SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E- Civil Engineering

CURRICULUM and SYLLABI

[For students admitted in 2018-2019]

B.E / B.Tech Regulation 2015R

Approved by BOS and Academic Council meetings

SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005
(An Autonomous Institution)

Courses of Study for BE/BTech Semester I under Regulations 2015R (CBCS)

Branch: CIVIL

S.No.	Course Code	Course Title	L	T	P	C	Group code
Theory							
1	U15ENG101AR	Technical English – I	2	0	2	3	HS
2	U15MAT102AR	Mathematics – I	3	2	0	4	BS
3	U15PHY103AR	Engineering Physics	3	0	0	3	BS
4	U15CHE104AR	Engineering Chemistry	3	0	0	3	BS
5	U15CPR105AR	Programming in C	3	0	0	3	ES
6	U15EGR106AR	Engineering Graphics[1]	2	2	0	3	ES
Practical							
7	U15PCL107AR	Physics and Chemistry Laboratory-I[2]	0	0	2	1	BS
8	U15CPL108AR	C Programming Laboratory	0	0	2	1	ES
9	U15EPL109R	Engineering Practices Laboratory[3]	0	0	2	1	ES
		Total Credits				**22**	
Optional Language Elective*							
10	U15OLE1101	French	0	0	2	1	HS
11	U15OLE1102	German					
12	U15OLE1103	Japanese					

* Students may opt for foreign languages viz., German/French/Japanese with additional one credit (over and above the CGPA calculation).

[1] The examination will be conducted for 3 hours through written and practical modes.

[2] Laboratory classes on alternate weeks for Physics and Chemistry. The lab examination will be conducted separately for 50 marks each with 2 hours duration.

[3] The lab examination will be conducted separately for Group A (Civil & Mechanical) and Group B (Electrical & Electronics) with 50 marks each with 1 ½ hours duration.

Approved by

HOD- First Year Dr. M. Renuga	Chairperson BOS/Civil & HOD-Civil Dr. R. Malathy	Chairperson BOS/EEE & HOD-EEE Dr. S. Padma	Chairperson BOS/ Mechanical & Mechatronics HOD-Mechanical Dr. D. Senthilkumar	Chairperson BOS/ FT & HOD-FT Dr. G. Gunasekaran

Member Secretary, Academic Council
Dr. R. Shivakumar

Chairperson, Academic Council & Principal
Dr. S.R.R. Senthilkumar

SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005
(An Autonomous Institution)

Courses of Study for BE / B Tech Semester II under Regulations 2015R (CBCS)

Branch: CIVIL

S.No.	Course Code	Course Title	L	T	P	C	Group code
Theory							
1	U15ENG201AR	Technical English –II	2	0	2	3	HS
2	U15MAT202AR	Mathematics - II	3	2	0	4	BS
3	U15PHY203AR	Physics For Civil Engineering	3	0	0	3	BS
4	U15CHE205AR	Chemistry For Civil Engineering	3	0	0	3	BS
5	U15PSC206R	Problem Solving in C#	3	0	0	3	ES
6	U15GE207R	Engineering Mechanics	2	2	0	3	ES
Practical							
7	U15PCL208AR	Physics and Chemistry Laboratory – II$	0	0	2	1	BS
8	U15PSL209R	Problem Solving in C Laboratory#	0	0	2	1	ES
9	U15CDL210R	Computer Aided Drafting Laboratory	0	0	2	1	ES
		Total Credits				**22**	
Optional Language Elective*							
10	U15OLE1201	French	0	0	2	1	HS
11	U15OLE1202	German					
12	U15OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (over and above the CGPA calculation).

Common to CIVIL & FT

$Laboratory classes on alternate weeks for Physics and Chemistry. The lab examination will be conducted separately for 50marks each with 2 hours duration.

Approved by

HOD-First Year Dr. M. Renuga	Chairperson BOS/ Civil & HOD-Civil Dr. R. Malathy	Member Secretary, Academic Council Dr. R. Shivakumar	Chairperson, Academic Council & Principal Dr. S.R.R. Senthilkumar

07.05.2018

B.E/B.Tech Regulations- 2015R

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester III under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT301AR	Transforms and Partial Differential Equations	3	2	0	4
2	U15CE301R	Construction Materials and Practices	3	0	0	3
3	U15CE302R	Mechanics of Solids	3	2	0	4
4	U15CE303R	Surveying	3	0	0	3
5	U15CE304R	Fluid Mechanics	3	0	0	3
Practical						
6	U15CE305R	Computer Aided Building Drawing Laboratory	0	0	4	2
7	U15CE306R	Survey Laboratory	0	0	4	2
8	U15ENG301R	Communication Skills Laboratory	0	0	2	1
9	U15GE301R	Soft Skills and Aptitude-I	0	0	2	1
					Total Credits	23

Approved By

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

Copy to:-
HOD/Civil, 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 under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
		Theory				
1	U15MAT401AR	Numerical Methods for Engineering Computation	3	2	0	4
2	U15CHE404R	Environmental Sciences	3	0	0	3
3	U15CE401R	Strength of Materials	3	2	0	4
4	U15CE402R	Transportation Engineering	3	0	0	3
5	U15CE403R	Applied Hydraulics and Fluid Machinery	3	0	0	3
6	U15CE404R	Concrete Technology	3	0	0	3
		Practical				
7	U15CE405R	Hydraulic Engineering Laboratory	0	0	4	2
8	U15CE406R	Material Testing Laboratory	0	0	4	2
9	U15GE 401R	Soft Skills and Aptitude-II	0	0	2	1
					Total Credits	**25**

Approved By

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

Copy to:-

HOD/Civil Engineering, 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 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
		Theory				
1	U15GE502R	Professional Ethics And Human Values	3	0	0	3
2	U15CE501R	Structural Analysis-I	3	2	0	4
3	U15CE502R	Environmental Engineering	3	0	0	3
4	U15CE503R	Design of Reinforced Concrete Elements	3	2	0	4
5	U15CE504R	Soil Mechanics	3	0	0	3
6	U15CE 902R	**Professional Elective:** Architecture and Town Planning	3	0	0	3
	U15CE 903R	**Professional Elective:** Construction Practices and Equipments				
	U15CE906R	**Professional Elective:** Remote Sensing and GIS				
		Practical				
7	U15CE505R	Soil Mechanics Laboratory	0	0	4	2
8	U15CE506R	Concrete and Highway Laboratory	0	0	4	2
9	U15CE507R	Technical Seminar[#]	0	0	2	1
10	U15GE501R	Soft Skills and Aptitude-III	0	0	2	1
					Total Credits	**26**
[#] Internal Assessment Only						

