SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E- Civil Engineering

CURRICULUM and SYLLABI

[For students admitted in 2020-2021]

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**

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

Sona College of Technology, Salem – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Civil Engineering

S.N	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
	Theory							
1	U19ENG201A	English for Engineers-II	2	0	2	3	HSMC	60 (30L+30P)
2	U19MAT202A	Differential Equations and Vector Calculus	3	1	0	4	BSC	60
3	U19PPR205	Problem Solving Using Python Programming	3	0	0	3	ESC	45
4	U19BEE206	Basics of Electrical and Electronics Engineering	3	0	0	3	ESC	45
5	U19CE201	Basics of Engineering Mechanics	3	1	0	4	ESC	60
	Practical							
6	U19BEE207	Basics of Electrical Engineering Laboratory	0	0	2	1	ESC	30
7	U19PCL208A	Physics and Chemistry Laboratory-II	0	0	3	1.5	BSC	45
8	U19PPL211	Python Programming Laboratory	0	0	2	1	ESC	30
9	U19GE201	Basic Aptitude-II	0	0	2	0	EEC	30
					Total Credits	**20.5**		
	Optional Language Elective*							
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	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**

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT301A	Fourier Analysis and Statistics	3	1	0	4	60
2	U19CE301	Mechanics of Fluids	2	1	0	3	45
3	U19CE302	Strength of Materials -I	2	1	0	3	45
4	U19CE303	Construction Materials and Practices	3	0	0	3	45
5	U19CE304	Surveying	3	0	0	3	45
6	U19GE302	**Mandatory Courses :** Environment and Climate Science	2	0	0	0	30
Practical							
7	U19CE305	Materials Testing Laboratory	0	0	2	1	30
8	U19CE306	Survey Laboratory	0	0	2	1	30
9	U19ENG301	Communication Skill Laboratory	0	0	2	1	30
10	U19GE301	Soft Skills and Aptitude-I	0	0	2	1	30
					Total Credits	**20**	

Approved By

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Member Secretary, Academic Council
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Copy to:-

HOD/Civil Engineering, Third Semester BE Civil Students and Staff, COE

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19CE401	Environmental Engineering	3	0	0	3	45
2	U19CE402	Strength of Materials-II	2	1	0	3	45
3	U19CE403	Transportation Engineering	3	0	0	3	45
4	U19CE404	Concrete Technology	3	0	0	3	45
5	U19CE901	**Professional Elective -** Application of IoT for Civil Engineering	3	0	0	3	45
	U19CE903	**Professional Elective -** Elements of Building Planning					
6	U19GE403	**Mandatory Course** - Essence of Indian Traditional Knowledge	2	0	0	0	30
Practical							
7	U19CE405	Fluid Mechanics Laboratory	0	0	2	1	30
8	U19CE406	Concrete and Highway Laboratory	0	0	2	1	30
9	U19CE407	Environmental Engineering Laboratory	0	0	2	1	30
10	U19GE401	Soft Skills and Aptitude-II	0	0	2	1	30
					Total Credits	**19**	

Approved By

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

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

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HOD/Civil Engineering, Fourth Semester BE Civil Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester V under 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	U19CE906	**Professional Elective -** Housing Planning and Management	3	0	0	3	45
	U19CE907	**Professional Elective -** Architecture and Town Planning					
5	noc22_ce92	**NPTEL -** Availability and Management of Groundwater Resources	3	0	0	3	45
Open Elective							
6	U19CS1002	Cloud Computing	3	0	0	3	45
	U19CS1004	Mobile Application Development					
	U19CS1006	Data Science					
	U19EC1001	Biomedical Instrumentation and Measurements					
	U19EC1002	Embedded and Real Time Systems					
	U19EC1003	Sensors and Smart Structures Technologies					
	U19EC1005	Signal and Image Processing					
	U19MC1004	Fundamentals of Robotics					

Practical							
7	U19CE504	Survey Camp	0	0	2	1	30
8	U19CE505	Computer Aided Civil Engineering Drawing	0	0	2	1	30
9	U19CE506	Soil Mechanics Laboratory	0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude-III	0	0	2	1	30
					Total Credits	**22**	

Approved By

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HOD/Civil Engineering, Fifth Semester BE Civil Students and Staff, COE

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	U19CE913	**Professional Elective** - Smart Structures and Smart Materials	3	0	0	3	45
	U19CE917	**Professional Elective** - Prefabricated Structures					
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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Member Secretary, Academic Council
Dr.R.Shivakumar

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

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HOD/Civil Engineering, Sixth Semester BE Civil Students and Staff, COE

Civil
VII
2019-Batch

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech, Semester VII - 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	-	Professional Elective *	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
	U19CS1003	Internet of Things					
	U19EC1003	Sensors and Smart Structures Technologies					
	U19EC1006	Mobile Technology and Its Applications					
	U19EE1002	Energy Conservation and Management					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19EE1004	Renewable Energy Systems					
	U19IT1001	Problem Solving Techniques using Java Programming					
	U19MC1004	Fundamentals of Robotics					
	U19ME1002	Industrial Safety					
		Practical					
7	U19CE704	Estimation and quantity surveying	0	0	4	2	60
8	U19CE705	Design Project	0	0	4	2	60
9	U19CE706	Internship	0	0	0	2	60
10	U19CE707	Industrial Lecture	0	0	2	0	30
					Total Credits	**24**	**480**

VII

***Industry oriented course (Building Information Modeling – 3 credits) conducted by L&T Edutech. Students skip one professional elective in 7th semester by credit transfer by the above Industrial oriented course.**

ApprovedBy

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/CivilEngineering, Seventh Semester BE Civil Students and Staff, COE

Civil
VIII

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**	**360**

Approved By

Chairperson, Civil Engineering BoS
Dr.R.Malathy

Member Secretary, Academic Council
Dr.R.Shivakumar
20/12/23

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar
28/12/23

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HOD/Civil Engineering, Eighth Semester BE Civil Students and Staff, COE

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

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2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS
3	U19PHY103A	Physics for Civil Engineering	3	1	0	4	BS
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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					
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HOD/Civil, First Semester BE Civil Students and Staff, COE

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 – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2019 (CBCS)
Branch: Civil Engineering

S.N	Course Code	Course Title	L	T	P	C	Category	Total Contact Hours
	Theory							
1	U19ENG201A	English for Engineers-II	2	0	2	3	HSMC	60 (30L+30P)
2	U19MAT202A	Differential Equations and Vector Calculus	3	1	0	4	BSC	60
3	U19PPR205	Problem Solving Using Python Programming	3	0	0	3	ESC	45
4	U19BEE206	Basics of Electrical and Electronics Engineering	3	0	0	3	ESC	45
5	U19CE201	Basics of Engineering Mechanics	3	1	0	4	ESC	60
	Practical							
6	U19BEE207	Basics of Electrical Engineering Laboratory	0	0	2	1	ESC	30
7	U19PCL208A	Physics and Chemistry Laboratory-II	0	0	3	1.5	BSC	45
8	U19PPL211	Python Programming Laboratory	0	0	2	1	ESC	30
9	U19GE201	Basic Aptitude-II	0	0	2	0	EEC	30
					Total Credits	**20.5**		
	Optional Language Elective*							
10	U19OLE1201	French	0	0	2	1	HSMC	30
11	U19OLE1202	German						
12	U19OLE1203	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 Engineering Students and Staff, COE

L T P C
2 0 2 3

U19ENG201A-English for Engineers – II

Common to Civil Branch

Course Outcome: At the end of 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.

	COURSE OUTCOMES	PROGRAMME OUTCOMES													
		1	2	3	4	5	6	7	8	9	10	11	12	Pso 1	Pso 2
1	Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.	2	2	3	2	2	2	3	3	3	3	3	3	3	3
2	Develop and demonstrate listening skills for academic and professional purposes	2	2	1	2	3	2	3	3	3	3	3	3	3	3
3	Draw conclusions on explicit and implicit oral information	3	2	3	2	3	2	3	3	3	3	3	3	3	3
4	Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary	2	2	2	2	2	2	3	3	3	3	3	3	3	3
5	Read for gathering and understanding information, following directions and giving responses.	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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, grammatical structures
- 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.

Textbook:

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.

Reference

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.

B. E. / CIVIL ENGINEERING

SEMESTER – II	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	L	T	P	C
U19MAT202A		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.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2							2	2	
CO2	3	3	2	3	2							2	2	
CO3	3	3	2	3	2							2	2	
CO4	3	3	2	3	2							2	2	
CO5	3	3	2	3	2							2	2	

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.

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. 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.

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U19PPR205 PROBLEM SOLVING USING PYTHON PROGRAMMING 3 0 0 3

COURSE OUTCOMES

At the end of 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.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3									3	3
CO2	2	3	3	3	3								3	2
CO3	2	3	3	3	3								3	2
CO4	2	3	3	3	3								3	2
CO5	2	3	3	3	3								3	2

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

TEXT BOOK

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)

REFERENCES

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education, 2018.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. 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.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1	1	1	2	-	-	1	1	1	1
CO2	2	2	1	1	1	1	1	-	-	-	1	1	1	1
CO3	2	2	1	1	1	1	1	-	-	-	1	1	1	1
CO4	2	2	1	1	1	1	1	-	-	-	1	1	1	1
CO5	2	2	1	2	1	1	1	2	-	-	1	1	1	1

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 **9**

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 InternationalPublishers, 2006
3. R. S. Khurmi, " Engineering Mechanics", S. Chand Publishers, 2018.
4. Dr. N. Kotteswaran, "Engineering Mechanics – Statics & Dynamics", SriBalaji Publications 2004.

U19BEE207 BASIC OF ELECTRICAL ENGINEERING LABORATORY

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.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1	1	1	2	-	-	1	1	1	1
CO2	2	2	1	1	1	1	1	-	-	-	1	1	1	1
CO3	2	2	1	1	1	1	1	-	-	-	1	1	1	1

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

After successful completion of this course, the students should be able to

CO1:	Apply the principles of Optics, Electricity and Elasticity to determine the Engineering properties of materials.
CO2:	Identify hardness and suggest the quality of water suitable for domestic purpose and analyze the concentration of carbonate, bicarbonate and hydroxide present in the given sample of water.
CO3:	Determine the resistivity of the given copper turn used for house hold applications and determine the amount of pH of house hold water sample and suggest the remedial measures.

Pre-requisite: Capable of using Screw guage, Vernier calliper, Travelling microscope, Spectrometer, able to handle burette and pipette

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			1		1					1			2
CO2	3			1		1					1			2
CO3	3			1		1					1			2

Course Assessment methods

Direct		Indirect
Mean of 1st half of Experiment (10) Quiz on 1st half (5) Internal test I (10) Mean of 2nd half of Experiment (10)	Quiz on 2nd half (5) Internal test II (10) RTPS (10) End semester Examination (40)	Course end survey

List of Experiments (Physics part)

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.

List of Experiments (Chemistry part)

7	Estimation of hardness of water sample by EDTA method.
8	Estimation of alkalinity of water sample by indicator method.
9	Estimation of HCl by pH metry.
10	Estimation of HCl by conductometry. (HCl vs NaOH)
11	Estimation of ferrous ion by potentiometric titration.

