and surface water availability. |
| 2 | Identify the groundwater movement beneath the earth and apply various groundwater quality improving techniques. |
| 3 | Choose appropriate crop irrigation techniques based on seasonal variation and water availability. |
| 4 | Make use of suitable water distribution systems for effective and efficient irrigation in a given land area. |
| 5 | Utilize suitable approaches for implementing Canal irrigation, reducing Salinity and Water Logging problems. |

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

| | |
|---|---|
| CO1 | Remember the basic concepts of rainfall occurrence and its data interpretation **(K1)** |
| CO2 | Understand the groundwater movement and method of measuring the yield **(K2)** |
| CO3 | Select suitable methods of irrigation for better crop management **(K3)** |
| CO4 | Examine the various types of forces, suitable location and design of weirs, impounding structures and Dams **(K4)** |
| CO5 | Discover the possible canal irrigation techniques river training works and controlling water logging issues **(K4)** |

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

**CO – PO Mapping**

| Cos | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | - | 2 | 1 | 2 | 1 | 1 | - | - | - | - | 2 | 1 |
| CO2 | 3 | 1 | - | 1 | 1 | 1 | 2 | 1 | - | - | - | - | 1 | 2 |
| CO3 | 3 | 2 | - | 2 | - | 2 | 1 | 1 | - | - | - | - | 2 | 1 |
| CO4 | 3 | 1 | - | 1 | 1 | 1 | 2 | 2 | - | - | - | - | 1 | 2 |
| CO5 | 2 | 1 | - | 2 | 2 | 2 | 1 | 1 | - | - | - | - | 2 | 1 |
| **CO (Avg)** | **2.8** | **1.4** | **-** | **1.6** | **1** | **1.6** | **1.4** | **1.2** | **-** | **-** | **-** | | **1.6** | **1.4** |

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

| UNIT-I | SURFACE WATER HYDROLOGY | 9 Hours |
|---|---|---|

Hydrological Cycle - Rainfall and its measurements – Precipitation circulation-Temperature-Humidity-Wind formation and forms of precipitation-interpretation of rainfall data-Snow cover and snow fall. Runoff-, infiltration indices- Hydrograph analysis - Unit hydrograph.

| UNIT-II | GROUND WATER HYDROLOGY | 9 Hours |
|---|---|---|

Groundwater occurrence-Distribution-Aquifer-Types-Aquifer properties: Permeability, specific yield, transmissivity and storage coefficient; Measurement of yield of an open well-Typical cross section of open and tube well- Sanitary protection of wells. Methods of estimation-Ground water table fluctuation and Its interpretations-Groundwater Development and Potential in India-GEC norms. Saline water intrusion. Rain water harvesting.

| UNIT-III | IRRIGATION PRACTICES | 9 Hours |
|---|---|---|

Irrigation - need for irrigation-Merits and demerits of irrigation -Crop and crop seasons- Consumptive use of water- Duty, delta, base period-Factors affecting duty-Irrigation efficiencies-Planning and development to irrigation projects. Irrigation methods: Canal irrigation-Lift irrigation-Tank irrigation-Flooding methods-Sprinkler irrigation-Drip irrigation.

| UNIT-IV | DIVERSION AND IMPOUNDING STRUCTURES | 9 Hours |
|---|---|---|

Weirs-Elementary profile of weir-Weirs on pervious foundations – Types of impounding structures - Percolation ponds-Tanks and sluices- Dams-Types-Factors affecting location and type of dams-Forces on a dam-Spill ways- Factors affecting location and type of dams.

| UNIT-V | IRRIGATION STRUCTURES | 9 Hours |
|---|---|---|

Canal irrigation: Classification and alignment of canals-Canal drops: Types-Cross drainage works- Types -Canal head works- Canal regulators. Salinity and water logging- Causes and effect of water logging- Logging control- Reclamation of saline land- System layout of drainage system-River training works- Canal losses- introduction to irrigation management.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | Garg S.K, “Irrigation Engineering,” Laxmi Publications, New Delhi, 2009. |
| 2. | Punmia B.C, “Irrigation and Water Power Engineering”, Laxmi Publishers, New Delhi,2016. |
| **REFERENCES:** | |
| 1. | Arora K.R, “Irrigation, Water Power and Water Resources Engineering”, Standard Publishers Distributors, New Delhi, 2010. |
| 2. | Subramanya, Engineering Hydrology, Tata-McGraw Hill,2013. |
| 3. | Ragunath H.M, “Hydrology”, Willey Eastern Limited, New Delhi, 2008. |
| 4. | Asawa G.L, “Irrigation Engineering”, New Age International Publishers, New Delhi,2009. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE602 | STRUCTURAL ANALYSIS II | 2 | 1 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Gain knowledge on analysis of indeterminate structures by slope deflection method. |
| **2.** | Understand the applications of moment distribution method for analysis of indeterminate structures. |
| **3.** | Analysis of indeterminate structures by matrix flexibility method. |
| **4.** | Perform analysis of indeterminate structures by matrix stiffness method. |
| **5.** | Comprehend the concept of plastic analysis of beams and rigid frames. |

| | |
|---|---|
| **CO1** | Analyse the continuous beams and rigid frames by slope defection method. **(K4)** |
| **CO2** | Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway. **(K2)** |
| **CO3** | Illustrate knowledge of to analyse the continuous beams and pin jointed plane frames by matrix flexibility method. **(K3)** |
| **CO4** | Apply matrix stiffness method to analyse the continuous beams and pin jointed plane frames. **(K3)** |
| **CO5** | Recognize the concept of Plastic analysis and the method of analysing beams and rigid frames. **(K2)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | 2 | 1 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | 2 | 1 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | 2 | 1 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | 2 | 1 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | 2 | 1 | 2 | 2 |
| **CO (Avg)** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **2** | **-** | **-** | **2** | **1** | **2.8** | **2.8** |

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

| UNIT-I | SLOPE DEFLECTION METHOD | 9 Hours |
|---|---|---|

Slope deflection equations– Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements- symmetric frames with symmetric and skew-symmetric loadings.

| UNIT-II | MOMENT DISTRIBUTION METHOD | 9 Hours |
|---|---|---|

Basic concepts-Stiffness, distribution and carry over factors-Fixed end moments- Application to statically indeterminate beams and frames (with and without sway): Deformed shape, shear force and bending moment diagram (unknowns restricted to three only).

| UNIT-III | FLEXIBILITY MATRIX METHOD | 9 Hours |
|---|---|---|

Basic concepts of flexibility method- primary structure – compatibility conditions Formulation of flexibility matrices - analysis of continuous beams, rigid and pin jointed frames by direct flexibility method (redundancy restricted to two only).

| UNIT-IV | STIFFNESS MATRIX METHOD | 9 Hours |
|---|---|---|

Basic concepts of stiffness method- restrained structure – equilibrium conditions -Formulation of stiffness matrix- analysis of continuous beams, Rigid and pin jointed frames by direct stiffness method (unknowns restricted to two only).

| UNIT-V | PLASTIC ANALYSIS | 9 Hours |
|---|---|---|

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

**TOTAL (30+15): 45 Hours**

**TEXT BOOKS:**


1. Bhavikatti,S.S, Matrix Method of Structural Analysis, I.K.International Publishing House Pvt.Ltd.,NewDelhi-4,
2. Devdas Menon, Structural Analysis, Narosa Publishing House, 2018

| REFERENCES: | |
|---|---|
| 1. | Punmia B.C, “Theory of Structures”, Standard Book House, New Delhi, 2000. |
| 2. | Pandit G.S, and Gupta S. P, “Structural Analysis a Matrix Approach”, Tata McGraw Hill Publications, New Delhi, |
| 3. | Reddy .C.S , ―Basic Structural Analysis‖, Tata McGraw Hill Publishing Company, 2011 |
| 4. | Negi L.S. and Jangid R.S, “Structural Analysis”, Tata McGraw Hill Publications, New Delhi, 2003. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE603 | FOUNDATION ENGINEERING | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| 1. | Impart the knowledge of the subsurface investigation and bore log report interpretation |
| 2. | understand various bearing capacity determination techniques |
| 3. | Evaluate the importance of Shallow foundation and Design principles |
| 4. | To discuss the importance of pile foundations. |
| 5. | Explicate the earth pressure of retaining wall |