Approved By

Chairperson, Civil Engineering BoS   Member Secretary, Academic Council   Chairperson, Academic Council & Principal

Dr.R.Malathy   Dr.R.Shivakumar   Dr.S.R.R.Senthil Kumar

Copy to:-

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

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
—		**Theory**				
1	U15CE601R	Structural Analysis-II	2	2	0	3
2	U15CE602R	Design of Steel Structures (Limit State Design)	2	2	0	3
3	U15CE603R	Foundation Engineering	3	0	0	3
4	noc21-ce13	**Professional Elective** - Maintenance and Repair of Concrete Structures	3	0	0	3
5	U15CE914R	**Professional Elective** - Housing Planning and Management	3	0	0	3
6	U15CE915R	**Professional Elective** - Prefabricated Structures	3	0	0	3
		Open Electives				
7	U15CS1003R	Internet of Things	3	0	0	3
8	U15EC1006R	Sensors and Smart Structures Technologies	3	0	0	3
9	U15EE1006R	Renewable Energy Systems	3	0	0	3
10	U15EE1007R	Innovation IPR and Entrepreneurship Development	3	0	0	3
11	U15IT1003R	Problem Solving Techniques using Java Programming	3	0	0	3
12	U15IT1004R	Python Programming	3	0	0	3
13	U15MC1002R	3D Printing Technology	3	0	0	3
14	U15ME1004R	Industrial Safety	3	0	0	3
		Practical				

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester VII 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U15CE701R	Construction Management	3	0	0	3	45
2	U15CE702R	Earth Quake Resistant Structures and Management	3	0	0	3	45
3	U15CE919R	**Elective** - Prestressed Concrete Structures	3	0	0	3	45
4	U15CE922R	**Elective** - Contracts Laws and regulations	3	0	0	3	45
	U15CE923R	**Elective** - Traffic Engineering and Management					
5	U15CE927R	**Elective** -Water Resources and Irrigation Engineering	3	0	0	3	45
Open Elective							
6	U15CS1005R	Object Oriented Programming and Data Structures	3	0	0	3	45
	U15EE1004R	Energy Conservation and management					
	U15EE1006R	Renewable Energy Systems					
	U15IT1003R	Problem Solving Techniques using Java Programming					
	U15MC1002R	3D Printing Technology					
	U15ME1002R	Renewable Energy Sources					
	U15ME1004R	Industrial Safety					
	U15ME1005R	Maintenance Engineering					
	U15ME1010R	3D Printing					
Practical							
7	U15CE703R	Estimation and quantity surveying	0	0	4	2	60
8	U15CE704R	Design Project	0	0	4	2	60
9	U15CE705R	Internship	0	0	0	1	30
					Total Credits	**23**	

Approved By

Chairperson, Civil Engineering BoS   **Member Secretary, Academic Council**   **Chairperson, Academic Council & Principal**

Dr.R.Malathy   Dr.R.Shivakumar   Dr.S.R.R.Senthil Kumar

Copy to:-

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

16.06.2021   Regulations-2015R

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester VIII 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Practical					
1	U15CE801R	Project Work	0	0	24	12	360
					Total Credits	**12**	

Approved By

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

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

SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005
(An Autonomous Institution)

Courses of Study for BE/BTech Semester I under Regulations 2015R (CBCS)

Branch: CIVIL

S.No.	Course Code	Course Title	L	T	P	C	Group code
		Theory					
1	U15ENG101AR	Technical English – I	2	0	2	3	HS
2	U15MAT102AR	Mathematics – I	3	2	0	4	BS
3	U15PHY103AR	Engineering Physics	3	0	0	3	BS
4	U15CHE104AR	Engineering Chemistry	3	0	0	3	BS
5	U15CPR105AR	Programming in C	3	0	0	3	ES
6	U15EGR106AR	Engineering Graphics[1]	2	2	0	3	ES
		Practical					
7	U15PCL107AR	Physics and Chemistry Laboratory-I[2]	0	0	2	1	BS
8	U15CPL108AR	C Programming Laboratory	0	0	2	1	ES
9	U15EPL109R	Engineering Practices Laboratory[3]	0	0	2	1	ES
		Total Credits				**22**	
		Optional Language Elective*					
10	U15OLE1101	French					
11	U15OLE1102	German	0	0	2	1	HS
12	U15OLE1103	Japanese					

* Students may opt for foreign languages viz., German/French/Japanese with additional one credit (over and above the CGPA calculation).

[1] The examination will be conducted for 3 hours through written and practical modes.

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[3] The lab examination will be conducted separately for Group A (Civil & Mechanical) and Group B (Electrical & Electronics) with 50 marks each with 1 ½ hours duration.

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HOD-First Year Dr. M. Renuga	Chairperson BOS/Civil & HOD-Civil Dr. R. Malathy	Chairperson BOS/EEE & HOD-EEE Dr. S. Padma	Chairperson BOS/ Mechanical & Mechatronics HOD-Mechanical Dr. D. Senthilkumar	Chairperson BOS/ FT & HOD-FT Dr. G. Gunasekaran

Member Secretary, Academic Council
Dr. R. Shivakumar

Chairperson, Academic Council & Principal
Dr. S.R.R. Senthilkumar

U15ENG101AR - TECHNICAL ENGLISH I

	L	T	P	C	M
	2	0	2	3	100

Course Outcomes

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

1. frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.

2. develop and demonstrate listening skills for academic and professional purposes.

3. draw conclusions on explicit and implicit oral information.

4. develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.

5. read for gathering and understanding information, following directions and giving responses.

UNIT I – FOCUS ON LANGUAGE
- General Vocabulary
- Prefixes and Suffixes
- Active and Passive Voices
- Adjectives, Comparative Adjectives
- Prepositions and Dependent Prepositions
- Collocations
- Tenses
- Modal Verbs and Probability

UNIT II – LISTENING -I
- 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 short conversations or monologues.
- Taking down phone messages, orders, notes etc.
- Listening for gist, identifying topic, context or function.

UNIT III – LISTENING – II

- • Listening comprehension, entering information in tabular form.
- • Intensive listening exercises and completing the steps of a process.
- • Listening exercises to categorise data in tables.
- • Listening to extended speech for detail and inference.

UNIT IV – READING -I

- • Understanding notices, messages, timetables, advertisements, graphs, etc.
- • Reading passages for specific information transfer.
- • Reading documents for business and general contexts and interpreting graphical representations.
- • Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- • Oral reading – poetry and prose excerpts, general and technical articles, and anecdotes.