12	Evaluate the iron content of the water by spectrophotometry.
	Total Hours: 45 Hrs

U**19PPL211** **PYTHON PROGRAMMING LABORATORY** **0 0 2 1**

COURSE OUTCOMES

At the end of 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

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

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 Regulations 2019
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19MAT301A	Fourier Analysis and Statistics	3	1	0	4	60
2	U19CE301	Mechanics of Fluids	2	1	0	3	45
3	U19CE302	Strength of Materials -I	2	1	0	3	45
4	U19CE303	Construction Materials and Practices	3	0	0	3	45
5	U19CE304	Surveying	3	0	0	3	45
6	U19GE302	**Mandatory Courses :** Environment and Climate Science	2	0	0	0	30
Practical							
7	U19CE305	Materials Testing Laboratory	0	0	2	1	30
8	U19CE306	Survey Laboratory	0	0	2	1	30
9	U19ENG301	Communication Skill Laboratory	0	0	2	1	30
10	U19GE301	Soft Skills and Aptitude-I	0	0	2	1	30
					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

B. E. CIVIL ENGINEERING

SEMESTER – III	FOURIER ANALYSIS AND STATISTICS	L	T	P	C
U19MAT301A		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 measures of central tendency and dispersion to the given data and analyze the results.
5. apply the concepts of correlation and regression to the given data and analyze the result.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2							2	2	
CO2	3	3	2	3	2							2	2	
CO3	3	3	2	3	2							2	2	
CO4	3	3	2	3	2							2	2	
CO5	3	3	2	3	2							2	2	

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 – Diagrammatic representation – Simple, subdivided and multiple bar diagrams – Pie diagram – Pictograph – Graphs of frequency distribution – Histogram – Frequency polygon – Frequency curve – Cumulative frequency curve.

UNIT – IV MEASURES OF CENTRAL TENDENCY AND DISPERSION 12

Measures of central tendency (Simple arithmetic mean, median and mode) – Quartiles – Measures of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation and 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.

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20. 05. 2020 **B. E. / B. Tech. Regulations 2019**

COURSE CODE	COURSE NAME	L	T	P	C
U19CE301	MECHANICS OF FLUIDS	2	1	0	3

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

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

CO1	Describe the fundamental and physical properties of a fluid (K2)
CO2	Imbibe basic laws and equations used for analysis of static and dynamic fluids (K2)
CO3	Evaluate the fluid velocity considering major and minor losses; and also understand the application of Equations of motion & Conservation of momentum to different fluids (K3)
CO4	Apply the Boundary layer concept for different fluid flow types (K3)
CO5	Apply the similitude concept and set up the relation between a model and a prototype (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
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	FLUID PROPERTIES AND FLUID STATICS	9 Hours

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 Hours

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 Hours

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 Hours

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 Hours

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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE302	Strength of Materials -I	2	1	0	3

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

1.	Inculcate the basic knowledge on the stress-strain and its application in civil engineering structures.
2.	Develop the ability of students to carry out analysis of complex state of stress.
3.	Analyse and understand different internal forces and stresses induced dueto representative loads on structural elements.
4.	Aware the student about different types of stresses induced in beams and shafts dueto bending and twisting moments respectively
5.	Evaluate the behaviour of torsional member and application in springs.

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

CO1	Comprehend the state of stresses and strains in various structural components under all types of forces.(**K2**)
CO2	Determine principal stresses and planes for an element in two and three dimensional state of stress.(**K4**)
CO3	Draw the Shearing force and bending moment diagrams for beams subjected to all the types of loading.(**K3**)
CO4	Calculate bending and shearing stresses of beam under flexure and shear.(**K4**)
CO5	Ideas of torsional stresses and how to evaluate it in circular sections and its applications in spring analysis.(**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	POS2
CO1	3	2		2				3					2	
CO2	3	2		2				3					2	
CO3	3	2		2				3					2	
CO4	3	2		2				3					2	
CO5	3	2		2				3					2	
CO (Avg)	**3**	**2**		**2**				**3**					**2**	

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

UNIT-I	SIMPLE STRESSES	9 Hours

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 Hours

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

UNIT-III	SHEARING FORCE AND BENDING MOMENT	9 Hours

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 Hours

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 Hours

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: 45 Hours

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.
3.	Bhavikatti. S., “Solid Mechanics”, Vikas publishing house Pvt. Ltd, New Delhi, 2010.
4.	Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van NosReinbhold, New Delhi1995.
5.	S.S. Rattan “ Strength of Materials” McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013)

COURSE CODE	COURSE NAME	L	T	P	C
U19CE303	CONSTRUCTION MATERIALS AND PRACTICES	3	0	0	3

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

1.	Impart the basic knowledge about building construction and types of buildings with requirements
2.	Acquaint the various building materials
3.	Expound the concrete making materials with its desirable properties
4.	Elucidate the various construction practices
5.	Explicate the function and classification of various building components and form works

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

CO1	Familiarize the Building components and its function.(K2)
CO2	Choose effective brick, timber, roofing materials in the field.(K2)
CO3	Select suitable type of concrete making materials.(K2)
CO4	Practice various construction techniques in the field.(K3)
CO5	Understand the Function and location of doors, windows and stair case.(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	INTRODUCTION TO BUILDING CONSTRUCTION	9 Hours

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 Hours

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 Hours

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 Hours

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	BUILDING COMPONENTS AND FORMWORKS	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.	Rajput R K., "Engineering Materials", S Chand and Company Ltd, 2014.
2.	Arora S.P and Bindra S.P, "Building Construction", DhanpatRai 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", McGraw Hill Education (India) Private Limited, New Delhi, 2015.
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
U19CE304	SURVEYING	3	0	0	3

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

1.	Study the basics of linear/angular measurement methods like Chain surveying,Compass surveying
2.	Know the basics of levelling and theodolite survey in elevation and angular measurements
3.	understand tacheometric surveying in distance and height measurements
4.	Know the setting out of simple curves by linear and instrument method
5.	study the total station surveying

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

CO1	Conduct linear and angular measurement survey with the help of chain, tape and compass.**(K1)**
CO2	Determine the horizontal and vertical distance by traversing using theodolite and measure difference in elevation and produce reduced level of the given points.**(K3)**
CO3	Describe the methods of Tacheometric surveying and contouring. **(K1)**
CO4	Describe the methods of setting out curves in the field and to determine the area and volume of structures.**(K1)**
CO5	Handle total station instrument for making the horizontal and vertical measurements.Conduct the global positioning system for determining geographical location of the site.**(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	2	3	1	1	3	3	2	1	-	-	2	3	2
CO2	3	3	2	2	2	3	2	1	1	-	-	3	1	2
CO3	3	2	2	2	2	2	3	-	1	-	-	2	1	2
CO4	2	2	3	2	2	2	3	3	2	-	-	2	2	2
CO5	2	3	3	2	2	2	3	1	2	-	-	2	2	2
CO (Avg)	**3.2**	**2.4**	**2.6**	**1.8**	**1.8**	**2.4**	**2.8**	**1.4**	**1.4**			**2.2**	**1.8**	**2**

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

UNIT-I	FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING	9 Hours

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 Hours

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 levelling: Heights and distances - Base of the object accessible and inaccessible.

UNIT-III	TACHEOMETRIC SURVEYING AND CONTOURS	9 Hours

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	CURVESAND TRIANGULATION	9 Hours

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 Hours

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 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
U19CE305	MATERIAL TESTING LABORATORY	0	0	2	1

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

1.	Provide basic knowledge on properties of various construction materials.
2.	Acquaint with the experimental methods to determine the mechanical properties of materials.
3.	Provide knowledge in design of concrete structures, soil subgrade and pavements.

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

CO1	Determine the physical properties of given cement, fine aggregates coarse aggregates and wooden sample. **(K4)**
CO2	Evaluate Modulus of elasticity, torsional strength, hardness and tensile strength of given specimens. **(K5)**
CO3	Apply the technical concepts and ways to solve engineering problems through conducting experiments. **(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	1	1	1	1	1	1	2	1	-	-	2	1	2
CO2	3	2	3	1	2	1	1	2	1	-	-	2	1	2
CO3	3	3	3	3	2	2	2	3	2	1	1	3	1	2
CO (Avg)	**3**	**2**	**2.3**	**1.7**	**1.7**	**1.3**	**1.3**	**2.3**	**1.3**	**0.3**	**0.3**	**2.3**	**1**	**2**

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

COURSE CONTENT

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-Sieve Analysis-Fineness modulus.

Coarse aggregate: Specific gravity test-Crushing strength-Impact strength-Shape test-Water absorption- Sieve 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.

TOTAL: 30 Hours

REFERENCES:

1.	M. S. Shetty, "Concrete Technology - Theory and Practice", S. Chand Publications, 2006
2.	IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by dry sieving.
3.	IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete
4.	IS 383– 1970 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.
5.	IS 456-2000 Code of Practice is an Indian Standard code for Plain and Reinforced Concrete

COURSE CODE	COURSE NAME	L	T	P	C
U19CE306	SURVEYING LABORATORY	0	0	2	1

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 in all the related calculations and in the preparation of the required maps.
3.	To impart intensive training in the use of surveying instruments
4.	To train the students to appreciate practical difficulties in surveying on the field.
5.	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	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.
CO2	Use modern surveying instruments like total station and GPS.
CO3	Apply the technical concepts and ways to solve engineering problems by conducting experiments.

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	3	3	2	2	2	2
CO2	3	3		2		2		2	3	3	2	2	2	2
CO3	3	3		2		2		2	3	3	2	2	2	2
CO (Avg)	**3**	**3**		**2**		**2**		**2**	**3**	**3**	**2**	**2**	**2**	**2**

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

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

Centre line marking for single Room and Double Room

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.

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:** a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making **e.** Public speaking **f.** Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. **Vedic Maths:** Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. **Numbers:** Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. **Averages:** Basics of averages and weighted average. d. **Percentages**: Basics of percentage and Successive percentages. e. **Ratio and proportion:** Basics of R &P, Alligations, Mixture and Partnership. f. **Profit ,Loss and Discount**: Basic & Advanced PLD g. **Data Interpretation**: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. 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:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures 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 Regulations 2019
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19CE401	Environmental Engineering	3	0	0	3	45
2	U19CE402	Strength of Materials-II	2	1	0	3	45
3	U19CE403	Transportation Engineering	3	0	0	3	45
4	U19CE404	Concrete Technology	3	0	0	3	45
5	U19CE901	**Professional Elective -** Application of IoT for Civil Engineering	3	0	0	3	45
	U19CE903	**Professional Elective -** Elements of Building Planning					
6	U19GE403	**Mandatory Course** - Essence of Indian Traditional Knowledge	2	0	0	0	30
Practical							
7	U19CE405	Fluid Mechanics Laboratory	0	0	2	1	30
8	U19CE406	Concrete and Highway Laboratory	0	0	2	1	30
9	U19CE407	Environmental Engineering Laboratory	0	0	2	1	30
10	U19GE401	Soft Skills and Aptitude-II	0	0	2	1	30
					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

COURSE CODE	COURSE NAME	L	T	P	C
U19CE401	Environmental Engineering	3	0	0	3

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

1.	Understand the various characteristics of Water so that its effective usage for various purposes can be obtained.
2.	Apply the various design criteria for the development of diverse unit operators and processes to have an effective water treatment system.
3.	Recognize the concepts behind the various types of Wastewater handling and their effective disposal.
4.	Utilize the various design concepts for effective planning of Wastewater treatment units.
5.	Determine appropriate cutting-edge Wastewater treatment techniques as per disposal norms.