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

| | |
|---|---|
| CO1 | Conduct subsurface investigation and select foundation based on soil condition.**( K1)** |
| CO2 | Estimate the bearing capacity of soil based on shear and settlement criteria. **(K4)** |
| CO3 | Analyze the proportion of various shallow foundations. **(K4)** |
| CO4 | Calculate the load carrying capacity of piles. **(K5)** |
| CO5 | Determine the earth pressure of the retaining wall. **(K2)** |

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

**CO – PO Mapping**

| | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | - | - | 2 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | - | - | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | - | - | 2 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | - | - | 2 | 3 | 2 |
| **CO (Avg)** | **3** | **2.8** | **3** | **2.2** | **2.2** | **2** | **1** | **3** | **1.4** | **0.6** | **0.6** | **2.8** | **3** | **2.2** |

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

| UNIT-I | SITE INVESTIGATION AND SELECTION OF FOUNDATION | 9 Hours |
|---|---|---|

Scope and objectives-Methods of exploration-Depth of boring-Spacing of bore hole-Sampling techniques-Representative and undisturbed sampling-methods - Split spoon sampler, Thin wall sampler, Stationary piston sampler-Penetration tests (SPT and SCPT) - Bore log report- Selection of foundation based on soil condition.

| UNIT-II | SHALLOW FOUNDATION | 9 Hours |
|---|---|---|

Introduction-Location and depth of foundation-Codal provisions-Bearing capacity of shallow foundation on homogeneous deposits-Terzaghi's formula and BIS formula- Bearing capacity from in-situ tests (SPT, SCPT and plate load) - Settlement - Total and differential settlement-Allowable settlements- Methods of minimizing settlements.

| UNIT-III | FOOTINGS AND RAFTS | 9 Hours |
|---|---|---|

Types of foundation- General design principles-proportioning of foundations-spread footings-combined footings-trapezoidal and strap footings-Raft foundation-contact pressure distribution.

| UNIT-IV | PILE FOUNDATION | 9 Hours |
|---|---|---|

Types of piles and their function –Load carrying capacity of piles -static formula-dynamic formulae (Engineering news and Hileys)- Load carrying capacity from insitu tests (SPT and SCPT)-Negative skin friction- Group capacity by different methods (Feld's rule, Converse-Labarre formula)-Settlement of pile and pile groups- pile load test (routine test only)-Under reamed piles.

| UNIT-V | EARTH PRESSURE THEORY | 9 Hours |
|---|---|---|

Plastic equilibrium in soils-Active and passive states-Rankine's theory- Coulomb's wedge theory-Condition for critical failure plane-Earth pressure on retaining walls of simple configurations-Rebhann's and Culmann's graphical method-Pressure on the wall due to line load-Stability analysis of retaining walls.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | Punmia B.C, “Soil Mechanics and Foundations”, Laximi Publications Pvt. Ltd, New Delhi, 17th edition, 2019. |
| 2. | Gopal Ranjan and Rao A.S.R, “Basic and Applied Soil Mechanics”, New Age International Publishers, New |
| **REFERENCES:** | |
| 1. | Venkatramaiah, C, “Geotechnical Engineering”, New Age International Publishers, New Delhi, 2019. |
| 2. | Murthy V.N.S, “Textbook of Soil Mechanics and Foundation Engineering; Geotechnical Engineering Series”, CBS Publishers Distribution Ltd, New Delhi. 2017. |
| 3. | Braja m.das, principles of foundation Engineering, Thomson Asia pvt.ltd, Singapore, 2016. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE604 | LIMIT STATE DESIGN OF STEEL STRUCTURES | 3 | 1 | 0 | 4 |

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

| | |
|---|---|
| **1.** | Impart the basic knowledge about steel structure design |
| **2.** | Understand the various design of connections in steel structures |
| **3.** | Evaluate the design of tension and compression members in steel |
| **4.** | Examine the design of various flexural members in steel |
| **5.** | Learn the classification of various trusses and design of purlin. |

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

| | |
|---|---|
| **CO1** | Apply the IS code practice for the design of steel structural elements**.( K1)** |
| **CO2** | Understand the bolted and welded connection for both axial and eccentric forces. **(K2)** |
| **CO3** | Design the tension and compression members. **(K5)** |
| **CO4** | Analyse and Design various types of flexural members. **(K4)** |
| **CO5** | Design different types of purlin**.(K5)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | - | 1 | 1 | 1 | 2 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | - | 2 | 2 | 1 | 2 |
| CO3 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | - | 2 | 2 | 1 | 2 |
| CO4 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | - | 2 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | - | 2 | 2 | 2 | 2 |
| **CO (Avg)** | **3** | **1.8** | **3** | **2** | **1.8** | **1.8** | **1** | **1.2** | **2.8** | **-** | **1.8** | **1.8** | **1.4** | **2** |

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

| UNIT-I | INTRODUCTION | 9+3=12 Hours |
|---|---|---|

Structural steel sections and products, grades and mechanical properties of steel, advantages of steel as structural material, types of steel structures. Introduction to Limit State Method of design of steel structures - failure criteria for steel, limit states of strength and serviceability, structural stability, durability, corrosion, fatigue and fire resistance. Loads and load combinations, characteristic strength and loads, partial safety factors.

| UNIT-II | DESIGN OF CONNECTIONS | 9+3=12 Hours |
|---|---|---|

Basic concepts of connection-Bolted connection: Types of bolts-modes of failures; Joints subjected to direct and eccentric load. Welded connection: Types and strength of welds- Butt and fillet welds -Joints subjected to direct load and eccentric load

| UNIT-III | DESIGN OF TENSION AND COMPRESSION MEMBERS | 9+3=12 Hours |
|---|---|---|

Tension members-Various forms-Modes of failure-Analysis and design of axially loaded tension members. Design of axially loaded compression members: Section classifications - Effective length - Slenderness ratio- Classification of column-Modes of failure; Design of axially loaded: Simple section compression members- Design of single and double angle strut- Continuous and discontinuous strut.

| UNIT-IV | DESIGN OF BEAMS | 9+3=12 Hours |
|---|---|---|

Beams: Types of steel beams- Modes of failure -Design of laterally supported and unsupported beam: Rolled beam- built-up beams- Design for strength and serviceability- Web yielding-Web crippling-Bearing stiffeners. Design principles of Welded plate girder.

| UNIT-V | DESIGN OF INDUSTRIAL STRUCTURES | 9+3=12 Hours |
|---|---|---|

Design of industrial building: Roofing - cladding and wall material – Structural components and framing- Types of roof trusses - components - Loads and Its combination-Wind load estimation for different type of zones-Design of purlins.