UNIT V – READING -II

- • Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea, meaning and contents of the whole text.
- • 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, 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

Listening test will be conducted for 20 marks internally and evaluated along with Technical English – I in the End Semester Valuation.
Reading test will be conducted for 20 marks internally and evaluated by internal examiners.

TEXTBOOK

1. Technical English – I & II, Dr. M. Renuga, et al. Sonaversity, Sona College of Technology, Salem, Revised edition, 2016.

EXTENSIVE READING

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

REFERENCE BOOKS

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.

U15MAT102AR - MATHEMATICS – I

(Common to Civil, Mech, Mechatronics, EEE, IT and FT Branches)

L	T	P	C	M
3	2	0	4	100

Course Outcomes

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

1. find the Eigen values and Eigen vectors of a real matrix and discuss their properties, reduce a real symmetric matrix from quadratic form to canonical form.

2. explain the three dimensional Cartesian coordinates and discuss the problems in straight line, plane and sphere.

3. describe curvature and find the radius of curvature, circle of curvature, evolutes, involutes and envelope of curves.

4. explain functions of several variables and find the Taylor's series expansion, Jacobians, maximum and minimum values of function of several variables.

5. describe the double and triple integrals, discuss the change of order of integration and find the area and volume by multiple integrals.

UNIT I – MATRICES   **9+6**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – properties – statement of Cayley – Hamilton theorem and its applications – orthogonal transformation of symmetric matrix to diagonal form – quadratic form – reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II – THREE DIMENSIONAL ANALYTICAL GEOMETRY   **9+6**

Direction cosines and ratios, angle between two lines – equation of plane, angle between two planes – equation of the straight line, coplanar lines, skew lines – equation of a sphere, plane section of a sphere, tangent plane, orthogonal spheres.

UNIT III – DIFFERENTIAL CALCULUS AND ITS APPLICATIONS

                                                                  9+6

Curvature in Cartesian coordinates, centre and radius of curvature, circle of curvature – evolutes, envelopes, evolute as the envelope of normals.

UNIT IV – FUNCTIONS OF SEVERAL VARIABLES   9+6

Partial derivatives, total differentiation – differentiation of implicit functions – Taylor's expansion – maxima and minima, constrained maxima and minima by Lagrange's multiplier method – Jacobians – properties.

UNIT V – MULTIPLE INTEGRALS   9+6

Evaluation of double integrals in Cartesian and polar coordinates – change of order of integration – change of variables from Cartesian to polar coordinates – area as double integral – evaluation of triple integrals in Cartesian coordinates – volume as triple integral in Cartesian coordinates.

Total: 75 Hours

TEXT BOOKS

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

2. T.Veerarajan,"Engineering Mathematics" (I Year), Tata McGraw Hill, 4th Edition, 2011.

REFERENCE BOOKS

1. P.Kandasamy, K.Thilagavathy and K.Gunavathy, "Engineering Mathematics", (for first year), S. Chand and Co., Ltd., Revised Edition 2011.

2. E.Kreyszig, "Advanced Engineering Mathematics", International Student Version, Wiley, 10th Edition, 2015.

3. S. Jayabharathi, "Mathematics - I", Sonaversity, Revised Edition, 2017.

4. N. P. Bali and M. Goyal, "Engineering Mathematics", University Science Press, New Delhi, 9th Edition, 2011.

U15PHY103AR - ENGINEERING PHYSICS

(Common to B.E. Mech, Mechatronics, Civil, EEE, CSE & B.Tech. IT, FT Branches)

L	T	P	C	M
3	0	0	3	100

Course Outcomes

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

1. design acoustically good buildings and describe the applications of ultrasonic waves in the field of non-destructive testing
2. classify lasers and explain its applications in the field of medicine, engineering and technology.
3. elucidate the principle of optical fibre communication, applications and the devices involved in the transmission and reception of data.
4. illustrate the dual nature of matter and radiation and its applications.
5. analyze crystal structures and the significance of defects in crystals.

UNIT I – ACOUSTICS AND ULTRASONICS   9

Classification of sound, Pitch, Loudness, Intensity level, Phon, Timbre, Reverberation, Reverberation time – Sabine's formula and its importance (no derivation) – Sound absorbing materials - Absorption Coefficient and its determination – Factors affecting acoustics of buildings and their remedies – Production of ultrasonic waves by magnetostriction and piezoelectric methods – acoustic grating – Acoustic impedance - Non Destructive Testing – Ultrasonic flaw detector – A scan display - Sonogram (block diagram).

UNIT II – LASERS   9

Principle of spontaneous and stimulated emission – Population inversion - Pumping – Einstein's A and B coefficients derivation – Basic requirements of a laser - Types of lasers – Nd:YAG laser, CO_2 and Semiconductor lasers (homojunction & heterojunction) – Qualitative applications – Lasers in welding, heat treatment and cutting – Medical applications (qualitative) – holography construction and reconstruction.

UNIT III – FIBRE OPTICS AND APPLICATIONS   9

Principle and propagation of light in optical fibers – Numerical aperture and acceptance angle – Types of optical fibres (material, refractive index, mode) – Double Crucible

Technique of fibre drawing – Splicing – Loss in optical fibre – attenuation, dispersion and bending - Fibre optic communication system (Block diagram) – Fibre optic sensors - temperature and displacement sensor - Endoscope.

UNIT IV – QUANTUM PHYSICS   9

Introduction – Compton Effect theory and experimental verification – Matter waves – Schrodinger's time independent and time dependent wave equation - Physical significance of the wave function – Particle in a one dimensional box – Evolution of microscope - Electron microscope – Comparison of optical and electron microscope - Scanning electron microscope.

UNIT V – CRYSTALLOGRAPHY   9

Crystalline Solids – Amorphous solids – Space Lattice - Unit cell – Bravais lattice – Lattice planes – Miller indices – 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.

Total: 45 Hours

TEXT BOOKS

1. B. K. Pandey and S. Chaturvedi, Engineering Physics , Cengage Learning India Pvt. Ltd., Delhi, 2012.

2. M. Arumugam, 'Engineering Physics' Anuradha Publications, Kumbakonam, 2006.

REFERENCE BOOKS

1. C. Shanthi et al., Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised edition, 2016).
2. R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publications, New Delhi, 2003.
3. V. Rajendran and A. Marikani, Engineering Physics, Tata Mc Graw Hill Publications Ltd, III Edition, New Delhi, 2004.
4. M.N. Avadhanulu and PG Kshirsagar, A Text book of Engineering Physics, S.Chand and company, Ltd., New Delhi, 2005.