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

CO1	Identify the quantity and quality of water from various sources and the processes involved in the water conveyance systems. **(K1)**
CO2	Infer the design principles of unit operations and processes for water treatment. **(K2)**
CO3	Illustrate the design concepts and implementation of sewage transmission systems. **(K2)**
CO4	Design various sewage treatment systems. **(K3)**
CO5	Justify the suitable advanced treatment techniques for water and wastewater treatment. **(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	3	2	1	1	1	2	1	-	-	-	-	2	1
CO2	3	3	2	2	1	2	2	2	-	-	-	-	1	1
CO3	3	3	2	2	1	2	2	2	-	-	-	-	2	1
CO4	3	3	2	1	1	1	2	2	-	-	-	-	1	1
CO5	3	3	2	2	1	2	1	2	-	-	-	-	2	2
CO (Avg)	**3**	**3**	**2**	**1.6**	**1**	**1.6**	**1.8**	**1.8**	**-**	**-**	**-**	**-**	**1.6**	**1.2**

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

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

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 Hours

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 Hours

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	SEWAGE TREATMENT AND DESIGN PRINCIPLES	9 Hours

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 Hours

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

TOTAL: 45 Hours

TEXTBOOKS:	
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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE402	Strength of Materials-II	2	1	0	3

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

1.	Determine the deflection of the beam based on the various methods.
2.	Analysis of the truss components using the method of joints, section, and tension coefficient.
3.	Apply knowledge and design columns for axial and bending.
4.	Calculation of Principal stress and strain for thin and compound cylinder
5.	Determining the stresses in unsymmetrical and curved beams.

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

CO1	Establish the slope and deflection in beams by using various methods. **(K2)**
CO2	Determine the forces in plane truss members **(K3)**
CO3	Familiarize the behavior of columns under axial and eccentric loads. **(K3)**
CO4	Examine the problems related to thin and thick cylinders subjected to fluid pressure and study the various theories of failures. **(K4)**
CO5	Determine the stresses due to the Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams. **(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	3	2	1	1	1	0	0	0	0	2	2	3	3
CO2	3	3	3	3	1	1	0	0	0	0	2	3	2	2
CO3	2	3	3	2	1	1	0	0	0	0	2	3	3	2
CO4	2	2	2	1	1	1	0	0	0	0	2	2	2	2
CO5	2	3	2	2	1	1	0	0	0	0	2	2	1	1
CO (Avg)	**2.4**	**2.8**	**2.4**	**1.8**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**2.4**	**2.2**	**2**

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

UNIT-I	DEFLECTION OF DETERMINATE BEAMS	6+3 = 9 Hours

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 = 9 Hours

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 = 9 Hours

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 = 9 Hours

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 = 9 Hours

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

TOTAL: 30+15= 45

TEXTBOOKS:	
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.	Ratan.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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE403	Transportation Engineering	3	0	0	3

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

1.	Understand the concept of highway development and different cross-sectional elements in the highway.
2.	Capability to know about the highway materials and design of pavements as per IS code.
3.	Apply knowledge and be able to design the pavements using IRC standards.
4.	Associate the concepts of railway planning and be able to design the permanent way.
5.	Able to locate the plan and also design the airport components.

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

CO1	Explain the various highway development and design cross-section elements. **(K1)**
CO2	Determine the characteristics of pavement materials and design of pavement as per IRC. **(K2)**
CO3	Design of pavement as per IRC. **(K3)**
CO4	Apply the concepts of railway planning while designing the permanent way. **(K4)**
CO5	Plan the locations and design of the airport components. **(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	3	3	2	3	1	1	1	3	3	3	3	3	3
CO2	3	3	3	2	2	2	1	1	3	2	3	2	3	2
CO3	-	-	3	-	-	-	-	-	2	-	-	-	3	2
CO4	3	1	1	1	1	1	1	2	2	1	2	2	3	2
CO5	3	3	3	2	3	1	1	1	3	1	1	2	3	2
CO (Avg)	**3**	**2.5**	**2.6**	**1.75**	**2.25**	**1.25**	**1**	**1.25**	**2.6**	**1.75**	**2.25**	**2.25**	**3**	**2.2**

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

UNIT-I	INTRODUCTION TO HIGHWAY	9 Hours

Introduction to Highway, classification of roads, highway planning-Road cross section-Camber, gradient, superelevation-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 Hours

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 Hours

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 Hours

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. A 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 Hours

Introduction to air transport –Site selection- Airport obstructions and zoning. Components of the 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 Hours

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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE404	Concrete Technology	3	0	0	3

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

1.	Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete.
2.	Outline the importance of adding admixtures and their properties.
3.	Design a concrete mix that fulfils the required properties for fresh and hardened concrete.
4.	Summarise the concepts of conventional concrete and its differences with special concretes.
5.	Demonstrate techniques of measuring the Non-Destructive Testing of the concrete structure.

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

CO1	Determine the properties of fresh and hardened concrete. **(K2)**
CO2	Apply a suitable admixture in the required field conditions. **(K4)**
CO3	Design the concrete mix using ACI and IS code methods. **(K3)**
CO4	Evaluate the properties and applications of special concretes. **(K1)**
CO5	Diagnose the strength and durability of concrete structures with different testing methods. **(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	2	1	2	2	2	3	1	2	1	-	2	-	2
CO2	3	2	2	2	2	2	3	1	2	1	-	2	-	2
CO3	3	2	3	2	2	2	3	1	2	1	-	2	-	2
CO4	3	2	2	2	2	2	3	1	2	1	-	2	-	2
CO5	3	2	2	2	2	2	3	1	2	1	-	2	-	2
CO (Avg)	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**1**	**2**	**1**	**-**	**2**	**-**	**2**

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

UNIT-I	FRESH AND HARDENED CONCRETE	9 Hours

Fresh concrete: Mechanism of hydration-Water-Cement ratio-Factors affecting the 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 seawater for mixing Concrete. Hardened concrete: Properties and tests-Strength of concrete - Temperature effects - Creep of concrete -Thermal properties of concrete - Micro cracking of the concrete

UNIT-II	ADMIXTURES	9 Hours

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

UNIT-III	MIX DESIGN	9 Hours

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 Hours

Special concretes: Lightweight 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 Hours

Non-destructive tests: Rebound hammer-Ultra sonic pulse velocity test. The 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 Hours

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.	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.
4.	Shetty, M.S., "Concrete Technology", Theory & Practice, S.Chand and Co, 2019.
5.	Bhavikatti S S, "Concrete Technology", I.K. International Publishing House Pvt. Limited, 2015.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE405	Fluids Mechanics Laboratory	0	0	2	1

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

1.	To provide practical knowledge in the verification of principles of fluid flow.
2.	To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps.
3.	To impart knowledge in measuring pressure, discharge, and velocity of fluid flow.

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

CO1	Measure the flow, discharge, and energy loss in pipes and open channels. **(K2)**
CO2	Demonstrate the characteristics curves of pumps and turbines. **(K3)**
CO3	Apply the technical concepts and ways to solve engineering problems by conducting experiments. **(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	2	2	3	3	1	2	1	1	1	1	2	1	2	2
CO2	2	3	3	3	2	2	2	1	1	1	2	2	2	2
CO3	2	3	2	2	2	2	2	1	1	1	3	3	2	2
CO (Avg)	**2**	**2.6**	**2.6**	**2.6**	**1.6**	**2**	**1.6**	**1**	**1**	**1**	**2.3**	**2**	**2**	**2**

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

List of experiments

1.	Flow-through venturi 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 the impact of jet on a flat plate (normal/inclined)

TOTAL: 30 Hours

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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE406	Concrete and Highway Laboratory	0	0	2	1

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

1.	To impart knowledge in studying the behaviour of concrete in fresh and hardened conditions.
2.	To gain knowledge on the characteristics of aggregates.
3.	To understand the performance of bitumen by conducting various tests.

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

CO1	Analyze the various properties of concrete. **(K3)**
CO2	Characterize the aggregate and bitumen used for road construction. **(K2)**
CO3	Apply the technical concepts and ways to solve engineering problems by conducting experiments. **(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	2	2	3	3	1	2	1	1	1	1	2	1	2	2
CO2	2	3	3	3	2	2	2	1	1	1	2	2	2	2
CO3	2	3	2	2	2	2	2	1	1	1	3	3	2	2
CO (Avg)	**2**	**2.6**	**2.6**	**2.6**	**1.6**	**2**	**1.6**	**1**	**1**	**1**	**2.3**	**2**	**2**	**2**

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

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 Hours

REFERENCES:

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

COURSE CODE	COURSE NAME	L	T	P	C
U19CE407	Environmental Engineering Laboratory	0	0	2	1

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

1.	Understand the characteristic difference between Water and Wastewater as per Indian Standards.
2.	Acclaim suitable level of treatment for the water and wastewater samples accustomed.
3.	Assign suitable concepts for predicting the solution through the conduction of experiments over water and wastewater samples given.

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

CO1	Test the water and wastewater and their different characteristics as per standard. **(K2)**
CO2	Recommend the degree of treatment required for the water and wastewater. **(K4)**
CO3	Apply the technical concepts and ways to solve engineering problems by conducting the experiment **(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	1	1	1	1	-	1	1	-	-	-	-	1	1
CO2	2	2	1	1	2	-	2	1	-	-	-	-	1	2
CO3	1	1	1	1	1	-	1	1	-	-	-	-	1	1
CO (Avg)	**1.3**	**1.3**	**1**	**1**	**1.3**	**-**	**1.3**	**1**	**-**	**-**	**-**	**-**	**1**	**1.3**

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

List of experiments

1.	Sampling and preservation methods and significance of characterization of water and wastewater(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 Hours

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.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE901	Application of IoT For Civil Engineering	3	0	0	3

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

1.	Discuss the architecture of IoT.
2.	Know the concept of WoT.
3.	Know the Sensors used in IoT.
4.	Application of IoT in Smart Cities.
5.	Discuss the role of IoT in Environmental monitoring.