**TOTAL (45+15): 60 Hours**

**TEXT BOOKS:**


1. Duggal S.K, “Design of Steel Structures”, Tata McGraw-Hill Education, 2019.
2. Subramanian N, “Design of Steel Structures”, Oxford University Press, New Delhi 2008.

| REFERENCES: | |
|---|---|
| 1. | Bhavikatti S.S, “Design of Steel Structures”, I.K. International Publishing House Pvt. Ltd, New Delhi, 2017 |
| 2. | Negi L.S, “Design of Steel Structures”, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007. |
| 3. | Jayagopal L.S, and Tensing, “Design of Steel Structures” Vikas Publishing House Pvt. Ltd, India, 2016. |
| 4. | Gambhir M.L, “Fundamentals of Structural Steel Design”, McGraw Hill Education India Pvt. Ltd, 2013 |
| 5. | Shiyekar M.R, “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd, 2013. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE605 | CIVIL ENGINEERING SOFTWARE APPLICATION | 0 | 0 | 4 | 2 |

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

| | |
|---|---|
| **1.** | Practice the students to analyse the structural elements with different load combinations. |
| **2.** | Design the elements as per the functional requirements provided in the IS Code provisions. |
| **3.** | Incorporate the design developed for elements and develop them into drawings. |

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

| | |
|---|---|
| **CO1** | Apply the principles of mechanics to analyse the structural elements **(K3)** |
| **CO2** | Design the elements with different load combinations to suit its intended purpose.**(K5)** |
| **CO3** | Produce drawings as output with sectional and elevation details of the design.**(K3)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO2 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| COe3 | 3 | 2 | 3 | 1 | 2 | 1 | 2 | - | 1 | - | - | 1 | 1 | 2 |
| CO (Avg) | 3 | 1.67 | 3 | 1 | 1.67 | 1 | 2.67 | 0.33 | 1 | - | - | 1.6 | 1 | 2 |

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

**LIST OF EXPERIMENTS:**

Analyse, design and produce detailed drawing as per relevant codes using Excel and drafting software for

1. Reinforced concrete beam (singly and doubly reinforced section)
2. Reinforced concrete column (Short and long column)
3. Reinforced concrete slab (one way and two way)
4. Reinforced concrete isolated footing
5. Reinforced concrete beam column connections
6. Reinforced concrete dog-legged staircase
7. Analysis of two Storey RC building
8. Analysis, design and detailing of steel roof truss
9. Design of Concrete Mix proportioning

**TOTAL: 60 Hours**

**TEXT BOOKS/ CODE BOOKS:**

| | |
|---|---|
| 1. | IS 456-2000 – Code of Practice for Plain and Reinforced concrete |
| 2. | IS 800-2007 – Code of Practice for General Construction in Steel |
| 3. | SP 34 – Handbook on Concrete reinforcement and detailing |
| 4. | IS 10262 – 2009 – Guidelines for Concrete mix design proportioning |
| 5. | S Unnikrishna Pillai &Devdas Menon "Reinforced Concrete Design", 3rd Edition, McGraw Hill Education, 2017 |
| 6. | SK Duggal, " Design of Steel Structures", 3rd edition, Tata McGraw-Hill Education, 2017 |

**REFERENCES:**

| | |
|---|---|
| 1. | N Subramanian, "Design of reinforced concrete Structures", 1st Edition, Oxford University Press, 2013 |
| 2. | SS Bhavikatti, "Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007", I K International |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE606 | INNOVATIVE PROJECTS | 0 | 0 | 2 | 1 |

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

| | |
|---|---|
| 1. | To impart the knowledge of execution of innovative projects |
| 2. | To apply the knowledge of Civil Engineering for innovative projects |
| 3. | To interpret the outcomes of the projects pertain to industrial applications |

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

| | |
|---|---|
| CO1 | To identify the thrust areas in Civil Engineering and related domains.**(K3)** |
| CO2 | To formulate the methodology in interdisciplinary mode. **(K4)** |
| CO3 | Draft the methodology and develop the product related to the concept.**(K5)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 1 | 4 | 2 | 1 | 2 | 2 | 3 | 2 | 1 | - | - | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | - | - | 1 | 2 | 2 |
| CO3 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | - | 2 | - | - | 2 | 2 | 1 |
| CO (Avg) | **2.2** | **2** | **3** | **1.4** | **1.8** | **1.4** | **3** | **1** | **1.4** | **-** | **-** | **2** | **1.4** | **2** |

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

The objective of this course is to impart and inculcate the interdisciplinary thinking knowledge of the Civil Engineering students. Any existing problem in the society or industry related to Civil Engineering may be taken up by the students and innovative low cost solutions may be derived by the students etc. A team of students comprising not more than three may be mentored by the faculty in the department.

- Every project may hold one academic expert who is appointed by the HoD of the Department and industry mentor who is expert in the innovative area chosen by the team.
- The project problem formulated should be innovative and unique in Civil Engineering domain.
- Prior industry visits may be arranged to the industry where the problem is identified for example Cement manufacturing industry, RMC plants, Steel manufacturing industries etc.,
- Final solution identified by the student may be converted in to prototype and subjected to IRF may be filed along with guidance of the guide and HoD
- The hours allotted for this course shall be utilized by the students to receive directions from the guide to refer the existing literatures and perform the experiments in the lab to come up with the low cost solutions.
- Periodic reviews shall be held by the expert committee identified by the Head of the Department and assessment may be done.
- Monitoring committee may be appointed to regularly monitor the progress work of the student team
- Final report and relevant drawings may be submitted and final assessment may be done by the external member appointed by the Institute.

**TOTAL: 30 Hours**

**WEBSITES:**

| | |
|---|---|
| 1. | http://www.mycollegeproject.com/Innovative%20Projects.html |
| 2. | https://www.electronicsforu.com/mini-projects-ideas |
| 3. | https://www.innovation-project.info/ |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE916 | REPAIR AND REHABILITATION OF STRUCTURES | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| 1. | Describe the maintenance and repair strategies. |
| 2. | Identify the various patterns of cracks and moisture movement internally and externally. |
| 3. | Suggest the suitable repair materials for different deterioration. |
| 4. | Recommend right techniques to eliminate distressing in concrete and steel structures. |
| 5. | Suggest suitable repair techniques for different deterioration. |

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

| | |
|---|---|
| CO1 | Familiarize the Strategies in maintenance and repair of all type of structures .**(K2)** |
| CO2 | Learn the crack formation and moisture accumulation internally and externally in the structure**.(K2)** |
| CO3 | Select suitable repair materials for different worsening happen in the concrete structure**.(K3)** |
| CO4 | Check with suitable method for any distress happen in the structures**.(K3)** |
| CO5 | Renovate and Retrofit the distress in any existing structure**.(K3)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | 1 | - | 1 | 1 | 3 | 2 | 1 | - | - | 2 | 1 | 2 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO3 | 1 | 2 | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO4 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | - | - | 2 | 2 | 2 |
| CO5 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 2 | - | - | 2 | 2 | 2 |
| **CO (Avg)** | **1.4** | **1.8** | **2.6** | **1.4** | **2** | **1.4** | **3** | **1.6** | **1.4** | **-** | **-** | **2** | **1.4** | **2** |

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

| UNIT-I | MAINTENANCE AND REPAIR STRATEGIES | 9 Hours |
|---|---|---|

Introduction-Facts and importance of maintenance-Various aspects of inspection-Assessment procedure for evaluating damaged structure-Causes of deterioration-Diagnosis of causes -Flow charts for diagnosis.

| UNIT-II | BUILDING CRACKS AND MOISTURE PENETRATION | 9 Hours |
|---|---|---|

Building cracks: Causes -Diagnosis -Remedial measures -Thermal and Shrinkage cracks -Unequal loading -Vegetation and trees -Chemical action -Foundation movements. Moisture penetration: Sources off dampness -Moisture movement from ground -Reasons for ineffective damp proofing course -Roof leakage -Pitched roofs-Leakage of concrete slabs-Dampness in solid walls -Condensation -Hygroscopic salts.

| UNIT-III | MATERIALS FOR REPAIR | 9 Hours |
|---|---|---|

Introduction-Concrete chemicals-Special elements for accelerated strength gain-Expansive cement-Polymer concrete-Sulphur infiltrated concrete-Ferro cement- Fibre reinforced concrete-SIFCON-SIMCON-Rust eliminators and polymers coating for rebars during repair-Foamed concrete-Mortar-Dry pack.

| UNIT-IV | REPAIRING OF CONCRETE AND STEEL STRUCTURES | 9 Hours |
|---|---|---|

Concrete structures: Methods of repair-Repairing-Spalling -Disintegration -Repairing of concrete floors and pavements. Steel structures: Types and causes for deterioration -Preventive measures -Repair procedure -Brittle fracture -Lamellar tearing -Defects in welded joints -Mechanism of corrosion -Design to protect against corrosion -Design and fabrication errors -Distress during erection.

| UNIT-V | STRENGTHENING OF EXISTING STRUCTURES | 9 Hours |
|---|---|---|

Lintel: Functions of lintel and sunshade-Types of lintel; Arches: Construction-Elements-Classification. Doors and Windows: Technical terms-Types and their suitability. Stair and stair cases:Terminology-Location and classification of stairs-Requirement of good stair. Form works: Centering and shuttering - Scaffoldings, shoring and underpinning - Slip forms.