U15CHE104AR - ENGINEERING CHEMISTRY

(Common to BE - Civil, EEE, Mech, Mechatronics & BTech - FT)

L	T	P	C	M
3	0	0	3	100

Course Outcomes

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

1. analyze the types of impurities present in water, their removal methods and explain the conditioning methods for domestic and industrial uses.

2. outline the principles and applications of electrochemistry to engineering and technology.

3. compare the types of corrosion and describe the methods of corrosion control.

4. outline the principle and applications of surface chemistry and catalysis in engineering and technology.

5. illustrate the basics of nano chemistry, synthesis, properties and applications of nano materials in engineering and technology.

UNIT I – WATER TECHNOLOGY   9

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   9

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).

UNIT III – CORROSION AND CORROSION CONTROL   9

Chemical corrosion - Pilling-Bedworth rule – electrochemical corrosion – mechanism - galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – preliminary treatment - Paints constituents and their functions – surface conversion coatings – Galvanizing and Tinning.

UNIT IV – SURFACE CHEMISTRY AND CATALYSIS   9

Adsorption – types-physical and chemical adsorption – adsorption of gases on solids-adsorption isotherms – Freundlich and Langmuir isotherms-adsorption of solutes from solution – applications of adsorption-role of adsorption in catalytic reactions – ion exchange adsorption-basic principles in adsorption chromatography – adsorption in pollution abatement (granular activated carbon and powdered activated carbon) – catalysis-types - characteristics of catalysts - autocatalysis - definition and examples.

UNIT V – NANOCHEMISTRY   9

Basics - distinction between molecules, nanoparticles and bulk materials – size-dependent properties – nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire – Synthesis: precipitation – thermolysis – hydrothermal – solvothermal – electrodeposition - chemical vapour deposition - sol-gel technique – properties and applications of nano materials.

Total: 45 Hours

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi,   2010 (15th Edition).

2. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2008.

REFERENCE BOOKS

1. T. Maruthavanan et al., "Engineering Chemistry", Sonaversity, Sona College of Technology, Salem, Revised Edition 2018.

2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2009.

3. H.K. Chopra, A. Parmer, "Chemistry for Engineers", Narosa Publishing House, New Delhi, 110 002, 2016.

4. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

U15CPR105AR - PROGRAMMING IN C

(Common to BE - CIVIL, CSE, EEE, MECH, Mechatronics, B.Tech - FT, IT)

L	T	P	C	M
3	0	0	3	100

Course Outcomes

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

1. formulate problems, apply logics to solve problems by practice and outline the basics of computer technology

2. write, compile and find errors in simple c programs

3. apply the concepts such as arrays, decision making and looping statements to solve real-time applications

4. examine the power of functions and pointers to become expert programmers in c

5. solve simple scientific and statistical problems using structures and unions

UNIT I – INTRODUCTION TO PROBLEM SOLVING AND COMPUTERS

8

Problem formulation, Problem Solving methods, Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart. Need for computer languages, Generation and Classification of Computers - Basic Organization of a Computer

UNIT II – C PROGRAMMING BASICS   10

Structure of a C program – Compiling and Debugging a C program - C Character set, Identifies and Keywords, Data Types, Declarations, Expressions, Statements and Symbolic constants, Operators – Arithmetic Operators – Unary operators – Relational and Logical Operators – Assignment operators – Conditional operators. Managing Input and Output operations, pre-processor directives and storage classes

UNIT III – CONTROL STATEMENTS, ARRAYS AND STRINGS   9

Unconditional statements, conditional statements, branching and looping statements - Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations and solving simple scientific and statistical problems

UNIT IV – FUNCTIONS AND POINTERS   **9**

Function – Library functions and user-defined functions – Function prototypes and function definitions – Call by value – Call by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems – Pointers and Functions

UNIT V – STRUCTURES AND UNIONS   **9**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions

Total: 45 Hours

TEXT BOOKS

1. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 2011.
2. Balagurusamy E, "Programming in ANSI C", sixth edition, Tata Mcgraw-Hill, 2012.

REFERENCE BOOKS

1. Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.
2. Byron S Gottfried, "Programming with C", Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

U15EGR106AR - ENGINEERING GRAPHICS

L	T	P	C	M
2	2	0	3	100

Course Outcomes

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

1. predict the construction of various curves in civil elevation plan and machine components.

2. draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

3. analyze the principles of projection of various planes by different angle to project points, lines and planes.

4. draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method. understand the interior components of machinery (or) buildings by sectioning the solid,

5. study the development of simple solids for fabrication of sheet metals.

CONCEPTS AND CONVENTIONS (Not for Examination)   12

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)   12

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

UNIT I – PLANE CURVES (Free hand sketching)   12

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 – ISOMETRIC TO ORTHOGRAPHIC VIEWS 12
(Free Hand Sketching)

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.

UNIT III – PROJECTION OF POINTS, LINES AND PLANE SURFACES
(Free hand sketching and 2D Software) 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 IV – PROJECTION OF SOLIDS 12
(Free hand sketching and 2D Software)

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 V – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES
(Free hand sketching and 2D Software) 12

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.

TEXT BOOKS

1. P. Suresh et al., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.

2. K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.

REFERENCE BOOKS

1. Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.

2. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

3. K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.

4. Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002.

U15PCL107AR - PHYSICS AND CHEMISTRY LABORATORY I
(Common to CIVIL, EEE, Mech, Mechatronics & FT Branches)

L	T	P	C	M
0	0	2	1	100

Course Outcomes

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

1. apply the principles of optics, thermal physics and elasticity to determine the engineering properties of materials.

2. analyse the given water sample to determine the amount of hardness and alkalinity.

3. determine the thickness of the given copper turn used for house hold applications and evaluate the amount of alkalinity, pH, conductivity and iron content of house hold water sample.

List of Experiments – (PHYSICS PART)

1. Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.

2. Determination of the wavelength and velocity of ultrasonic waves and the compressibility of a given liquid using the ultrasonic interferometer.

3. Determination of thermal conductivity of a bad conductor using Lee's disc apparatus.

4. Determination of the angle and dispersive power of a given prism using a spectrometer.

5. Determination of laser wavelength, particle size (lycopodium powder), acceptance angle and numerical aperture of an optical fibre using a diode laser.