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

CO1	Understand the basic concept and pillars of IoT **(K1)**
CO2	Demonstrate the pillars and the architecture of the web of things **(K2)**
CO3	Study the suitability of IoT sensors for various applications in Civil Engineering **(K3)**
CO4	IoT tools for smart city applications **(K4)**
CO5	Monitor the environment using IoT architecture and related concepts **(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	1	2	1	3	1	1	-	-	3	2	2
CO2	3	1	3	1	2	1	3	1	1	-	-	3	2	2
CO3	3	1	3	1	1	1	3	1	1	-	-	2	2	2
CO4	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO5	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO (Avg)	**2.6**	**1.4**	**3**	**1**	**1.4**	**1**	**3**	**1.4**	**1**	**-**	**-**	**2.4**	**2**	**1.6**

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

UNIT-I	INTRODUCTION	9 Hours

Definition and functional Requirements-Motivation-Architecture-Web3.0 View of IoT-Ubiquitous IoT applications-Four pillars of IoT-DNA of IoT-The Toolkit approach for End-user participation in the Internet of Things.

UNIT-II	WEB OF THINGS	9 Hours

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

UNIT-III	IOT SENSORS	9 Hours

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

UNIT-IV	SMART CITY APPLICATION	9 Hours

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

UNIT-V	ENVIRONMENTAL MONITORING	9 Hours

Water management –Process –application. Air pollution-Methods-advantages. Water monitoring-quality standards. Indication of calamities-alert systems-applications. Smart irrigation-case study. Microclimate monitoring.

TOTAL: 45 Hours

TEXT BOOKS:

1. Arshdeepbahga, Vijay Madisetti, "Internet of things-A hands on approach" Universities press, 2015.
2. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012

REFERENCES:	
1.	Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
2.	Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010
3.	The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012
4.	Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

COURSE CODE	COURSE NAME	L	T	P	C
U19CE903	Elements of Building Planning	3	0	0	3

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

1.	Understand the concept of Building drawing and approval procedures.
2.	Analyze the requirements of Building with their standards.
3.	Signify the various types of structures with desired purposes.
4.	Understand the concept of Green building with the evaluation procedure.
5.	Prepare the documents of the building to sanction authorities.

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

CO1	Plan the residential building as per function requirements. **(K1)**
CO2	Design various elements of the building **(K3)**
CO3	Comprehend the provisions and standards of housing elements. **(K4)**
CO4	Explain the different green building rating systems with real-time examples **(K5)**
CO5	Formulate and design the housing layouts by various standards of the building **(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	2	1	3	1	1	-	-	3	2	2
CO2	3	1	3	1	2	1	3	1	1	-	-	3	2	2
CO3	3	1	3	1	1	1	3	1	1	-	-	2	2	2
CO4	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO5	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO (Avg)	**2.6**	**1.4**	**3**	**1**	**1.4**	**1**	**3**	**1.4**	**1**	**-**	**-**	**2.4**	**2**	**1.6**

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

UNIT-I	BUILDING FUNCTIONAL ELEMENTS	9 Hours

Introduction-Nomenclature of building planning and construction classification 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 Hours

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. Minimum standard dimensions of building elements-Provisions for lighting, ventilation, fire, means of access, and parking.

UNIT-III	PLANNING OF RESIDENTIAL BUILDING	9 Hours

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 the intelligent building. Fixing the position of various building components and justification.

UNIT-IV	GREEN BUILDING	9 Hours

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 Hours

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 sanctioning authority. Conventional symbols-Preparation of the site plan, plan, elevation, and sectional drawing- Interpretation of Structural, Architectural, and services drawings.

TOTAL: 45 Hours

TEXTBOOKS:	
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.

Semester – IV	U19GE401-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:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. b. Logarithms, Inequalities and Modulus c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. d. Time and Work: Pipes & Cistern and Work Equivalence. e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. g. Binary Number System.- Binary to decimal, Octal, Hexadecimal
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions

Dr.S.Anita

Head/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 6

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

Unit II 6

- Basics of Applied Vedic Science
- 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 6

- India's contribution to science and technology (from ancient to modern)
- 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

Dr. M. Raja
Course Coordinator / Sciences

23/1/2021

Dr. C. Shanthi
HOD / Sciences

Dr. M. Renuga
Chairperson BOS,
Science and Humanities

23.01.2021 **B.E. / B.Tech. Regulations 2019**

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester V under 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	U19CE906	**Professional Elective -** Housing Planning and Management	3	0	0	3	45
	U19CE907	**Professional Elective -** Architecture and Town Planning					
5	noc22_ce92	**NPTEL -** Availability and Management of Groundwater Resources	3	0	0	3	45
Open Elective							
6	U19CS1002	Cloud Computing	3	0	0	3	45
	U19CS1004	Mobile Application Development					
	U19CS1006	Data Science					
	U19EC1001	Biomedical Instrumentation and Measurements					
	U19EC1002	Embedded and Real Time Systems					
	U19EC1003	Sensors and Smart Structures Technologies					
	U19EC1005	Signal and Image Processing					
	U19MC1004	Fundamentals of Robotics					

Practical							
7	U19CE504	Survey Camp	0	0	2	1	30
8	U19CE505	Computer Aided Civil Engineering Drawing	0	0	2	1	30
9	U19CE506	Soil Mechanics Laboratory	0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude-III	0	0	2	1	30
					Total Credits	**22**	

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, 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

Influence 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 -√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 REINFORCED CONCRETE 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 CIVIL ENGINEERING DRAWING	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
U19CE906	HOUSING PLANNING AND MANAGEMENT	3	0	0	3

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

1.	Provide knowledge on the building planning and design.
2.	Impart the basic knowledge in the evaluation, construction and financing of housing projects.
3.	Provide the basic knowledge of site analysis and site plan.
4.	Aware the students aboutcost effective construction materials and methods.
5.	Provide basic knowledge in the housing finance and project appraisal.

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

CO1	Develop comprehensive knowledge about planning, design, evaluation, construction of housing projects**(K1)**
CO2	Create awareness about sustainable housing policies and programmes, cost effective materials and methods.**(K2)**
CO3	Impart knowledge about planning, evaluation, construction and financing of housing projects.**(K4)**
CO4	Recommend various construction strategy to save man power, materials, time and money.**(K2)**
CO5	Identify ongoing project cost effective ideas and its implementation methods.. **(K1)**

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	1	-	2	3	-	2	2	1	3	-	2	1	3	2
CO2	1	-	2	3	1	2	2	1	3	-	2	1	3	2
CO3	3	2	2	3	1	2	2	1	3	1	2	1	3	2
CO4	1	-	1	1	-	1	1	-	1	1	3	3	3	2
CO5	1	-	-	1	-	1	1	1	2	-	3	2	3	3
CO (Avg)	**1.4**	**0.4**	**1.4**	**2.2**	**0.4**	**1.6**	**1.6**	**0.8**	**2.4**	**0.4**	**2.4**	**1.6**	**3**	**2.2**

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

UNIT-I	INTRODUCTION TO HOUSING	9 Hours

Definition of basic terms - House, home, household, apartments, multi storied buildings, special buildings, objectives and strategies of national housing policies including slum housing policy, principle of sustainable housing - Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for housing at national, state and local levels.

UNIT-II	HOUSING PROGRAMMES	9 Hours

Basic concepts, contents and standards for housing programmes - Sites and services, neighborhoods- Plotted land development programs, open development plots, apartments, gated communities, townships, rental housing, co-operative housing, slum housing programmes - Slum improvement - Slum redevelopment and relocation - Use of GIS and MIS in slum housing projects, role of public housing agencies, and Private sector in supply , quality, infrastructure and pricing - Role of non-government organizations in slum housing.

UNIT-III	PLANNING AND DESIGN OF HOUSING PROJECTS	9 Hours

Formulation of housing projects - Land use and soil suitability analysis -Building bye laws and rules and development control regulations - Site analysis, layout design, design of housing units (design problems) - Housing project formulation.

UNIT-IV	CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS	9 Hours

New constructions techniques - Cost effective modern materials and methods of construction- Green building concept- Building centers - Concept, functions and performance evaluation – Introduction to Building Information Modelling (BIM)

UNIT-V	HOUSING FINANCE AND PROJECT APPRAISAL	9 Hours

Evaluation of housing projects for sustainable principles - Housing finance, Cost recovery - Cash flow analysis, subsidy and cross subsidy- Public private partnership projects - Viability gap funding - Pricing of housing units (Problems).

TOTAL: 45 Hours

TEXT BOOKS:

1.	Meera Mehta and Dinesh Mehta, “Metropolitan Housing Markets”, Sage Publications Pvt. Ltd., New Delhi, 2009.
2.	Francis Cherunilam and Odeyar D Heggade, “Housing in India”, Himalaya Publishing House, Bombay, 2005.

REFERENCES:	
1.	Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
2.	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994
3.	Government of India, National Housing Policy, 1994
4.	Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
5.	YatinPandya, "Elements of Space making", Mapin 2007.
6.	Tamilnadu combined development rules 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.

noc22_ce92 - Availability and Management of Groundwater Resources

Course layout

Week 1: Introduction of hydrological cycle, need for conservation of groundwater resources

Week 2: Geologic formations as aquifers

Week 3: Vadose and saturated zones

Week 4: Confined and unconfined aquifers and their parameters

Week 5: Porosity, permeability, transmissivity and storage coefficient

Week 6: Law of groundwater movement, Darcy's law and applications

Week 7: Estimation of Subsurface runoff, Types of wells, Well Hydraulics

Week 8: Measurement of rainfall, Index of wetness, Infiltration rate

Week 9: Estimation of Total Annual Replenishable Natural Groundwater Recharge

Week 10: Groundwater resources planning and management

Week 11: Rainwater Harvesting and Artificial groundwater recharge

Week 12: Impact of climate change on water resources

Books and references

1. Textbook of Geology- P. K. Mukerjee.
2. Textbook of Engineering & General Geology- Parbin Singh.
3. Groundwater- H. M. Raghunath
4. Hydrology and Water Resources Engineering – S.K. Garg

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. Display effective language knowledge to construct sentences with subject verb agreement and select the best alternative for the underlined parts of the sentences, and fill in the blanks in the given passages with suitable forms of words and their synonyms.

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

S. Anita

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	U19CE913	**Professional Elective** - Smart Structures and Smart Materials	3	0	0	3	45
	U19CE917	**Professional Elective** - Prefabricated Structures					
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
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, 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 two 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
U19CE913	SMART STRUCTURES AND SMART MATERIALS	3	0	0	3

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

1.	Impart the basic knowledge about different types of smart materials
2.	Incorporate the concept of smart building in practice
3.	Infuse the technology based sensors in building construction
4.	Incorporate the actuators and their implementation in building
5.	Explicate the function and classification of various building components and form works

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

CO1	Outline the fundamentals of Smart material**.(K1)**
CO2	Describe the measuring techniques using smart materials for solving civil engineering problems.
CO3	Select suitable sensors for analyzing various measurements**.(K2)**
CO4	Adapt the different actuator material in structural components**.(K3)**
CO5	Apply signal processing and control system in smart structures**.(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	2	1	3	1	2	1	2	1	1	-	-	1	1	2
CO2	3	1	3	1	2	2	1	1	1	-	-	1	2	1
CO3	3	1	2	1	3	1	3	-	1	-	-	1	2	1
CO4	2	2	3	2	2	1	1	-	3	-	-	2	1	1
CO5	3	3	1	2	1	1	2	2	1	-	-	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	INTRODUCTION	9 Hours

Introduction to smart materials and Structures - Smart-Bridge- Instrumented structures functions and response - Sensing systems – Self-diagnosis - Signal processing consideration - Actuation systems and effectors.