**TOTAL: 45 Hours**

**TEXT BOOKS:**


1. Guha P.K, "Maintenance and Repairs of Buildings", New Central Book Agency Pvt. Ltd, Calcutta, 2011.
2. Vidivelli B, "Rehabilitation of Concrete Structures", Standard Publishers Distributors, New Delhi, 2015.

| REFERENCES: | |
|---|---|
| 1. | Gambhir M.L, “Concrete Technology”, Tata McGraw Hill, 2012. |
| 2. | Neville A.M., Properties of Concrete, Fifth edition, Pearson Education Ltd. |
| 3. | Ravishankar.K, Krishnamoorthy.T.S, “Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures”, Allied Publishers, 2004. |
| 4. | Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE917 | PREFABRICATED STRUCTURES | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | To Describe the necessity of prefabrication and appreciate modular construction |
| **2.** | To Describe the structural behaviour of wall panels, columns and shear walls |
| **3.** | To Design the different joints used for prefabricated structural elements with proper detailing |
| **4.** | To Erect some of the prefabricated elements and also have the knowledge of the construction methods using these |
| **5.** | To design the pre-fabricated units |

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

| | |
|---|---|
| **CO** | Apply the various types of prefabrication systems**.(K3)** |
| **CO** | Know the construction of roofs and floors**.(K1)** |
| **CO** | Prepare dimensioning and detailing of joints **(K2)** |
| **CO** | Perform erection of the prefabricated structure**.(K3)** |
| **CO** | Design pre-fabricated units.**(K4)** |

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

**CO – PO Mapping**

| Cos | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO | 3 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | - | - | 2 | 1 | 2 |
| CO | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| CO | 3 | 2 | 3 | 1 | 2 | 1 | 3 | - | 1 | - | - | 2 | 1 | 2 |
| CO | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | - | - | 2 | 2 | 2 |
| CO | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 2 | - | - | 2 | 2 | 2 |
| CO (Av | **2.2** | **2** | **3** | **1.4** | **1.8** | **1.4** | **3** | **1** | **1.4** | **-** | **-** | **2** | **1.4** | **2** |

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

| UNIT-I | INTRODUCTION | 9 Hours |
|---|---|---|

Need for prefabrication - Principles - Materials - Modular co-ordination - Standardization - Systems Production - Transportation - Erection Disuniting of Structures.

| UNIT-II | PREFABRICATED COMPONENTS | 9 Hours |
|---|---|---|

Behaviour of structural Components–Large panel construction- Application of pre stressing of roof members-Floor systems - Two way load bearing slabs - Wall panels-Shear walls- segmental constructions

| UNIT-III | DIMENSIONING AND DETAILING OF JOINTS | 9 Hours |
|---|---|---|

Dimensioning and detailing of joints for different structural connections-Construction joints and expansion joints-Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column,-Column to Foundation, Connections between wall panels, Connections between floor panels

| UNIT-IV | ERECTION OF STRUCTURES | 9 Hours |
|---|---|---|

Production - Transportation and erection - Organizing of production - Storing and erection equipment - Shuttering and mould design - Dimensional tolerances, erection of R.C. structures -Total prefabricated buildings.

| UNIT-V | DESIGN OF PRE FABRICATED UNITS | 9 Hours |
|---|---|---|

Prefabricated units for Industrial structures, Multi-storied buildings and water tanks etc., Application of pre stressed concrete in prefabrication.

**TOTAL: 45 Hours**

**TEXTBOOKS:**


| | |
|---|---|
| 1. | Hubert Bachmann, Alfred Steinle, "Precast Concrete Structures", Ernst and Sohn GMBH & Co., K.G., 2011. |
| 2. | "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009. |

| REFERENCES: | |
|---|---|
| 1. | Lewicki B, “Building with Large Prefabricates”, Elsevier Publishing Company, Amsterdam / London / New York, 1966. |
| 2. | Levi M, (2000), Precast concrete materials, Manufacture properties and usage, Applied Science Publishers, London. |
| 3. | Kim S. Elliott, “Precast Concrete Structures” Butter-Heinemann, 2002. |
| 4. | LasslоMokk, “Prefabricated Concrete for Industrial and Public Sectors, AkademiaiKiado”, Budapest, 1964. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE920 | TRAFFIC ENGINEERING AND MANAGEMENT | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Inculcate the traffic characteristics and assess the related traffic problems in India |
| **2.** | Impart the basic knowledge in the concepts of traffic surveys and its level of service. |
| **3.** | Impart skills in characterizing traffic design of facilities to control and manage traffic. |
| **4.** | Aware the students about road accidents, traffic and environment hazards in transportation interaction. |
| **5.** | Develop a strong knowledge base of traffic planning and its management in any transportation area. |

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

| | |
|---|---|
| **CO1** | Analyse traffic problems and plan for traffic systems various uses.(**K3**) |
| **CO2** | Design the Channels, Intersections, signals and parking arrangements.(**K4**) |
| **CO3** | Develop Traffic management Systems.(**K3**) |
| **CO4** | Analyse the causes and report the accident. (**K2**) |
| **CO5** | Manage the traffic congestion using the available management measures. (**K2**) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | - | - | 3 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | - | - | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 2 | - | - | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | - | - | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | - | 3 | 3 | 3 |
| **CO (Avg)** | **3** | **2.4** | **2.6** | **3** | **1.8** | **1.6** | **2.6** | **2.2** | **2** | **0.2** | **-** | **3** | **2.4** | **2.2** |

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

| UNIT-I | TRAFFIC PLANNING AND CHARACTERISTICS | 9 Hours |
|---|---|---|

Road Characteristics - Road user characteristics - PIEV theory - Vehicle - Performance characteristics - Fundamentals of traffic flow - Urban traffic problems in India - Integrated planning of town ,country ,regional and all urban infrastructure - Towards sustainable approach.- land use & transport and modal integration.

| UNIT-II | TRAFFIC SURVEYS | 9 Hours |
|---|---|---|

Traffic surveys - Speed, journey time and delay surveys - Vehicles volume survey including non-motorized transports - Methods and interpretation - Origin destination survey - Methods and presentation - Parking survey - Accident analyses - methods, interpretation and presentation - Level of service - Concept, applications and significance.

| UNIT-III | TRAFFIC DESIGN AND VISUAL AIDS | 9 Hours |
|---|---|---|

Intersection-Types-Channelization, rotary, intersection design - Signal design - Coordination of signals -Grade separation - Traffic signs including VMS and road markings - Significant roles of traffic control personnel

| UNIT-IV | TRAFFIC SAFETY AND ENVIRONMENT | 9 Hours |
|---|---|---|

Road accidents - Causes, effect, prevention, and cost - Street lighting - Traffic and environment hazards - Air and noise pollution, causes, abatement measures - Promotion and integration of public transportation - Promotion of non-motorized transport.

| UNIT-V | TRAFFIC MANAGEMENT | 9 Hours |
|---|---|---|

Area traffic management system - Traffic system management with IRC standards -- Traffic regulatory measures-Travel demand management - Direct and indirect methods - Congestion and parking pricing - Coordination among different agencies - Intelligent transport system for traffic management, enforcement and education.