6. Determination of the Young's modulus of a given material by non-uniform bending method.

(Any five experiments may be conducted from the above list)

List of Experiments – (CHEMISTRY PART)

1. Estimation of hardness of water by EDTA method.

2. Estimation of alkalinity of water by indicator method.

3. Estimation of hydrochloric acid by pH metry.

4. Conductometric titration of strong acid vs strong base (HCl vs NaOH).

5. Estimation of ferrous iron by potentiometric titration (Fe^{2+} vs dichromate).

6. Estimation of corrosion in iron sheets by weight loss method.

(Any five experiments may be conducted from the above list)

Total: 30 Hours

U15CPL108AR - C PROGRAMMING LABORATORY
(Common to BE - CIVIL, CSE, EEE, Mech, Mechatronics & BTech FT, IT)

L	T	P	C	M
0	0	2	1	100

Course Outcomes

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

1. design and develop simple programs using branching, looping statements, functions and arrays

2. develop programs using structures, strings, pointers and recursion

3. effectively choose programming components that efficiently solve computing problems in real-world

List of Experiments

1. Programs using Input, Output and assignment statements

2. Programs using Branching statements

3. Programs using Looping statements

4. Programs using Functions

5. Programs using one dimensional and two dimensional arrays

6. Programs using Structures

7. Programs using Strings

8. Programs using Pointers (both data pointers and function pointers)

9. Programs using Recursion

Total: 30 Hours

U15EPL109R - ENGINEERING PRACTICES LABORATORY
(Common to all Branches)

L	T	P	C	M
0	0	2	1	100

Course Outcomes

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

1. plan the pipe connections using pvc, g.i pipes

2. analyze the process of wood separation with proper types of joints using tools and machines

3. demonstrate the method of material removal from metal components and assemble the components using sheet metals

4. demonstrate the working principles of house wiring and fluorescent lamp wiring

5. analyze the functions of logic gates (AND, OR, NOT, NAND, NOR and Ex-OR)

List of Experiments

GROUP A (CIVIL & MECHANICAL)

1. CIVIL ENGINEERING PRACTICE

PLUMBING WORKS

a. Basic pipe connections (PVC) involving the fittings like Valves, Taps, and Bends.

b. Mixed pipe (PVC and G.I) connections involving the fitting like Valves, Taps, and Bends

CARPENTRY WORKS

a. Planning

b. Lap joint

c. Cross lap joint

II MECHANICAL ENGINEERING PRACTICE

SHEET METAL WORK

a. Square tray

b. Funnel

FITTING WORK

   a. L joint

   b. V-joint

   c. Demonstration of Welding classes

GROUP B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING

1. Study of Resistor, Inductor and capacitor-ratings-colour coding-series and parallel equivalence.

2. House wiring

3. Fluorescent lamp wiring.

4. Stair-case Wiring and Door bell wiring

5. Measurement of circuit parameters for RLC series circuit..

6. Measurement of Energy using Energy meter for Single Phase system.

7. Study of Fan and Iron Box.

ELECTRONICS ENGINEERING

1. Verification of Ohm's Law

2. Measurement of Amplitude and frequency of AC wave forms using CRO.

3. Verification of logic gates (AND, OR, NOT, NAND, NOR and ExOR).

4. Generation of Clock Signal using IC 555 timer.

5. Soldering practice - Components Devices and Circuits - Using general purpose PCB.

6. Study of Multimeter

Total: 45 Hours

SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005
(An Autonomous Institution)
Courses of Study for BE / B Tech Semester II under Regulations 2015R (CBCS)
Branch: CIVIL

S.No.	Course Code	Course Title	L	T	P	C	Group code
		Theory					
1	U15ENG201AR	Technical English –II	2	0	2	3	HS
2	U15MAT202AR	Mathematics - II	3	2	0	4	BS
3	U15PHY203AR	Physics For Civil Engineering	3	0	0	3	BS
4	U15CHE205AR	Chemistry For Civil Engineering	3	0	0	3	BS
5	U15PSC206R	Problem Solving in C#	3	0	0	3	ES
6	U15GE207R	Engineering Mechanics	2	2	0	3	ES
		Practical					
7	U15PCL208AR	Physics and Chemistry Laboratory – II$	0	0	2	1	BS
8	U15PSL209R	Problem Solving in C Laboratory#	0	0	2	1	ES
9	U15CDL210R	Computer Aided Drafting Laboratory	0	0	2	1	ES
		Total Credits				22	
		Optional Language Elective*					
10	U15OLE1201	French					
11	U15OLE1202	German	0	0	2	1	HS
12	U15OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (over and above the CGPA calculation).

Common to CIVIL & FT

$Laboratory classes on alternate weeks for Physics and Chemistry. The lab examination will be conducted separately for 50marks each with 2 hours duration.

Approved by

HOD-First Year Dr. M. Renuga	Chairperson BOS/ Civil & HOD-Civil Dr. R. Malathy	Member Secretary, Academic Council Dr. R. Shivakumar	Chairperson, Academic Council & Principal Dr. S.R.R. Senthilkumar

U15ENG201AR - TECHNICAL ENGLISH II

L	T	P	C	M
2	0	2	3	100

Course Outcomes

At the end of the 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 emails, formal letters and descriptions of graphics
5. develop skills for writing reports and proposals

UNIT I – FOCUS ON LANGUAGE

• Cause and effect expressions

• Concord

• If conditionals

• Articles

• Pronouns

• Adverbs

• Grammatical structures

UNIT II – SPEAKING-I

• 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.

• Welcome address, vote of thanks, special address on specific topics.

UNIT III – SPEAKING – II

• Mini presentation in small groups of two or three regarding, office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising, applying for financial assistance, applying for a job, team work, discussion, presentation

- 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, 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.

UNIT IV – WRITING – I

- Email, fixing an appointment, Cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Letter Writing, Business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations
- Resume / CV
- Transcoding: Flow Chart, Pie Chart, Graph, Bar Chart, Tabular Column.

UNIT V – WRITING -II

- Technical report writing, feasibility reports, accident reports, survey reports
- General purpose writing specifications of equipment, description of an object, National and International issues, answering general questions with special emphasis on seeking opinions
- Technical Writing: recommendations, checklists, instructions, note making and memo
- Proposal: establishing a lab, introducing a subject in the curriculum, training programme for students

Total: 45 Hours

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

TEXTBOOK

Technical English – I & II, Dr. M. Renuga, et al. Sonaversity, Sona College of Technology, Salem, Revised edition, 2016.

EXTENSIVE READING

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons

2. " Discover the Diamond in You" – Arindam Chaudhuri – Vikas Publishing House Pvt. Ltd.

REFERENCE BOOKS

• 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.

U15MAT202AR - MATHEMATICS II

(Common to Civil, Mech, Mechatronics, EEE, IT and FT Branches)

L	T	P	C	M
3	2	0	4	100

Course Outcomes

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

1. explain the different types of ordinary differential equations and describe the various methods to solve ordinary differential equations.