UNIT-II	MEASURING TECHNIQUES	9 Hours

Strain Measuring Techniques using Electrical strain .gauges, Types - Resistance- Capacitance - Inductance - Wheatstone bridges - Pressure transducers - Load cells - Temperature compensation - Strain Rosettes-Field applications.

UNIT-III	SENSORS	9 Hours

Sensing technology - Types of sensors - Physical measurement using Piezo electric strain measurement - LVDT - Fiber optic techniques .chemical and bio-chemical sensing in structural assessment - Absorptive chemical sensors - Spectroscopes - Fibre optic chemical sensing systems and distributed measurement- Field applications.

UNIT-IV	ACTUATORS AND SMART MATERIALS	9 Hours

Actuator techniques - Actuator and actuator materials - Piezoelectric and electrostrictive material - Magneto structure material - shape memory alloys - Electro rheological fluids- Electromagnetic actuation - Role of actuators and actuator materials - displacement actuators, force actuators, power actuators, vibration dampers - Field applications.

UNIT-V	SIGNAL PROCESSING AND CONTROL SYSTEMS	9 Hours

Data acquisition and processing - Signal processing and control for smart structures - Sensors as geometrical processors - Signal processing - Signal-Conditioning devices; Constant voltage, constant current and pulse drive methods; structural dynamics and identification techniques - Control system - Linear and non-linear , passive, semi-active and active control, feedback and feed forward control strategies - Field applications.

TOTAL: 45 Hours

TEXT BOOKS:	
1.	Brain Culshaw, “Smart Structure and Materials”, Artech House, 1998.
REFERENCES:	
1.	Srinath L. S, “Experimental Stress Analysis”, Tata McGraw Hill, 1998.
2.	Dally J. W, and Riley W. F, “Experimental Stress Analysis - Tata McGraw Hill, 1998.
3.	AzfalSuleman- Smart Structures, “Applications and Related Technologies”, Springer, 2002.

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

General principles -Relieving loads -Strengthening super structures: To overcome low member strength and deflection: Plating -Post stressing -Jacketing -Bonded overlays - Reinforcement addition- Ferro cement overlay; Cracking and leakage: Vacuum concrete-Gunite-Shotcrete-Epoxy injection-Mortar repair for cracks; Strengthening substructures : Shoring-Underpinning; Protection methods of corrosion: Corrosion inhibitors-Corrosion resistant steel coating -Cathodic protection;

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 , 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.	LassloMokk, "Prefabricated Concrete for Industrial and Public Sectors, AkademiaiKiado", Budapest, 1964.

OPEN ELECTIVE

Civil

PREAMBLE
To
Municipal Solid Waste Management

Solid wastes represent one of the main environmental problems in India that needs to be dealt with. In order to minimize environmental impacts and pave the way for a sustainable development, integrated and specific actions need to be adopted and implemented. Due to rapid increase in the production and consumption processes, societies generate as well as reject solid materials regularly from various sectors – agricultural, commercial, domestic, industrial and institutional. The present course covers evaluation on the type and nature of wastes, estimation of total volumes and assessment of handling, storage, transportation and disposal methods to be adopted and the potential environmental impacts.

The overall objectives of the course:

- To assess the activities involved for the proposed and determine the type, nature and estimated volumes of waste to be generated.
- To identify any potential environmental impacts from the generation of waste at the site;
- To recommend appropriate waste handling and disposal measures / routings in accordance with the current legislative and administrative requirements; and
- To categories waste material where practicable (inert material / waste fractions) for disposal considerations i.e. public filling areas / landfill.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE1002	MUNICIPAL SOLID WASTE MANAGEMENT	3	0	0	3

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

1.	Provide a broader understanding on various aspects of sources and solid waste management.
2.	Impart the basic knowledge in the methods and processing of on-site storage.
3.	Provide the basic knowledge of types of collection vehicles and transfer stations.
4.	Aware the students about different techniques involved in off-site processing.
5.	Awareness to be given on disposing the wastes using sanitary landfills.

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

CO1	Identify the sources, types and characteristics of solid wastes. **(K1)**
CO2	Choose the on-site storage methods and processing techniques. **(K2)**
CO3	Summarize the methods of collection and its components. **(K2)**
CO4	Outline the off-site processing techniques & equipment's and resource recovery from solid wastes. **(K3)**
CO5	Evaluate the processing techniques and disposal methods for managing the municipal solid wastes.**(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	-	-	-	2	2	1	-	-	-	-	2	-
CO2	3	-	-	-	-	3	2	-	-	-	-	-	2	-
CO3	3	-	-	-	-	2	2	1	-	-	-	3	2	-
CO4	3	-	-	-	3	3	2	1	-	-	-	3	2	3
CO5	3	3	3	-	3	3	2	1	-	-	-	3	2	3
CO (Avg)	**3**	**1**	**0.6**	-	**1.2**	**2.6**	**2**	**0.8**	-	-	-	**1.8**	**2**	**1.2**

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

UNIT-I	SOURCES AND TYPES	9 Hours

Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management –IOT Applications in Waste management; Public awareness; Role of NGOs; Solid waste management rules 2016 - Construction and demolition Wastes

UNIT-II	ON-SITE STORAGE AND PROCESSING	9 Hours

On-site storage methods - Materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical evaluation of options.

UNIT-III	COLLECTION AND TRANSFER	9 Hours

Methods of Residential and commercial waste collection - Collection vehicles - Manpower- collection routes - Analysis of collection systems; Transfer stations - Selection of location, operation & maintenance; options under Indian conditions - Field problems- solving

UNIT-IV	OFF-SITE PROCESSING	9 Hours

Processing techniques and equipment; Resource recovery from solid wastes - Composting, incineration, Pyrolysis - Options under Indian conditions - Case studies.

UNIT-V	DISPOSAL	9 Hours

Dumping of solid waste; Sanitary landfills - Site selection, design and operation of sanitary landfills -Leachate collection and treatment, Land fill bio reactor, Landfill capping, Landfill mining.

TOTAL: 45 Hours

TEXT BOOKS:

1.	George Tchobanoglous, "Integrated Solid Waste Management", McGraw-Hill Publishers,2003.
2.	Vesilind P.A. and Rimer A.E, "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981

REFERENCES:	
1.	Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
2.	Landreth R.E, and P.A and Rebers, “Municipal Solid Wastes –problems and Solutions”, Lewis Publishers, 2000.
3.	Ramachandra T.V, “Management of Municipal Solid Waste”, TERI press, New Delhi, 2009.
4.	Paul T Willams, “Waste Treatment and Disposal”, John Wiley and Sons, 2000
5.	http://nptel.iitm.ac.in

PREAMBLE
To
Energy Efficiency and Green Building

- Green building, or sustainable design, is the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials, and of reducing impacts on human health and the environment for the entire lifecycle of a building.
- A sustainable building or green building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use-energy, water, and materials-while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design and construction.
- Solar water heating further reduces energy costs. Onsite generation of renewable energy through solar power, wind power, hydro power, or biomass can significantly reduce the environmental impact of the building. Power generation is generally the most expensive feature to add to a building.

Green buildings are designed in such a way to reduce overall impact on environment and human health by:

- Reducing trash, pollution and degradation of environment.
- Efficiently using energy, water and other resources.
- Protecting occupant health and improving productivity.

COURSE CODE	COURSE NAME	L	T	P	C
U19CE1003	ENERGY EFFICIENCY AND GREEN BUILDING	3	0	0	3

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

1.	Describe the importance of energy resources, its availability and conservation for sustainability goals.
2.	Study and identify the methods adopted to make the building as energy efficient.
3.	Gain knowledge about use of construction materials based on embodied energy values
4.	Study about different green building rating systems with real time examples.
5.	Create awareness about clean development mechanism and the role of UNFCCC in sustainability

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

CO1	Acquire the basics understanding of green building concept and associated resources. **(K1)**
CO2	Analyze the various methods to design green building parameters. **(K3)**
CO3	Understand the availability of construction materialsfor energy efficient construction **(K4)**
CO4	Aware about the various green building rating systems prevail in the country**(K3)**
CO5	Understand the role of UNFCCC and know about clean development mechanism **(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	2	1	3	1	1	-	-	3	2	2
CO2	3	1	3	1	2	1	3	1	1	-	-	3	2	2
CO3	3	1	3	1	1	1	3	1	1	-	-	2	2	2
CO4	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO5	2	2	3	1	1	1	3	2	1	-	-	2	2	1
CO (Avg)	**2.6**	**1.4**	**3**	**1**	**1.4**	**1**	**3**	**1.4**	**1**	**-**	**-**	**2.4**	**2**	**1.6**

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

UNIT-I	INTRODUCTION	9 Hours

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 Hours

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 Hours

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 Hours

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

UNIT-V	CLEAN DEVELOPMENT MECHANISM	9 Hours

Clean Development Mechanism - CDM Benefits for energy conservation methodology and procedure - Eligibility Criteria - UNFCCC - role of UNFCCC and Government of India.

TOTAL: 45 Hours

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 , (2008) 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

Civil
VII
2019-Batch

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech, Semester VII - 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	-	Professional Elective *	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
	U19CS1003	Internet of Things					
	U19EC1003	Sensors and Smart Structures Technologies					
	U19EC1006	Mobile Technology and Its Applications					
	U19EE1002	Energy Conservation and Management					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19EE1004	Renewable Energy Systems					
	U19IT1001	Problem Solving Techniques using Java Programming					
	U19MC1004	Fundamentals of Robotics					
	U19ME1002	Industrial Safety					
		Practical					
7	U19CE704	Estimation and quantity surveying	0	0	4	2	60
8	U19CE705	Design Project	0	0	4	2	60
9	U19CE706	Internship	0	0	0	2	60
10	U19CE707	Industrial Lecture	0	0	2	0	30
					Total Credits	**24**	**480**

VII

***Industry oriented course (Building Information Modeling – 3 credits) conducted by L&T Edutech. Students skip one professional elective in 7th semester by credit transfer by the above Industrial oriented course.**

ApprovedBy

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/CivilEngineering, Seventh Semester BE Civil Students and Staff, COE

Civil
VII-Sem
2020-Batch

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.

5/7/2022

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COURSE CODE	COURSE NAME	L	T	P	C
U19CE702	CONSTRUCTION ENGINEERING 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

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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 (Avg)	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

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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 (Avg)	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 (Avg)	3	3	3	3	2	2	3	1	3	2	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.

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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 (Avg)	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 (Avg)	3	3	3	3	2	2	3	2	3	2	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.

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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 (Avg)	**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.

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COURSE CODE	COURSE NAME	L	T	P	C
U19CE1001	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.

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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 (Avg)	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.

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U19CS1003 INTERNET OF THINGS 3 0 0 3

COURSE OUTCOMES:

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

- Recall characteristics, physical and logical designs, domains.
- Differentiate IoT and M2M and explain IoT design methodology.
- Describe the various IoT components.
- Design a portable IoT system using Arduino/Raspberry Pi.
- Discuss the various applications of IoT.