**TOTAL: 45 Hours**

**TEXT BOOKS:**


| | |
|---|---|
| 1. | Kadiyali.L.R. “Traffic Engineering and Transport Planning”, Khanna Publishers, Delhi, 2013. |
| 2. | Salter. R.I and Hounsell N.B, “Highway Traffic Analysis and design”, Macmillan Press Ltd.1996. |

| REFERENCES: | |
|---|---|
| 1. | Fred L, and Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd, New Delhi, 2011. |
| 2. | Garber and Hoel, “Principles of Traffic and Highway Engineering”, CENGAGE Learning, New Delhi, 2010. |
| 3. | Hobbs F.D. “Traffic Planning and Engineering”, University of Brimingham, Peragamon Press Ltd, 2005. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19GE602 | PROFESSIONAL DEVELOPMENT SKILLS (FOR CIVIL DEPT ONLY) | 0 | 0 | 2 | 1 |

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

| | |
|---|---|
| **CO1** | Explain the values of career planning and prepare a resume |
| **CO2** | Demonstrate interview skills and undergo mock interviews and group discussions |
| **CO3** | State entrepreneurship and prepare business plan. |

**Demonstrating Soft -Skills capabilities in the following areas:**

a. Career planning (Employment) – Resume writing - Tips for great resume
b. Interview Skills - Importance of body language in an interview – Confidence building – FAQs
c. Mock interview, mock stress interview
d. Mock Group Discussion
e. Career Planning (Self Employment) Understanding Entrepreneurship - Advantages of being an Entrepreneur - Create a Business plan.

**TOTAL: 30 Hours**

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | U19GE701 | Professional Ethics and Human Values | 3 | 0 | 0 | 3 | 45 |
| 2 | U19CE702 | Construction Engineering Management | 3 | 0 | 0 | 3 | 45 |
| 3 | U19CE703 | Earthquake Resistant Structures | 3 | 0 | 0 | 3 | 45 |
| 4 | U19CE922 | **Professional Elective -** Bridge Engineering | 3 | 0 | 0 | 3 | 45 |
| 5 | U19CE924 | **Professional Elective -** Prestressed Concrete Structures | 3 | 0 | 0 | 3 | 45 |
| **Open Elective** | | | | | | | |
| 6 | U19CS1001 | Big Data Analytics | 3 | 0 | 0 | 3 | 45 |
| | U19CS1002 | Cloud Computing | | | | | |
| | U19CS1003 | Internet of Things | | | | | |
| | U19CS1004 | Mobile Application Development | | | | | |
| | U19EE1005 | Electrification In Building Construction | | | | | |
| **Practical** | | | | | | | |
| 7 | U19CE704 | Estimation and quantity surveying | 0 | 0 | 4 | 2 | 60 |
| 9 | U19CE705 | Design Project | 0 | 0 | 4 | 2 | 60 |
| 9 | U19CE706 | Internship | 0 | 0 | 0 | 2 | 60 |
| 10 | U19CE707 | Industrial Lecture | 0 | 0 | 1 | 0 | 30 |
| | | | | | **Total Credits** | **24** | |

**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 Engineering, Seventh Semester BE Civil Students and Staff, COE

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE702 | CONSTRUCTION MANAGEMENT | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the concepts of construction management. |
| **2.** | Impart the basic knowledge in terms of planning and scheduling. |
| **3.** | Demonstrate the network planning methods and resource levelling |
| **4.** | Provide knowledge about managing of cost control in construction project. |
| **5.** | Describe the procedures adopted in P.W.D. and C.P.W.D to establish accounts and stores. |

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

| | |
|---|---|
| **CO1** | Discuss the basic principles of construction management. (K2) |
| **CO2** | Explain the process involved in the Construction Planning and Scheduling.( K3) |
| **CO3** | Describe the planning and control of resource management. (K2) |
| **CO4** | Discuss the different methods of cash flows practiced in the Construction Industry( K3) |
| **CO5** | Carry out measurement of work, estimation and other account related activities as per government norms. (K3) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 1 | 1 | 1 | - | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO2 | 2 | 2 | 3 | 2 | - | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 2 | - | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 2 | 2 | - | 2 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 1 |
| CO5 | 1 | 3 | 2 | 2 | - | 2 | 3 | 1 | 2 | 1 | 1 | 2 | 1 | 2 |
| **CO (Avg)** | **1.8** | **2.2** | **2.2** | **1.8** | **-** | **1.8** | **2.2** | **1.2** | **1.6** | **1** | **1** | **2** | **1.2** | **1.2** |

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

| UNIT-I | INTRODUCTION | 9 Hours |
|---|---|---|

Definition-Importance- Key areas of Project management- Definition of project management- Prime factors of construction -Pareto chart of Construction Management - Objectives of construction management- Stages of construction management- Key functionalities- Project stages and process groups- Project life cycle- Types of organizations &hierarchy of organization.

| UNIT-II | CONSTRUCTION PLANNING AND SCHEDULING | 9 Hours |
|---|---|---|

Introduction – Preparation of network – Advantages of Network analysis – Activity and Event oriented network – Planning by CPM & PERT – Comparison between CPM & PERT – CPM: Calculation of critical path – critical activity –project duration –determination of activity floats (or) slag – PERT- resource levelling.

| UNIT-III | RESOURCE MANAGEMENT PLANNING AND CONTROL SYSTEMS | 9 Hours |
|---|---|---|

**CONSTRUCTION PLANNING**: Collection of field data - preliminary estimates - approval and sanction of estimates - budget provision - scheduling methods - progress report and charts -legal aspects of management.

**RESOURCE PLANNING**: Types of resources- Estimating resource requirements-Material management-Effective utilization of machineries and equipments-Manpower planning -Planning for materials, machines, men and organization.

| UNIT-IV | COST CONTROL AND MANAGEMENT | 9 Hours |
|---|---|---|

Preliminary cost estimate for BOQ- Month wise expenditure - Cash flow statement - Job cost ledger- Monthly stock statement- Inventories- Material receipt- Overhead cost- Invoicing- Reconciliation of materials- JCR- Financial Profit projections.

| UNIT-V | ACCOUNTS AND STORES | 9 Hours |
|---|---|---|

Measurements of work - recording - check measurements - types of bills - mode of payment - budget estimate - revised estimates - completion of report and certificates - claims and transfer classification of transaction - ledger

| | |
|---|---|
| accounts - interest account - cash book. suspense classification -Stores - maintenance inspection - inventories - transfer of surplus and accounting of shortage - stores - procedures adopted in P.W.D. and C.P.W.D. | |
| | **TOTAL: 45 Hours** |
| **TEXT BOOKS:** | |
| 1. | Chitkara, K.K., Construction Project Management, Tata McGraw Hill, New Delhi, Third Edition, 2014 |
| 2. | Eugenio Pellicer, VíctorYepes, Teixeira, Jose. C. Moura, Helder.P. and JoaquínCatala., Construction Management, Wiley-Blackwell, New Jercy, First Edition, 2013. |
| **REFERENCES:** | |
| 1. | Shrivastava, U K., Construction Planning & Management, Galgotia Publications, New Delhi, Third Edition,2014. |
| 2. | Kumar NeerajJha., Construction Project Management, Pearson Education, New Delhi, Second Edition,2015 |
| 3. | Barbara J.Jackson. "Construction Management Jumpstart: The best first step toward a carrier in construction management" 2nd Edition, Wiley, 2010. |
| 4. | Punmia, B.C. and Khandelwal, K. K., Project Planning and Control with PERT and CPM,Laxmi Publications, New Delhi, Fourth Edition,2016 |
| 4. | https://cbt.eku.edu/sites/cbt.eku.edu/files/files/programs/Const.pdf |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE703 | EARTHQUAKE RESISTANT STRUCTURES | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| 1. | Understand the terminology of earthquake Phenomena |
| 2. | Realize the Causes and Effects of Earthquake |
| 3. | Identify the Fundamentals of Earthquake Vibrations of Structures |
| 4. | Compute the Damage and failure of Concrete and Masonry Buildings due to earthquake |
| 5. | Cognize the Codal Provisions and Design Philosophy |