2. define and explain the vector functions, operators and discuss the methods of solving line, surface and volume integrals.

3. state the special features of function of a complex variable, properties and discuss the problems involving conformal mapping.

4. describe the power series expansion of a complex function and the procedures of evaluating the complex integral.

5. define laplace transform, its inverse, properties and solve an ordinary differential equation using Laplace transform.

UNIT I – ORDINARY DIFFERENTIAL EQUATIONS   9+6

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 – VECTOR CALCULUS   9+6

Vector differentiation: Scalar and vector valued functions, gradient, directional derivative, divergence and curl, scalar potential.

Vector integration: Line, surface and volume integrals, statement of Green's, Stoke's and Gauss divergence theorems, simple applications involving squares, rectangles, cubes and rectangular parallelepiped.

UNIT III – ANALYTIC FUNCTIONS   9+6

Function of a complex variable, analytic function, necessary conditions and sufficient conditions (excluding proof), properties of an analytic function, harmonic conjugate, construction of an analytic function by Milne's Thomson method, conformal mapping: $w = z + c$, cz, $1/z$ and bilinear transformation.

UNIT IV – COMPLEX INTEGRATION   9+6

Statement of Cauchy's integral theorem and Cauchy's integral formula, simple applications, Taylor's and Laurent's expansions, singular points, residues, statement of Cauchy's residue theorem, evaluation of contour integration over unit circle and semi circle (excluding poles on real axis).

UNIT V – LAPLACE TRANSFORM   9+6

Laplace transform: conditions for existence, transform of elementary functions, basic properties, transform of derivatives and integrals, transform of unit step function and impulse function, transform of periodic functions.

Inverse Laplace transform: standard results – statement of convolution theorem and its applications, initial and final value theorems, solution of linear second order ordinary differential equations with constant coefficients using Laplace transformation.

Total: 75 Hours

TEXT BOOKS

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

2. T. Veerarajan, "Engineering Mathematics"(I Year), Tata McGraw Hill, 4th Edition, 2011.

REFERENCE BOOKS

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Engineering Mathematics", (for first Year), S. Chand and Co., Ltd., Revised Edition 2011.

2. E. Kreyszig., "Advanced Engineering Mathematics", John Wiley and Sons (Wiley Student Edition), 10th Edition, 2011.

3. S.Karthikeyan, R. Rajeswari, P. Senthilvadivu and R.Shivakumar, "Vector Calculus and Complex Analysis", Sonaversity, Revised Edition, 2017.

4. N. P. Bali, M. Goyal, "Engineering Mathematics", University Science Press, New Delhi, 9th Edition, 2011.

U15PHY203AR- PHYSICS FOR CIVIL ENGINEERING

L	T	P	C	M
3	0	0	3	100

Course Outcomes

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

1. examine the elastic behaviour of solid materials and apply hydrodynamic principles for the flow of liquids.

2. calculate the electrical and thermal conductivity of conducting materials.

3. compare the different modes of heat transfer and analyze the concept of green building.

4. analyze stress distribution in solids using strain measuring techniques.

5. recognize the novel properties of new engineering materials.

UNIT I – PROPERTIES OF MATTER AND HYDRODYNAMICS   9

Elasticity - Poisson's ratio and relation between moduli (qualitative) – Stress-strain diagram- Factors affecting elasticity - Bending of beams – Cantilever- Expression for bending moment – Measurement of Young's modulus by uniform and non-uniform bending- I shaped girders - Stream line flow – Turbulent flow- Poiseuille's formula for flow of liquid through a capillary tube – Determination of coefficient of viscosity of a liquid.

UNIT II – CONDUCTING MATERIALS   9

Conductors- Classical free electron theory of metals-Electrical and thermal conductivity-Wiedemann-Franz law-Lorentz number-Drawbacks of classical theory-Quantum theory-band theory of solids(qualitative treatment only) – Fermi distribution function- Effect of temperature on Fermi Function-Density of energy states- Carrier concentration in metals – application of conducting materials in electrically conductive concrete.

UNIT III – THERMAL PHYSICS   9

Modes of heat transfer – conduction - convection – radiation - Coefficient of thermal conductivity - Thermal diffusivity - Rectilinear flow of heat along a bar (derivation) – Radial and cylindrical flow of heat, Spherical shell method - Thermal conductivity of rubber and glass tube - Conduction through compound media – Thermal insulation in

buildings - Thermal insulating materials – Green building concept

UNIT IV – STRAIN MEASURING TECHNIQUES   9

Stress – Strain – Electrical strain gauges – Resistance, capacitance, Inductance, Wheatstone bridge – Theory of photoelasticity - Stress optic law – Effect of stressed model in a plane polariscope – Isoclinic and Isochromatic fringes – Photo elastic bench

UNIT V – NEW ENGINEERING MATERIALS   9

Metallic glasses: Preparation - properties - applications

Shape memory alloys: Characteristics - properties of Ni-Ti alloy – application- advantages and disadvantages of SMA

Advanced Ceramics: Introduction – characteristics – structural ceramics

Nanoscience and Nanotechnology – significance of the nanoscale - different types of nanostructures (Confinement Dimensions 0-D, 1-D, 2-D and 3-D) - Categories of nanomaterials - Fabrication of nanomaterials - Ball milling method and Chemical vapour deposition technique - Carbon nanotubes - Types of carbon nanotubes - CNT structure – properties and applications.

Total: 45 Hours

TEXT BOOKS

1. B. K. Pandey and S. Chaturvedi, 'Engineering Physics', Cengage Learning India Pvt. Ltd., Delhi, 2012.
2. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, 2006.

REFERENCE BOOKS

1. C. Shanthi et al., Physics for Civil Engineering, Sonaversity, Sona College of Technology, Salem (Revised edition, 2017).
2. V. Rajendran and A. Marikani, 'Materials Science' TMH Publications, New Delhi, 2004.
3. Subramaniam. N, Brijlal, 'Heat and Thermodynamics', S. Chand Group, New Delhi, 2007 (Unit II).
4. Subramaniam. N, Brijlal, 'Properties of Matter', S. Chand Group, New Delhi, 2007 (Unit I).

U15CHE205AR - CHEMISTRY FOR CIVIL ENGINEERING

	L	T	P	C	M
	3	0	0	3	100

Course Outcomes

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

1. analyze the types of polymers, polymerization reactions, polymerization techniques and fabrication methods of polymers for engineering applications.

2. describe the chemistry of engineering materials and their industrial applications.

3. discuss the chemistry of modern composite materials and their applications.

4. explain the industrial importance of phase rule and alloys.

5. describe the chemistry of building materials.