UNIT I FUNDAMENTALS OF IOT **9**

Introduction-Definition and Characteristics of IoT- Physical design- IoT Protocols-Logical design - IoT communication models, Iot Communication APIs- Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs.

UNIT II M2M AND IOT DESIGN METHODOLOGY **9**

IoT and M2M- difference between IoT and M2M - Software defined networks, network function virtualization– Needs- IoT design methodology

UNIT III IOT COMPONENTS **9**

Sensors and actuators - Communication modules - Zigbee- RFID-Wi-Fi-Power sources.

UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS **9**

Platform - Arduino/Raspberry Pi- Physical devices - Interfaces - Programming - APIs/Packages

UNIT V CASE STUDY **9**

Various Real time applications of IoT- Home automation-Automatic lighting-Home intrusion detection- Cities-Smart parking-Environment-Weather monitoring system- Agriculture-Smart irrigation.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES:

1. Manoel Carlos Ramon, —Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmersl, Apress, 2014.

2. Marco Schwartz, —Internet of Things with the Arduino Yunl, Packt Publishing, 2014.

3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.

4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2nd edition , 2013.

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U19CS1003	INTERNET OF THINGS	3 0 0 3

PREAMBLE

The "Internet of Things" (IoT) is the network of physical objects or "things" embedded with sensors, actuators, software, electronics and network connectivity to enable it to achieve greater value and service by exchanging data between the physical world and computer systems over existing network infrastructure. By connecting everyday real world objects such as transports, buildings and industrial equipments, IoT guarantees to revolutionize how we live and work. In the year 2020, it is estimated that approximately 30 billion devices will be connected in IoT. IoT will drive new consumer and business behavior that will demand increasingly intelligent industry solutions. It can also help various industries like agriculture, health services, energy, security, disaster management etc., which need to automate solutions to problems faced through remotely connected devices.

The Internet of Things involves three distinct stages:

1. The sensors which collect data (including identification and addressing the sensor/device)

2. An application which collects and analyzes this data for further consolidation

3. Decision making and the transmission of data to the decision-making server. Analytical engines, actuators and Big data may be used for the decision making process.

After completing the course the students will attain the following,

- Ability to build real time IoT applications by interfacing the sensors with minimal programming.
- Ability to associate sensor networks and communication modules for building IoT systems.

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U19CS1001 **BIG DATA AND ANALYTICS** 3 0 0 3

COURSE OUTCOMES:

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

- Compare and analyze different types of digital data characteristics of Big Data
- Implement programs using Hadoop open source software framework
- Design and develop programs using NoSQL Databases like Mongo DB and Cassandra
- Apply MapReduce programming for various big data based problems
- Implement programs using Hive and Pig Databases

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	2	3	2	0	1	1	2	2	2	2	2
CO3	2	1	2	3	3	2	1	1	1	2	3	2	2	3
CO4	3	1	2	3	3	2	0	1	0	2	3	2	2	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

UNIT I INTRODUCTION TO BIG DATA 9

Types of Digital Data: Classification of Digital Data Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Characteristics of Big Data ,Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment , A Typical Hadoop Environment.

UNIT II BIG DATA ANALYTICS 9

Introduction -Big Data Analytics, Classification of Analytics, Challenges in Big Data, Technologies to handle Challenges Posed by Big Data- Data Science- Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency (BASE), Few Top Analytics Tools.

UNIT III HADOOP 9

Introduction Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges ,History of Hadoop , Hadoop Overview, Use Case of Hadoop ,Hadoop Distributors ,HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator),Interacting with Hadoop Ecosystem, MapReduce Programming -Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression

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UNIT IV NO SQL DATABASES 9

Cassandra :Apache Cassandra - An Introduction , Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections, Using a Counter, Time to Live (TTL), Alter Commands, Import and Export, Querying System Tables, Practice Examples- MongoDB, Terms Used in RDBMS and MongoDB, Data Types in MongoDB , MongoDB Query Language

UNIT V HIVE AND PIG 9

Hive: Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, SerDe, User-defined Function(UDF).

Pig: Introduction to Pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview , Data Types in Pig ,Running Pig , Execution Modes of Pig ,HDFS Commands ,Relational Operators ,Eval Function ,Complex Data Types ,Piggy Bank, User-Defined Functions (UDF) ,Parameter Substitution , Diagnostic Operator , Word Count Example using Pig,Pig versus Hive

Total: 45 hours

TEXT BOOKS:

1. **Big Data and Analytics**, Seema Acharya, Subhashini Chellappan, Infosys Limited, Publication: Wiley India Private Limited,1st Edition 2015(Chapters 1,2,3,4,5,6,7,8,9,10)

REFERENCE BOOKS:

1. **Hadoop in Practice**, Alex Holmes, Manning Publications Co., September 2014, Second Edition.
2. **Programming Pig,** Alan Gates, O'Reilly, Kindle Publication.
3. **Programming Hive,** Dean Wampler, O'Reilly, Kindle Publication.

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O.E

ECE VII Sem

U10EC1003 SENSORS AND SMART STRUCTURES TECHNOLOGIES 3 0 0 3

Course Outcomes

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

1) Insight into the basic concept regarding smart materials and their use in structures.
2) Analyze the use of measuring techniques in smart materials and structures.
3) Identify the suitable sensors for smart materials.
4) Apply the techniques of actuators in smart structures.
5) Relate the data acquisition techniques, signal processing and control for smart structures.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1						3	2	1
CO2	2	1	2	1	2	1	2					3	2	1
CO3	2	1	2	1	2	1						3	2	1
CO4	2	1	2	1	2	1	2					3	2	1
CO5	2	1	2	1	2	1						3	2	1

Unit I INTRODUCTION TO SMART MATERIALS AND STRUCTURES 9

Introduction to Smart Materials and Structures – Instrumented Structures Functions and Response –Sensing Systems – Smart Bridge – Self Diagnosis – Signal Processing Consideration for bridges – Actuation Systems and Effectors.

Unit II MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical Strain Gauges, Types – Resistance – Capacitance – Inductance – Wheatstone Bridges – Pressure Transducers – Load Cells – Temperature Compensation – Strain Rosettes.

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Unit III SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain Measurement – Inductively Read Transducers – The LVDT – Fiber Optic Techniques. Chemical and Bio-Chemical Sensing in Structural Assessment – Absorptive Chemical Sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed Measurement –Fire Sensor –Emergency Fire Alarm –Humidity Sensor – Accelerometers – Motion Sensors and Pressure Sensors

Unit IV ACTUATORS 9

Actuator Techniques – Actuator and Actuator Materials – Piezoelectric and Electrostrictive Material – Magnetostrictive Material – Shape Memory Alloys – Electro Rheological Fluids– Electro Magnetic Actuation – Role of Actuators and Actuator Materials.

Unit V SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors : Signal Processing – Control System – Linear and Non-Linear systems.

TOTAL : 45 HOURS

Text Book

1) A.K. Sawhney, "A Course in Electical and Electronic and Measurements and Instrumentation",Dhanpat rai and co pvt limited, 2015.
2) Brain Culshaw , "Smart Structure and Materials", Artech House, Borton. London, 1996.

References

1) L. S. Srinath , "Experimental Stress Analysis", Tata McGraw,1998.
2) J. W. Dally & W. F. Riley, "Experimental Stress Analysis", Tata McGraw, 1998.
3) Srinivasan, A.V and Michael McFarland. D, "Smart Structures -Analysis and Design", Cambridge University Press, 2001

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U19EC1006 MOBILE TECHNOLOGY AND ITS APPLICATIONS 3 0 0 3

Course Outcomes

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

1) Analyze the 1G and 2G Technologies.
2) Explain the 2.5G evolutions
3) Analyze the principles of 3G and UMTS
4) Analyze the evolutions of 4G.
5) Summarize the various wireless security applications and solve the mobile phone faults.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3		1		1	1	3		
CO2	3	3	3	3	3	3		1		1	1	3		
CO3	3	3	3	3	3	3		1		1	1	3		
CO4	3	3	3	3	3	3		1		1	1	3		
CO5	3	3	3	3	3	3		1		1	1	3		

Unit I 1G and 2G 9

First Generation (1G): 1G Systems – General 1G System Architecture – Generic MTSO Configuration – Generic Cell Site Configuration – Call Setup Scenarios – Handoff – Frequency Reuse – Spectrum Allocation – Channel Band Plan
Second generation (2G): Enhancements over 1G Systems – Integration with Existing 1G Systems – GSM - iDEN – CDPD

Unit II 2.5G Generation 9

Enhancements over 2G – Technology Platforms – General Packet Radio Service (GPRS) – Enhanced Data Rates for Global Evolution (EDGE) – High-Speed Circuit Switched Data (HSCSD) – CDMA2000 (1XRTT) – WAP-Migration Path from 2G to 2.5G to 3G..

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Unit III **3G Generation** **9**

Introduction – Universal Mobile Telecommunications Service (UMTS), UMTS Basics, The UTRAN Architecture, Handover, UMTS Services – The UMTS Air Interface – Overview of the 3GPP Network Architecture – Overview CDMA2000 – Commonality Between WCDMA/CDMA2000/CDM

Unit IV **4G and Beyond** **9**

Introduction to LTE - Network architectures – EPC – E-UTRAN architecture – Mobility management – Resource management – Services – Channel – logical and transport channel mapping – downlink/uplink data transfer – MAC control element – PDU packet formats – scheduling services – random access procedure – Objectives of 5G-Architecture – Features and benefits.

Unit V **Wireless Security and Mobile Phone service** **9**

Introduction – Fingerprint – Classification of major security attacks against RFID systems - GSM Security – Barcode scanner technology features and applications – QR code – BAR code – OTP – AirDrop.
Mobile phone Service: Parts in the mobile phones -Mobile phones assembling and disassembling –motherboard - Mobile Operating Systems - Fault finding - Advanced troubleshooting techniques.

TOTAL : 45 HOURS

Text Book

1) Clint Smith,P.E, Dannel Collins, "3G Wireless Networks" 2nd edition, Tata McGraw-Hill, 2008.
2) Vijay K.Garg, "Wireless Network Evolution- 2G & 3G" Pearson, 2013.

References

1) T.S Rapp port, "Wireless Communications" Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint, 2013.
2) JochenH.Schiller, "Mobile Communications", 2/e, Pearson, 2014
3) SassanAhmadi, "LTE-Advanced – A practical systems approach to understanding the 3GPP LTE Releases 10 and 11 radio access technologies", Elsevier, 2014

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PREAMBLE
TO
ENERGY CONSERVATION AND MANAGEMENT

Energy is one of the most important resources to sustain our lives. At present we still depend a lot on fossil fuels and other kinds of non-renewable energy. The extensive use of renewable energy including solar energy needs more time for technology development. In this situation Energy Conservation (EC) is the critical needs in any countries in the world.

Energy saving is important and effective at all levels of human organizations – in the whole world, as a nation, as companies or individuals. Energy Conservation reduces the energy costs and improves the profitability.