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

| | |
|---|---|
| CO1 | Know the meaning of terms of earthquake and guidelines of earthquake preparedness (K1) |
| CO2 | Understand the type of failure occurred due to earthquakes in the specified zone based on the given criteria(K5) |
| CO3 | Recognize the equation of motion for various parameters of earthquake(K5) |
| CO4 | Describe the type of damage occurred in the given type of buildings based on earthquake intensity in the given seismic zone.(K4) |
| CO5 | Explain the relevant provisions of IS codes for construction of earthquake resistant building for the given seismic zone.(K4) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| **CO** | **3** | **3** | **3** | **3** | **3** | **2** | **1** | **2** | **2** | **2** | **2** | **1** | **2** | **2** |

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

| UNIT-I | Basics of Earthquake Phenomena | 9 Hours |
|---|---|---|

Definition and meaning of terms: Focus, Epicenter, Focal depth, foreshocks, aftershocks, magnitude and intensity of Earthquake. Seismic waves, Body waves. Natural period, response spectrum, seismic mass, seismic weight, structural response factor, time history analysis, earthquake zones, zone map, zero period acceleration, Measurement of earthquake shaking and its working principle, Richter scale.Guidelines for Earthquake preparedness: Individual, Home and community planning.

| UNIT-II | Causes and Effects of Earthquake | 9 Hours |
|---|---|---|

Causes and effects of earthquake. Formation of earth and its cores. Formation, types and movement of tectonic plates, Elastic rebound theory, Types of earthquake and Faults. Ground shaking, Ground failure, Tsunami and fire.

| UNIT-III | Fundamentals of Earthquake Vibrations of Structures | 9 Hours |
|---|---|---|

Equation of Motion (By Newton's Law and By D'Alembert's Principle), Degrees of Freedom, Simplified Single Degree of Freedom, Mathematical Modeling, Equation of Motion for Free Vibration for Damped and Un damped System (Single Degree of Freedom System), Equation of Motion for Forced Vibration for Damped and Un damped System(Single Degree of Freedom System), Logarithmic Decrement

| UNIT-IV | Concrete and Masonry Buildings | 9 Hours |
|---|---|---|

Typical damage and failure patterns of brick masonry, causes of damages in brick masonry. Damage to RCC buildings: Sliding of roof support, falling of infill walls, crushing of column ends, diagonal cracking of column-beam joints, pulling out of reinforcement bars, foundation sinking and tilting. Typical damage and failure of stone masonry, causes of damages in stone masonry

| UNIT-V | Codal Provisions and Design Philosophy | 9 Hours |
|---|---|---|
| Codal Provision and Design Philosophy : IS: 1893 (part I): General provisions and principles for design of earthquake resistant buildings, assumptions in earthquake resistant design of structure (No numerical). IS: 13920 Ductile detailing, meaning of ductility, need of ductility in concrete structure, typical sketches with reinforcement details of columns, beams and beam column connections showing longitudinal steel , splicing of steel, transverse steel, stirrups as per IS: 13920. (No numerical) | | |
| | | **Total : 45 Hours** |

| **TEXT BOOKS:** | |
|---|---|
| 1. | Earthquake Resistant Design of Structures Agarwal, Pankaj Shrikhande, Manish PHI Learning, Delhi,2011 ASIN: B00K7YFYVE ISBN-13 9788120328921 |
| 2. | Earthquake Resistant Design of Structures Duggal, S. K. Oxford University Press, Delhi, 2013 ISBN-13 9780198083528 |
| **REFERENCES:** | |
| 1. | Elements of Earthquake Engineering Jai Krishna , A. R. Chandrashekharan Chandra, B. South Asian Publishers Pvt |
| 2. | IITK-BMTPC Earthquake Tips- IIT Kanpur |
| 3. | IS 1893( Part I):2002 ,Indian Standard Criteria for Earthquake Resistant Design of Structures- General Provisions and Buildings , BIS, New Delhi. |
| 4. | IS 13920:1993 Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces-Code of Practice, |
| 5. | IS 13935- Repair and seismic strengthening of building: Guidelines |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE704 | ESTIMATION AND QUANTITY SURVEYING | 0 | 0 | 4 | 2 |

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

| | |
|---|---|
| 1. | Impart the basic knowledge on the types of estimate for RC building and Steel structures. |
| 2. | Compute the quantities for sewerage and water supply systems |
| 3. | Apply the knowledge to prepare the valuation reports for different types of structures. |

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

| | |
|---|---|
| CO1 | Explain the basic concept of quantity estimation for different types of structures **(K3)** |
| CO2 | Develop the quantities for sewerage and water supply systems **(K3)** |
| CO3 | Identify the valuation for different types of structures **(K3)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | |
| CO3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | |
| CO | **3** | **2.67** | **2.67** | **3** | **3** | **3** | **2** | **3** | **2** | **2.67** | **2.67** | **3** | **3** | |

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

Introduction to estimation - Types of estimate- Necessity-Overview of specification - Detailed and Drawing-Method of measurements- Calculation of quantities of brick work, RCC, PCC, Steel and Stone masonry - Plastering - Rate analysis - Tenders - Contracts-Types of contracts. Introduction to Valuation- Types of valuation - Necessity- Capitalized value- Depreciation value- Scarp value- Salvage value - Value of the building- Calculation of Standard rent- Mortgage- Lease.

1. Estimation of load bearing walls.
2. Estimation of R.C.C framed structures
3. Estimation of steel framed structures
4. Estimation of septic tanks and soak pit
5. Estimation of sewerage systems
6. Estimation of earth work-Cutting and filling
7. Estimation of roads
8. Estimation of retaining walls
9. Estimation of culverts
10. Bar bending schedule
11. Valuation of residential buildings
12. Valuation of industrial buildings

**TOTAL: 60 Hours**

**TEXT BOOKS:**


| | |
|---|---|
| 1. | B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010. |
| 2. | B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006 |


**REFERENCES:**


| | |
|---|---|
| 1. | Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD |
| 2. | Tamil Nadu Transparencies in Tenders Act, 2000 |
| 3. | Standard Databook for analysis and rates |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE705 | DESIGN PROJECT | 0 | 0 | 4 | 2 |

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

| | |
|---|---|
| 1. | Identify the initial level process involved in the design of Civil Engineering projects |
| 2. | Understand the various design steps and design involved using IS codes for respective structure type |
| 3. | Impart the application knowledge of any Civil Engineering software for design purpose |

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

| | |
|---|---|
| CO1 | Understand the problem statement taken in the projects and study the relevant application tools and softwares |
| CO2 | Apply the tools and concepts to arrive the methodology |
| CO3 | Analyze the problem identified and frame the solution that could be low cost and eco friendly |

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

**CO – PO Mapping**

| Cos | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 3 | 2 | 2 | 1 | 2 | 2 |
| **CO** | **3** | **3** | **3** | **3** | **2** | **2** | **3** | **1** | **3** | | **2** | **2** | **2** | **2** |

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

**COURSE CONTENT** **60 Hours**

The objective of this course is to impart and improve the design capability of the student. This course has been conceived purely on a design problem in any one of the disciplines of Civil Engineering, e.g., design of an RC structure, design of a wastewater treatment plant, design of a foundation system, design of traffic intersection, etc. The design problem can be allotted to either an individual student or a team of students comprising not more than three.