UNIT I – POLYMER CHEMISTRY   9

Nomenclature of Polymers – Functionality – Types of Polymerization-Addition-Condensation and Copolymerization – Classification of Polymers – Free Radical Mechanism of Addition Polymerization – Properties of Polymers – Glass transition temperature – tacticity – 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 II – CHEMISTRY OF ENGINEERING MATERIALS   9

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.

UNIT III – CHEMISTRY OF MODERN COMPOSITE MATERIALS

9

Blends and composites, significance and choice of polymers for blending, polymer alloys, plastic-plastic, rubber-plastic and rubber-rubber blends, FRP – composition and application of glass , carbon, boron, alumina and aramid FPRs. Reinforcement – Particle reinforced composites (PRC) – Composition and application of clay, silica, carbon, TiO_2 and metal nano structured materials in PRC.

UNIT IV – PHASE RULE AND ALLOYS   **9**

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead – silver system only).

Alloys: Introduction- definition- properties of alloys- significance of alloying, functions and effect of alloying elements - ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V – CHEMISTRY OF BUILDING MATERIALS   **9**

Lime – classification – manufacture and properties of lime – Cement – classification – Portland cement – chemical composition – manufacture – setting and hardening – analysis of cement – concretes – weathering of concrete, cement and its prevention – special cements - gypsum – plaster of paris – Glass - manufacture, types, properties and uses - Applications of Chemistry in Civil engineering.

Total: 45 Hours

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi , 2010.

2. B.K. Sharma, "Engineering Chemistry", Krishna Prakasan Media (P) Ltd., Meerut (2001).

REFERENCE BOOKS

1. A.P. Uthirakumar et al., "Chemistry for Civil Engineering" by Sonaversity, Sona College of Technology, Salem, Revised Edition, 2018.

2. Gowariker V.R. , Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.,), Chennai, 2006

3. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).

4. N. Krishnamurthy, K. Jeyasubramanian and P. Vallinayagam, "Applied Chemistry", Tata McGraw-Hill Publishing Company Limited, New Delhi (1999).

U15PSC206R - PROBLEM SOLVING IN C

(Non Circuit branches: MECH, FT, Civil)

L	T	P	C	M
3	0	0	3	100

Course Outcomes

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

1. write c programs to solve problems using appropriate language features.

2. design and develop interactive real-time applications using files.

3. write programs using preprocessor directives and apply the concept of dynamic memory allocation.

4. write programs for several sorting and searching methods.

5. write programs using c graphics features.

UNIT I – C PROGRAMMING FUNDAMENTALS- A REVIEW   9

Conditional statements – Control statements – Functions – Arrays – Pointers - Variation in pointer declarations – Function Pointers – Function with Variable number of arguments – Structures and Unions

UNIT II – FILE HANDLING   9

File handling concepts – File read – write – binary and Stdio - File Manipulations Command line arguments

UNIT III – PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION   9

Preprocessor: Macro Substitution, File Inclusion, Compiler Control Directives – Dynamic Memory Allocation: Library Functions for Dynamic Memory Allocation.

UNIT IV – SORTING AND SEARCHING TECHNIQUES   8

Sorting algorithms: Insertion Sort - Selection Sort - Bubble Sort - Merge Sort – Quick Sort- Shell Sort – Bucket Sort - Searching: Linear Search and Binary Search.

UNIT V – C GRAPHICS BASICS   **10**

Introduction, initializing the graphics, C Graphics functions, programs, Simple 2D
Graphics: Text, Lines, Arc, Ellipse, Polygon and Rectangle.

Total: 45 Hours

TEXT BOOK

1. K R Venugopal, S R Prasad "Mastering C" Tata McGraw-Hill Education Pvt Ltd,
    2012.

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language",
    2nd Edition, Pearson Education, 1988.

2. E Balagurusamy "Programming in ANSI C" Sixth Edition Tata McGraw-Hill
    Education Pvt Ltd, 2012.

3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition,
    Pearson Education, 1996.

4. Byron S Gottfried, "Programming with C", Schaum''s Outlines, Second Edition,
    Tata McGraw-Hill, 2006.

5. Yashavant P. Kanetkar. "Let Us C", 14th edition, BPB Publications, 2016.

6. Deitel and Deitel, "C How to Program", 6th edition, Pearson Education, New
    Delhi, 2011.

U15GE207R - ENGINEERING MECHANICS

	L	T	P	C	M
	2	2	0	3	100

Course Outcomes

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

1. the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.

2. further, they should understand the principle of work and energy. he should be able to comprehend the effect of friction on equilibrium.

3. they should be able to understand the laws of motion, the kinematics of motion and the interrelationship.

4. they should also be able to write the dynamic equilibrium equation. all these should be achieved both conceptually and through solved examples.

UNIT I – BASICS & STATICS OF PARTICLES   12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle

Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II – EQUILIBRIUM OF RIGID BODIES IN 2 DIMENSIONS   12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions

UNIT III – FRICTION   12

Frictional force – Laws of Coulomb friction – Angle of friction – cone of friction – Equilibrium of bodies on inclined plane – Ladder friction - Wedge Friction – Belt friction – Screw Jack - Self locking

UNIT IV – PROPERTIES OF SURFACES AND SOLIDS   12

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 – Mass moment of inertia of cylinder

UNIT V – DYNAMICS OF PARTICLES   12

Displacements, Velocity and acceleration, their relationship – Rectilinear and Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

Total: 60 Hours

TEXT BOOKS

1. Engineering mechanics by Sonaversity, III edition, by 2013
2. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. Dynamics, McGraw–Hill International Edition, (1997).

REFERENCE BOOKS

1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw–Hill, (2001).
4. MeriamJ.L,KraigeL.G,"Engineering Mechanics-Statics"6th Edition, Wiley, 2010.
5. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
6. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

U15PCL208AR - PHYSICS AND CHEMISTRY LABORATORY II

(Common to Civil, EEE, Mech, FT and Mechatronics Branches)

L	T	P	C	M
0	0	2	1	100

Course Outcomes

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

1. apply the principles of optics, electricity and elasticity to determine the engineering properties of materials.

2. evaluate the amount of iron content in the given sample using spectrophotometry, analyze the amount of chloride in a domestic water sample and analyse the quality of brass by estimating copper.

3. determine the resistivity of the given fuse wire used for house hold applications and determine the dissolved oxygen in two different water samples collected from the students residential areas.