Energy costs are often treated as a fixed overhead by organisations. But, by taking the right approach to energy management it is possible to make considerable savings. Successful energy management must combine an effective strategy with the right practical interventions. Many organisations would like to save energy, but they need to make energy management an integral part of running the organisation to ensure success. Energy Management is very important for the management of factories/companies, and Energy Conservation is one of its major topics.

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U19EE1002 **ENERGY CONSERVATION AND MANAGEMENT** **3 0 0 3**

COURSE OUTCOMES

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

1. Assess role of energy in global economic development.
2. Explain methodology of energy audit and concept of instruments used.
3. Discuss various lamps and design energy efficient illumination schemes.
4. Apply energy conservation concepts in buildings.
5. Identify the energy conserving opportunities in utilities.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3		2			2	3	3	3	2
CO2	2	2	3	3	3				2			3	3	2
CO3	2	2	3	3	3	3			3		2	3	3	2
CO4	2	2	3	3	3	2		3				3	3	2
CO5	2	2	3	3	3		3			3		3	3	2

UNIT- I ENERGY SCENARIO AND BASICS **9**

Classification of Energy – Purchasing Power Parity – Energy Security – Strategy to meet future energy requirements – Objectives and features for electricity act 2003 – Energy efficiency standards and labeling – Study of Global and Indian primary energy reserves – Study of energy scenario for India – Energy and environment – Global environmental issues – Types of Energy – Electrical and Thermal energy basics – Energy units and conversions.

UNIT- II ENERGY MANAGEMENT AND AUDIT **9**

Definition and objectives of energy management and audit – Need for energy audit – Types of energy audit – Methodology for conducting detailed energy audit – ENCON opportunities and measures – Energy audit report. Energy costs – Benchmarking – Energy performance – Fuel and Energy substitution – Instruments and metering for energy audit – Basic principles, components of material and energy balance – Sankey diagram – Financial analysis terms – Payback period, ROI, NPV, IRR.

UNIT- III LIGHTING SYSTEMS **9**

Introduction – Terms in Lighting and Illumination – Light sources - Lamp types – Arc Lamps, Vapour lamps – Incandescent lamp, Fluorescent lamp – Energy saving lamps – CFL, LED – Lighting design for interiors – Indoor and outdoor lighting schemes – Energy saving opportunities – Energy efficient lighting controls.

UNIT- IV ENERGY CONSERVATION IN BUILDINGS **9**

Energy conservation building code (ECBC) – Compliance approaches – ECBC guidelines on Building envelope, HVAC system, Service hot water, Water pumps – Energy consumption in Escalators and Elevators – Building Energy Management Systems – Star ratings – Energy Efficiency Measures in AC and Lighting system.

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UNIT- V ENERGY EFFICIENT OPPORTUNITIES IN UTILITIES 9

Introduction to Compressed air system components – Heat transfer loops in refrigeration systems – Standards and labelling of room air conditioners – Introduction to Fans, Blowers and Compressors – Types of pumps, Pump curves – Efficient operation of pumps – Components of cooling towers and its efficient operation - Introduction to DG set system.

Energy Efficiency and energy savings in Compressed Air System, HVAC system, Fans and Blowers, Pumping system, Cooling towers, and DG sets.

Lecture: 45; Tutorial: 00; Total: 45

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2. "Energy Efficiency in Electrical Utilities", Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCE BOOKS:

1. Chakrabarti A, "Energy Engineering and Management", PHI, 2011.
2. Murphy W R, McKay G, "Energy management", Elsevier, 2009.
3. Rajput R K, "Utilization of Electrical Power", Lakshmi Publications, 2006.

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PREAMBLE
TO
Innovation, IPR and Entrepreneurship Development

The open elective course syllabus has been framed by Entrepreneurship Development Cell of Sona College of Technology on above mentioned title for even semester. The course covers a wide range of topics from Innovation, Intellectual Property Right and entrepreneurial Competitiveness and competency, basic requirements of setting of an enterprise/startups, factors influencing entrepreneurship, Barriers to Entrepreneurship & Concepts, Issues of Entrepreneurship Failure, Idea selection, Innovation & creativity, design thinking.

The course also covers identifying and selecting a good business opportunity, market survey & research, techno-economic feasibility assessment and preparation of preliminary project reports, management of working capital, costing, break even analysis, taxation, income tax, GST, provision of incentives, subsidies & concessions, entrepreneurship finance and angels & ventures capital fund etc. Benefit out of Government policies to small scale industries and business incubators.

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U19EE1003 INNOVATION, IPR AND ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

COURSE OUTCOMES

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

- Acquire the knowledge for establishment of an enterprise and management,
- Derive the innovative ideas, right approach to the problem and arrive solution for problem with IPR and its legal aspects.
- Prepare the project report preparation and assessment of Business.
- Acquire the knowledge on costing, Techno-economic aspects, find out the sources of finance and opportunities in business.
- Identify the support system for Entrepreneurs by Government and venture capitals.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1			3			3	3		3	3	3	3		3
CO2			3			3	3	3	3	3	3	3		3
CO3			3			3	3	3	3	3	3	3		3
CO4			3			3	3	3	3	3	3	3		3
CO5			3			3	3	3	3	3	3	3		3

UNIT I ENTREPRENEURSHIP & MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT II INNOVATION, CREATIVITY, DEVELOPMENT PROCESS AND LEGAL ASPECTS 9

Innovation and Creativity- An Introduction, Innovation in Current Environment, Types of Innovation Sources of new Ideas, Methods of generating innovative ideas, creating problem solving, product planning and development process. Legal aspects of business (IPR, Labor law).

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, GST.

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UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Lecture: 45; Tutorial: 0; Total: 45 Hrs

TEXT BOOKS:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013. 99
2. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014.

REFERENCES:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2 nd Edition Dream tech, 2005.
3. Rajeev Roy, "Entrepreneurship" 2 nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.
5. Innovation and Entrepreneurship Book by Peter Drucker,
6. James Larminie and John Lowry, "Electric Vehicle Technology Explained " John Wiley & Sons, 2003.

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PREAMBLE
TO
RENEWABLE ENERGY SYSTEMS

Energy is an important source of all technological developments as well as for all basic needs. The usage of renewable energy sources are the only way for sustainable development and future energy requirements. Renewable energy encourages the generation of electricity without any environmental impact and improves the economic growth of the country.

By choosing this elective the students will be able to know the importance of renewable energy sources for power generation. And also they could understand how the fossil fuels are made an impact on environmental issues. They will be familiar with the following

1. Concept of solar energy power production and solar photovoltaic cells and the application of solar PV system and Bio Mass power generation system.
2. Principle of conversion of wind energy in to electric energy
3. Working of geothermal and hydro power stations.
4. Principle of the conversion of tidal and wave energy in to electric energy.
5. The emerging technology of power generation.

After completion of this subject students will know how the energy can be produced locally. This knowledge would provide an opportunity to install small capacity power generation units independently for their needs.

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U19EE1004 **RENEWABLE ENERGY SYSTEMS** **3 0 0 3**

COURSE OUTCOMES

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

1. Describe the power demand scenario in world level and impact of various renewable energy sources in satisfying power demand.
2. Explain the principle of operation and the application of solar system.
3. Outline in the components and to find the suitability based on the performance of wind energy and Conversion system, biomass energy system
4. Describe the principle of operation and the application of geo thermal power tidal power generation scheme, wave energy and OTEC scheme.
5. Illustrate the emerging energy generation systems of MHD, Thermal and fuel cells applications.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2					2		2	3	3	3
CO2	3	3	3	2	1	3	3	1	2		3	3	3	3
CO3	3	3	3	2	2	3	3	1	2		3	3	3	3
CO4	3	3	3	2	2	3	3	1	2		3	3	3	3
CO5	3	3	3	2	2	3	3	1	2		3	3	3	3

UNIT I INTRODUCTION **9**

World energy futures–Energy sources and their availability – Energy cycle of the earth – environmental aspects of energy utilization – Energy plantation- Renewable energy resources and their importance-Prospects of Renewable energy sources.

UNIT II SOLAR ENERGY SYSTEMS **9**

Introduction –Solar radiation and measurements-Solar energy collectors-solar energy storage systems- Solar pond and applications- Applications of solar energy: solar pumping, solar cooking, solar distillation and solar greenhouse.

UNIT III WIND AND BIOMASS ENERGY SYSTEMS **9**

Introduction – Wind Energy conversion- Wind speed and power relation – Power extracted from wind – wind distribution and wind speed predictions – types of Wind power systems.

Bio mass conversion technologies-Biogas generation-Types of biogas plants-Bio gas from plant wastes-Utilization of Bio gas and applications.

UNIT IV GEO THERMAL, TIDAL AND OCEAN ENERGY SYSTEMS **9**

Geothermal energy – Estimates of Geothermal power- site selection for geothermal power plant-Applications of Geothermal energy.

Origin of tides – Basic principle of Tidal power- Operation of a Tidal power plant. Ocean Thermal Energy conversion system- Open and closed OTEC cycles- Prospects of ocean thermal energy conversion in India.

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UNIT V EMERGING ENERGY SYSTEMS 9

Magneto Hydro Dynamic (MHD) Power Generation- MHD systems and its operation. Thermo Electric power generation- Basic principle- Thermo electric power generator.

Thermonuclear fusion energy-Nuclear fusion and reactions- Advantages. Fuel cell- classification of fuel cells- Fuel cell based electrical power generation scheme- Applications.

Lecture: 45; Tutorial: 0; Total: 45 Hours

TEXT BOOKS:

1. Rai, G.D., "Non-Conventional Energy Sources", Khanna Publishers, Sixth Edition 2017.
2. Khan, B.H, Non- Conventional Energy Resources", Mc. Graw Hill Education Ltd, third reprint 2017.

REFERENCE BOOK

1. Rao S. Paruklekar,B.B, "Energy Technology – Non Conventional, Renewable and Conventional", KhannaPublishers,1994.
2. F.Kreith and J.F.Kreider, "Principles of Solar Engineering", McGraw Hill.
3. T.N.Veziroglu, "Alternative Energy Sources", Vol 5 and 6, McGraw Hill.
4. Mukund R.Patel, "Wind and Solar Power Systems", CRC Press LLC.

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O.E

IT
VII Sem

U19IT1001 PROBLEM SOLVING TECHNIQUES USING JAVA PROGRAMMING 3003

PREAMBLE

The students opting for this course will learn to code in Java and improve the programming and problem-solving skills. Through this course, the students will acquire appropriate skills to design algorithms as well as develop and debug programs. We are excited to offer a unique course structure, designed to support learners of different engineering departments and to fulfill their dreams of pursuing a career in an IT industry.

This course aims to satisfy the curiosity of the learners who wants to know how a ticket is booked in railways, or how an electricity consumption bill is generated. After the completion of the course, learners will be able to code real time problems in JAVA programming language.