- Every project work shall have a guide who is a member of the Faculty of Civil Engineering of the College. The project guide of the design project is appointed by the Head of the Department.
- The project coordinator for the respective deign project is appointed by Head of the Department.
- The number of students in each team should not exceed three.
- The hours allotted for this course shall be utilized by the students to receive directions from the guide, in library reading, laboratory work, and computer analysis or field work. The student should also present his/her progress made in the project in the periodical reviews.

Each student/team shall finally produce a comprehensive report including background information, literature survey, problem statement, project work details, and conclusions. The candidate/team is expected to submit the project report on or before the last working day of the semester. After scrutiny, the report will be duly acknowledged by Head of the Department

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE706 | INTERNSHIP | 0 | 0 | 0 | 2 |

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

| | |
|---|---|
| 1. | Provides a real time exposure on the latest and trending technologies in the core companies |
| 2. | Refine and clarify professional and career goals through critical analysis of the internship experience |
| 3. | Gain an understanding of workplace dynamics, professional expectations, and the influence of culture on both |

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

| | |
|---|---|
| CO1 | Understand the intricacies of implementation of textbook knowledge into practice **(K2)** |
| CO2 | Grasp new developments and update himself or herself**(K3)** |
| CO3 | Prepare himself/herself for the implementation of new techniques (**K5**) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO | **3** | **3** | **3** | **3** | **3** | **2** | **3** | **3** | **3** | **2** | **3** | **3** | **3** | **3** |

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

**COURSE CONTENT** **60 Hours**

The students will individually undertake training in reputed civil engineering companies for a duration of 30 hours during the summer vacation of sixth semester. At the end of the training, a report on the work done and lessons learnt will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff members.

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE707 | INDUSTRIAL LECTURE | 0 | 0 | 1 | 0 |

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

| | |
|---|---|
| 1. | Identify any practical problem related to Civil Engineering domain |
| 2. | Interact with the industry mentors to understand the problem statement |
| 3. | Aware of various problems prevail in the construction industry to solve |

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

| | |
|---|---|
| CO1 | Understand the real world problem prevail in the field of planning, analysis, design and execution (K2) |
| CO2 | Apply the core concepts to solve real world Civil Engineering problems (K3) |
| CO3 | Analyze the problem statement and arrive the appropriate solution methods (K4) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| **CO** | **3** | **3** | **3** | **3** | **2** | **2** | **3** | **2** | **3** | | **2** | **2** | **2** | **2** |

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

| COURSE CONTENT | 30 Hours |
|---|---|

Industry lecture will be conducted for the students twice in a month and experts will be invited from various industries. Industry experts will share their domain knowledge and relevant field visits may also be arranged. At the end of the course students may submit report of industry lectures for final assessment.

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE922 | BRIDGE ENGINEERING | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Classify the bridge based on the importance , historical background and other parameters |
| **2.** | Understand the behaviour of load distribution on superstructure based on different theories |
| **3.** | Describe the types of substructures used for all type of bridges |
| **4.** | List the different types of bearings used in bridges based on usage. |
| **5.** | Recommend the type of maintenance required based on rating of existing bridges |

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

| | |
|---|---|
| **CO1** | Brief the classification of bridges and important of the parameters involved in bridge development. (K1) |
| **CO2** | Describe in detail the design procedure for superstructure of bridges using load distribution methods. (K4) |
| **CO3** | Describe the components of substructures and types of footing used for bridges. (K3) |
| **CO4** | Evaluate the role of bearings and its types. (K2) |
| **CO5** | Identify the type of inspection methods and retrofitting measures according to the rating of existing bridges(K3) |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| **CO (Avg)** | **3** | **3** | **3** | **3** | **3** | **2** | **1** | **2** | **2** | **2** | **2** | **3** | **3** | **3** |

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

| UNIT-I | INTRODUCTION | 9 Hours |
|---|---|---|

Historical background of bridges and Classification. Bridge aesthetics and proportioning. Review of applicable design codes. Loads and forces on bridges. Bridge geometry. Bridge Hydrology: Determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth.

| UNIT-II | BRIDGE SUPERSTRUCTURE (REINFORCED CONCRETE) | 9 Hours |
|---|---|---|

Load distribution theories- Analysis and design of slab culvert-Tee beam and slab bridge.

| UNIT-III | BRIDGE SUPERSTRUCTURE (PRESETRESSED CONCRETE) | 9 Hours |
|---|---|---|

Design of prestressed concrete bridges - Preliminary discussions - Design of girder section - cable layout - check for stresses and diagonal tension - Diaphragms - end block - short term and long term deflections

| UNIT-IV | BRIDGE SUBSTRUCTURE | 9 Hours |
|---|---|---|

Piers-Abutments -Wing walls - Materials for substructures-Type of foundation-Spread- Pile foundation- Caissons-Cofferdams- Wing wall-Retaining wall.

| UNIT-V | BEARINGS & MAINTENANCE | 9 Hours |
|---|---|---|

Importance of bearings-Free and fixed bearings & Types - Bed blocks - Bridge inspection-Detailed & Routine inspection-Rating of existing bridges-Rebuilding bridges-Retrofitting and rehabilitation of bridges.

**Total : 45 hours**

| TEXT BOOKS: | |
|---|---|
| 1. | Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., January 2019 |
| 2. | KrishnaRaju N, "Design of Bridges ", Oxford and IBH, 5th Edition, 2019 |
| **REFERENCES:** | |
| 1. | Ponnuswamy S, "Bridge Engineering", Tata McGraw-Hill Education, 2017. |
| 2. | Jagadeesh T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, 2013. |
| 3. | Rajagopalan N. "Bridge Superstructure", Alpha Science International, 2006. |

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE924 | PRESTRESSED CONCRETE STRUCTURES | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the prestressed concrete and its concepts. |
| **2.** | Impart the basic knowledge of prestresslosses in prestressed concrete members. |
| **3.** | Instruct the design principles of flexural prestressed beams. |
| **4.** | Aware the students about composite beams and its applications. |
| **5.** | Provide the general design features of special prestressed structures. |

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

| | |
|---|---|
| **CO1** | Understand the requirement of prestressed concrete and its systems and methods.**(K2)** |
| **CO2** | State the different types of losses in prestressed concrete members and the factors affecting it.**(K3)** |
| **CO3** | Design the flexural prestressed members for flexural, shear and anchorage requirements. **(K5)** |
| **CO4** | Analyse and design the composite beams and methods in achieving continuity in continuous beams. **(K5)** |
| **CO5** | Explain the designfeatures of Prestressed concrete water tanks, pipes, sleepers and concrete bridge decks. **(K2)** |

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

**CO – PO Mapping**

| COs | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 1 | 3 | 3 | 2 | 1 | 1 | 1 | - | - | 2 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | - | - | 2 | 3 | 1 |
| CO3 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | - | - | 2 | 3 | 1 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | - | - | 2 | 3 | 1 |
| CO5 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | - | - | 2 | 3 | 1 |
| **CO** | **3** | **2** | **1.8** | **3** | **3** | **2** | **1** | **2.8** | **1** | **-** | **-** | **2** | **3** | **1** |

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

| UNIT-I | PRINCIPLES OF PRESTRESSING | 9 Hours |
|---|---|---|

Introduction-Materials for prestressed concrete- Systems and methods of prestressing -Analysis of sections: Stress, strength and load balancing concept.

| UNIT-II | LOSSES AND DEFLECTION OF PRESTRESSED CONCRETE MEMBERS | 9 Hours |
|---|---|---|

Losses-Types of losses: Elastic shortening- Shrinkage of concrete-Creep of concrete-Friction-Anchorage slip- Relaxation of steel. Deflection-Factors affecting deflection-Effect of tendon profile on deflections-short and long term deflection.

| UNIT-III | DESIGN OF FLEXURAL MEMBERS AND ANCHORAGE ZONES | 9 Hours |
|---|---|---|

Behaviour of flexural members-Determination of ultimate flexural strength as per BIS. Design concepts of flexural members. Design for shear based on BIS. Anchorage zone- Concepts of bond stress- Determination of anchorage zone stresses in post-tensioned beams- IS code method; Design of anchorage zone reinforcement.

| UNIT-IV | COMPOSITE BEAMS AND CONTINUOUS BEAMS | 9 Hours |
|---|---|---|

Analysis and design of composite beams-Methods of achieving continuity in continuous beams-Analysis for secondary moments-Concordant cable and linear transformation-Calculation of stresses-Principles of design.

| UNIT-V | MISCELLANEOUS STRUCTURES | 9 Hours |
|---|---|---|

Introduction-General features and design principles of: Prestressed concrete water tanks, pipes, sleepers and concrete bridge decks.

**TOTAL: 45 Hours**

| TEXT BOOKS: | |
|---|---|
| 1. | Krishna Raju N., “Prestressed Concrete”, 5th Edition, Tata McGraw Hill Company, New Delhi, 2012 |
| 2. | Pandit G.S, and Gupta S.P, “Prestressed Concrete”, CBS Publishers and Distributers Pvt. Ltd, 2012. |
| **REFERENCES:** | |
| 1. | Rajagopalan N, “Prestressed Concrete”, Narosa Publishing House, 2002. |
| 2. | Dayaratnam P, “Prestressed Concrete Structures”, Oxford and IBH, 2013 |
| 3. | Lin T.Y, Ned. H, and Burns, “Design of Prestressed Concrete Structures”, Wiley India Pvt. Ltd, New Delhi, 2013. |

**U19GE701 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3**

**COURSE OUTCOMES:**

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

- Identify the core values that shape the ethical behavior of an engineer.
- Analyze and practice engineering ethics in their profession.
- Apply codes of ethics in the context of social experimentation.
- Explore various safety issues and ethical responsibilities of an engineer.
- Adopt ethical practices pertaining to global issues.

CO / PO Mapping

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

| COs | Programme Outcomes (POs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | P09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 3 |
| CO2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 1 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO5 | 2 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**UNIT-I HUMAN VALUES 9**

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT -II ENGINEERING ETHICS 9**

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Profession and Professionalism – Professional Ideals and Virtues –Theories of Right action- Self Interest- Customs and Religion-Uses of Ethical Theories.

**UNIT-III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Contrasts with standard experiments- Engineers as Responsible Experimenters – Importance and limitations of Codes of Ethics - Industrial Standards - A Balanced Outlook on Law – Industrial Standards-Case Study: Space shuttle challenger disaster.

**UNIT-IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and Risk – Types of risk - Assessment of Safety and Risk – Risk Benefit analysis-Reducing Risk – Case Studies - Chernobyl and Bhopal plant disaster.

Collegiality and Loyalty –Respect for Authority- Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Importance and consequences of whistle blowing - Professional Rights – Employee Rights – Intellectual Property Rights (IPR) and its components– Discrimination.

**UNIT-V GLOBAL ISSUES 9**

Multinational Corporations – Environmental Ethics – Computer Ethics and Internet- Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Participation in professional societies- –Code of Conduct – Corporate Social Responsibility.

**Lecture: 45, Tutorial: 0, TOTAL: 45 Hours**

**TEXT BOOKS**


1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, Indian Edition, Tenth reprint, 2017.
2. Professional Ethics and Human values- Sonaversity, Edition 2018.


**REFERENCES**


1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 2012.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2016.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
4. R.Subramanian, "Professional Ethics ",Oxford University Press , Second Edition, 2017.

# Open Electives
# CIVIL

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| U19CE1004 | DISASTER MANAGEMENT | 3 | 0 | 0 | 3 |

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

| | |
|---|---|
| **1.** | Provide knowledge on the types and effects of disasters. |
| **2.** | Impart basic knowledge to reduce the impact of disasters. |
| **3.** | Understand the relationship and impact of development projects on environment and society. |
| **4.** | Disseminate the National policy and role played by our country during disasters. |
| **5.** | Provide basic knowledge in assessment of disasters with case study. |

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

| | |
|---|---|
| **CO1** | Distinguish various types of disasters, their causes and impacts on environment and society (K2) |
| **CO2** | Explain different phases of disaster management cycle (K3) |
| **CO3** | Assess vulnerability and prepare disaster risk reduction measures (K4) |
| **CO4** | Explain the vulnerability profile of India(K5) |
| **CO5** | Prepare hazard zonation maps for all types of hazards (K4) |

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

**CO – PO Mapping**

| Cos | Pos | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | POS |
| CO1 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO** | **3** | **2.6** | **3** | **2.6** | **2.6** | **2.8** | **3** | **2.8** | **2.8** | **2.8** | **2.8** | **3** | **2.8** | **2.8** |

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

| UNIT-I | INTRODUCTION TO DISASTERS | 9 Hours |
|---|---|---|

Definitions: Disaster, Hazard, Vulnerability, Resilience, Disaster Preparedness - Classification of Disasters - Causes for Disasters - Impacts of Disasters on Society, Environment, Economics, Politics, Health, etc. - Types of Vulnerability - The Sphere Project

| UNIT-II | APPROACHES TO DISASTER RISK REDUCTION | 9 Hours |
|---|---|---|

Phases of Disaster Management Cycle - Culture of safety, prevention, mitigation, and preparedness - Community-based Disaster Risk Reduction - Structural and Non-structural mitigation measures

| UNIT-III | INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT | 9 Hours |
|---|---|---|

Linkage between Development and Disasters -Impact of Development Projects on Environment and Society - Climate Change Adaptation - IPCC - India's Participation - Relevance of Indigenous Knowledge, Appropriate Technology, and Local Resources

| UNIT-IV | DISASTER RISK MANAGEMENT IN INDIA | 9 Hours |
|---|---|---|

Hazards-Vulnerability Profile of India - Components of Disaster Relief: Water, Sanitation, Food, Shelter, Health, etc. - National Policy and Disaster Management - Institutional Framework for Disaster Management in India - Role of NGOs in Disaster Risk Reduction - Role of Armed Forces during Disasters

| UNIT-V | DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS | 9 Hours |
|---|---|---|
| Application of Information Technology, Remote Sensing Technology, and Geographic Information System in Disaster Risk Reduction - Case Studies on Landslide Hazard Zonation, Seismic Assessment of Buildings and Infrastructures, Drought Assessment, Coastal Flooding Assessment, Storm Surge Assessment, Fluvial and Pluvial Floods Assessment, Forest Fires Assessment | | |
| | | **TOTAL: 45 Hours** |

| **TEXT BOOKS:** | |
|---|---|
| 1. | Singhal J.P. "Disaster Management", Laxmi Publications, 2010. |
| 2. | Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. |
| 3. | Pardeep Sahni and Madhavi Malalgoda Ariyabandu, "Disaster Risk Reduction in South Asia", PHI Learning Private Limited, Delhi- 110092, 2017 |
| 4. | Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 |
| 5. | Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010. |
| **REFERENCES:** | |
| 1. | Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005 |
| 2. | Government of India, National Disaster Management Policy,2009. |

**Sona College of Technology, Salem**
**(An Autonomous Institution)**
**Courses of Study for B.E. / B.Tech. Semester VIII Regulations 2019**
**Branch: Civil Engineering**

| S. No | Course Code | Course Title | Lecture | Tutorial | Practical | Credit | Total Contact Hours |
|---|---|---|---|---|---|---|---|
| **Practical** | | | | | | | |
| 1 | U19CE801 | Project Work | 0 | 0 | 24 | 12 | 360 |
| | | | | | **Total Credits** | **12** | |

**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 Engineering, Eighth Semester BE Civil Students and Staff, COE