COURSE OUTCOMES

1. Apply Object Oriented Programming concepts and basic features of Java to write programs for
   solving problems
2. Write java programs with objects and classes of java
3. Develop real time systems using java inheritance concepts
4. Build java applications using exceptions and I/O
5. Solve real time problems using java packages and connect java applications with relational databases using JDBC for storing and retrieving sensitive data

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1		3	3	2	3									3
CO2		3	3	2	3									3
CO3		3	3	2	3									3
CO4		3	3	2	3									3
CO5		3	3	2	3									3

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Introduction to Object Orientation- Need for Object Oriented Paradigm- Characteristics of Object Oriented Programming - The History and Evolution of Java – An Overview of Java – Java Virtual Machine - Data Types –Variables - Arrays – Operators- Control Statements - Command Line Arguments

UNIT II OBJECTS AND CLASSES 9

Introducing Classes - Class fundamentals - Declaring Objects – Introducing Methods – Constructors- Parameterized Constructor – Copy Constructor – this keyword- Method Overloading – Constructor Overloading –Access control – Static keyword– Nested and Inner classes – Local Inner class

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UNIT III INHERITANCE AND INTERFACE 9

Inheritance basics – Types of Inheritance – Super keyword – Method Overriding – Abstract Classes - final keyword- Interfaces- Default Interface Methods-Use static methods in an interface- Nested interfaces

UNIT IV EXCEPTION HANDLING AND I/O 9

Exception Handling Fundamentals – Exception Types – Uncaught Exception – Using try and catch – Multiple catch clauses – Nested try statements – throw – throws – finally - finalize method - I/O FileInputStream – I/O FileOutputStream

UNIT V PACKAGES AND JDBC CONNECTIVITY 9

Working with predefined and user defined packages - Access Protection – Importing Packages - Basics of JDBC Connectivity – SQL Queries – create – insert – select - delete – update.

TOTAL: 45 HOURS

TEXT BOOK

1. Herbert Schildt, "Java™: The Complete Reference", Ninth Edition, Tata McGraw Hill, 2014.

REFERENCES

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Ninth Edition, Prentice Hall, 2013.
2. K. Arnold, D. Holmes and J. Gosling, "The JAVA programming language", Fourth Edition, Addison Wesley Professional, 2005.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Third Edition, Addison Wesley, 2000.
4. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fifth Edition, Tata McGraw-Hill Publishing company Ltd., 2009.

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O.E

M ET VII

Department of Mechatronics Engineering

Open Elective

U19MC1004	FUNDAMENTALS OF ROBOTICS	L	T	P	C
		3	0	0	3

Course Outcomes

After successful completion of this course, the students should be able to

CO1:	Understand the basic robotic concepts
CO2:	Select the suitable drive system for robot application
CO3:	Select the suitable sensors and grippers for the respective application
CO4:	Develop VAL Programming for simple applications
CO5:	Illustrate the robotic application in various sectors

Pre-requisite

NIL

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2			3	2		3		3	3	3	3
CO2	2	2	2		3				3		2	3	2	3
CO3	3	2	2		3				3		2	3	3	3
CO4	3	3	3	3	3				3		2	3	3	2
CO5	3	3	3	3	3	3	3		3			2	3	3

Course Assessment methods

Direct		Indirect
Internal test I (8) Internal test II (8) Internal test III (8) Assignment/seminar/Quiz (5)	Online test (6) Attendance (5) End semester Examination (60)	Course end survey

Unit 01: INTRODUCTION TO ROBOTICS — **9 Hours**

Introduction to Robotics – History of Robotics – Laws of Robotics - Anatomy of a Robot – Classification of Robots – Robot Configurations - Robot subsystems: Motion subsystem, Recognition subsystem, Control subsystem – Robot Links – Joints in robot –Robot Specifications.

Unit 02: ROBOT MOTIONS AND DRIVE SYSTEMS	9 Hours
Degrees of freedom – DOF associated with arm and body - DOF associated with wrist –Joint Notation scheme- Robot Kinematics – Robot Drive systems – Hydraulic Actuators – Pneumatic actuators – Electrical actuators: Stepper motors, DC motors, Servomotor.	
Unit 03: ROBOT SENSORS AND END EFFECTORS	**9 Hours**
Classification of Robotic sensors and their functions – Tactile sensors – Inductive Proximity sensor – Hall effect sensor – Range sensor –Force ant Torque sensors- Types of end effectors – Mechanical grippers – Vacuum cups – Magnetic grippers – Adhesive grippers – Tools as end effectors.	
Unit 04: ROBOT PROGRAMMING	**9 Hours**
Methods of Robot Programming: Lead through methods, Textual robot Languages – Robot language structure – First generation Languages – Second generation Languages – VAL Programming – Simple Programming examples.	
Unit 05: ROBOT APPLICATIONS	**9 Hours**
Robotics Applications in Manufacturing: Welding Robot, AGVs– Healthcare: Surgery Robot, Therapeutic Robot – Agriculture: Crop Harvesting & Fruit Picking Robot – Defence & Space: Exoskeleton Robot, Telerobotics.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Total Hours: 45 Hrs

TEXT BOOKS

1. M.P.Groover, M.Weiss,R.N. Nagal,N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata McGraw-Hill Publication, 2012.

REFERENCES

1. Richard D.Klafter, "Robotics Engineering" PHI Learning Private Limited, 2009.
2. Ganesh S.Hedge, "A text book in Industrial Robotics", Laxmi Publications, 2006.
3. S K Saha, "Introduction to Robotics", Tata McGraw-Hill Publication, 2012.
4. Sathya Ranjan Deb, "Robotics Technology & flexible Automation" Second edition, Tata McGraw-Hill Publication, 2009.

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COURSE CODE **U19ME1002** L T P C

COURSE NAME **INDUSTRIAL SAFETY** 3 - - 3

Course Outcomes

Upon completion of this course the students will be able to

CO1 Summarize various legal provisions available in safety regulation.

CO2 Analyze industrial environment hygiene and develop precautionary measure to avert occupational diseases.

CO3 Demonstrate the uses of different grades of fire protection systems related with different classes of fire.

CO4 Develop Agronomical study of different work environment in industries.

CO5 Discuss the importance of safety training and its impact on shop floor of factories.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
COs, POs PSOs Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO – 1	3	-	-	-	1	3	3	3	2	2	3	3	2	2
CO – 2	3	2	2	1	3	3	3	3	2	2	-	2	2	3
CO – 3	2	3	2	3	3	3	3	3	3	3	3	2	2	3
CO – 4	2	1	3	3	3	3	2	3	1	2	-	2	3	3
CO - 5	1	3	3	3	-	3	-	3	3	3	2	3	2	2

Unit I **BASICS OF SAFETY ENGINEERING & ACTS** L 9 T 0

Evolution of modern safety concept –safety performance monitoring. Acts – factories act – 1948 – Statutory authorities – inspecting staff – Tamilnadu Factories Rules 1950 under Safety and health – environment act – 1986 – Air act 1981, water act 1974 – other acts. Safety in industries – General safety concepts, machine guarding, hazards in metal removing process, welding process, cold and hot working process.

Unit II **OCCUPATIONAL HEALTH AND INDUSTRIAL HYGIENE** L 9 T 0

(Basic concepts, related hazards and exposure limits)

Physical Hazards – Noise, heat, radiation, vibration, recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases. Biological and Ergonomical Hazards-Basic concepts. Occupational Health-Concept and spectrum of health – functional units and activities of occupational health services, pre-employment and post-employment medical examinations – occupational related diseases, levels of prevention of diseases, notifiable occupational diseases. Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, Preliminary Hazard Analysis (PHA), human error analysis, hazard operability studies (HAZOP), safety warning systems.

Unit III FIRE ENGINEERING AND EXPLOSIVE CONTROL L 9 T 0

Fire properties of solid, liquid and gases – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – Principles of explosion – Explosion Protection – Electrical Safety. Electrical Hazards – Primary and Secondary hazards – concept of earthing – protection systems – fuses, circuit breakers and over load relays – first aid cardiopulmonary resuscitation techniques.

Unit IV ERGONOMICS L 9 T 0

Introduction to ergonomics: The focus of ergonomics, ergonomics and its areas of application in the work system, modern ergonomics, and future directions for ergonomics. Anatomy, Posture and Body Mechanics: anatomy of the sprine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, effectiveness and cost effectiveness. Anthropometry and its uses in ergonomics, Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Ergonomics in IT industries.

Unit V SAFETY EDUCATION AND TRAINING L 9 T 0

Importance of training – identification of training needs – training methods – programs, seminars, conferences, competitions –motivation – communication – role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety Training.

Total Number of hours: 45

Learning Resources

Text Books

1. Krishnan N.V., "Safety Management in Industry", Jaico Publishing House, Bombay, 1997.
2. Hand book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.

Reference Books

1. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.
2. Guidelines for Hazard Evaluation Procedures Centre for Chemical Process Safety, AICHE 1992.
3. The factories Act 1948, Madras Book Agency, Chennai, 2000.
4. Introduction to Ergonomics, R.S. Bridger, Taylor & Francis.

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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.

5/7/2022

Member Secretary-Academic Council
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005.

Civil
VIII

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**	**360**

Approved By

Chairperson, Civil Engineering BoS
Dr.R.Malathy

Member Secretary, Academic Council
Dr.R.Shivakumar
20/12/23

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar
28/12/23

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

COURSE CODE	COURSE NAME	L	T	P	C
U19CE801	Project Work	0	0	24	12

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

1.	Identify the problems in the field of Civil Engineering
2.	Understand the various procedure and design involved using IS codes for respective problem.
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	Apply knowledge and demonstrate to manage project in multi-disciplinary areas **(K3)**
CO2	Design and conduct experiments to interpret data pertaining to engineering problems **(K4)**
CO3	Prepare documentation and presentation **(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	2	3	1	3	1	1	1	2	2	-	2	3	2
CO2	3	2	3	1	3	1	1	1	2	2	-	2	3	1
CO3	2	2	3	1	2	1	1	1	2	2	-	1	2	1
CO (Avg)	2.67	2	3	1	2.67	1	1	1	2	2	-	1.67	2.67	1.33

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

The student will work on a topic assigned by the Head of the Department under the guidance of a faculty member and prepare a comprehensive project report after satisfactory completion of the project work. The student will be evaluated based on the report and the viva voce examination conducted by a team of examiners including one external examiner.

- The number of students in the group should not exceed three.
- Every project work shall have a guide who is a member of the Faculty of Civil Engineering of the College. The project guide and project coordinator are appointed by the Head of the Department.
- The hours allotted for this course shall be utilized by the students to receive guidance and directions from the guide, in library reading, laboratory work, and computer analysis or field work. The student should also present the progress made in the project in the periodical reviews.
- All the students are expected to present their project outcomes in one National/International-Conference or Journal publications which are related to their projects. Copy of the certificate of presentation/publication should be submitted during final viva voce.

Each student/group shall finally produce a comprehensive report comprising background information, literature survey, problem statement, project work details, and conclusions. The candidate is expected to submit the project report on or before the last working day of the semester. The report will be scrutinized and duly acknowledged by the Head of the Department.

22/12/23
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Head Of The Department.
Dean (R&D) of Civil Engg.
Sona College of Technology,
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