LIST OF EXPERIMENTS   (PHYSICS PART)

1. Determination of rigidity modulus of the material using torsion pendulum.

2. Determination of specific resistance of a given wire using Carey-Foster's bridge.

3. Determination of Young's modulus of the material by non-uniform bending method.

4. Determination of wavelength of the spectral lines in the mercury spectrum using a spectrometer.

5. Determination of band gap of a semiconductor diode.

6. Determination of coefficient of viscosity of the given liquid using Poiseuille's method

(Any five experiments may be conducted from the above list)

LIST OF EXPERIMENTS (CHEMISTRY PART)

1. Determination of molecular weight of Polyvinyl alcohol using Ostwald Viscometer.

2. Estimation of copper in brass solution by EDTA method.

3. Determination of Calcium Oxide (CaO) in Cement.

4. Estimation of chromium in waste water.

5. Determination of dissolved oxygen in water by Winkler's method.

6. Estimation of Iron content in water by Spectrophotometric method.

(Any five experiments may be conducted from the above list)

Total: 30 Hours

U15PSL209R - PROBLEM SOLVING IN C LABORATORY
(Non Circuit branches: MECH, FT, Civil)

L	T	P	C	M
0	0	2	1	100

Course Outcomes

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

1. write c programs to solve problems using appropriate language features.
2. write programs for sorting list of items and searching an item in a given list.
3. write programs using c graphics features.

Write C programs for the following. The faculty concerned will add the suitable scenario based questions for the concepts and that must be shared during the lab classes. (Compiler/IDE: GCC / Code::Blocks)

1. Functions (includes Pass by value, Pass by reference and recursive functions)
2. Pointer manipulations
3. File Handling in C
4. Command Line Arguments in C.
5. Sorting algorithms - Bubble Sort, Insertion Sort, Selection Sort, Merge Sort and Quick Sort.
6. Linear Search and Binary Search algorithms.
7. Graphics primitives - Line, Arc, Ellipse, Polygon, Rectangle.

Total: 30 Hours

U15CDL210R - COMPUTER AIDED DRAFTING LABORATORY

	L	T	P	C	M
	0	0	2	1	50

1. **General Introduction**

    Introduction to CAD Modeling Software – Industrial Applications – Parametric & Feature based modeling. Comparison - CAD models with Proto types. Practice - Sketch – Part Model – Detailing.

    Introduction about ANALYSIS.

2. **Preparation of Standard Solid Primitives**

    Create 3D- simple solids- Prism, Pyramid, Cylinder and Cone – Front view-Top view- and side view Create 3D simple models- V-block, Spur Gear, Bolt and Nut etc.).

3. **Preparation of Orthographic Drawing and Sectioning**

    Ortho graphic view and Cut section of standard Machine Elements.,

4. **Material Properties and Rendering**

    Applying different materials for Machine Components-Steel –Aluminum-Copper-Brass-Silver-Wood

    Plastic-Ceramic-.Concrete etc., Preparing Final CAD outputs with rendering features.

5. **Geometric Tolerance and Dimension**

    Detailing with Fits, Limits and Tolerance.

    Introduction to GD&T – Industrial Drawing practice- Machining symbols, Welding Symbols etc.,

Note: Laboratory Practicing CAD Modeling Software: Solidworks 2012.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester III under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15MAT301AR	Transforms and Partial Differential Equations	3	2	0	4
2	U15CE301R	Construction Materials and Practices	3	0	0	3
3	U15CE302R	Mechanics of Solids	3	2	0	4
4	U15CE303R	Surveying	3	0	0	3
5	U15CE304R	Fluid Mechanics	3	0	0	3
Practical						
6	U15CE305R	Computer Aided Building Drawing Laboratory	0	0	4	2
7	U15CE306R	Survey Laboratory	0	0	4	2
8	U15ENG301R	Communication Skills Laboratory	0	0	2	1
9	U15GE301R	Soft Skills and Aptitude-I	0	0	2	1
					Total Credits	23

Approved By

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

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

	L	**T**	**P**	**C**
U15MAT301AR **TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**	**3**	**2**	**0**	**4**

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

1. Describe the general form of Fourier series, expand the periodic function and complex form in terms of Fourier series and find harmonics of Fourier series.
2. Describe the complex (or infinite) Fourier transform pairs, sine and cosine transforms pairs and their properties and apply Parseval's identity to evaluate integrals.
3. Form the partial differential equations, solve first order linear and nonlinear partial differential equations of certain type, and solve homogenous and non-homogenous linear partial differential equations with constant coefficients of higher order.
4. Classify the second order partial differential equations and solve linear hyperbolic and elliptic partial differential equations using method of separation of variables and Fourier series.
5. State Z transform pair, solve Z transform of certain functions, form the difference equation andhence solve it by means of Z transforms.

UNIT-I   FOURIER SERIES   15
General Fourier series - Dirichlet's conditions, odd and even functions, half range sine and cosine series, Parseval's identity, complex form of Fourier series, harmonic analysis.

UNIT-II   FOURIER TRANSFORMS   15
Fourier integral theorem (without proof) - Fourier transform pair, sine and cosine transforms, properties, transforms of simple functions, convolution theorem (without proof), Parseval's identity.

UNIT-III   PARTIAL DIFFERENTIAL EQUATIONS   15
Formation of partial differential equations, Lagrange's linear equation, solutions of standard types of first order partial differential equations, linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV   BOUNDARY VALUE PROBLEMS   15
Classifications of quasi linear PDE, solutions of one dimensional wave equation in cartesian co-ordinates, steady state solution of two dimensional equation of heat conduction in Cartesian co-ordinates (Insulated edges excluded).

UNIT-V   Z -TRANSFORMS AND DIFFERENCE EQUATIONS   15
Z –Transforms - Elementary properties, inverse Z - transform, convolution theorem (without proof), formation of difference equations and solution of difference equations using Z-transform.

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. Transforms and Partial Differential Equations – III" by Sonaversity 2011
2. Veerarajan. T., "Enginering Mathematics" (For semester III), 3rd Edition, Tata Mc Graw Hill, 2008

REFERENCES:
1. Bali N.P., and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications (P) Ltd., 2007
2. Ramana B.V.,"Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi 2007
3. Glyn James,"Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education 2007
4. Erwin Kreysizig, "Advanced Engineering Mathematics", 8th edition, Wiley India 2007
5. Grewal B.S., "Higher Engineering Mathematics", 40th Edition, Khanna Publishers, Delhi 2007
6. Anand Kumar ,Signals and Systems, Phi Learning, 3rd Edition, 2013
7. S. Palani, Signals and Systems by Ane Books Pvt. Ltd. First Edition, 2009
8. Ramesh Babu,Signals and Systems,SciTech Publications, 3rd Edition, 2013

CONSTRUCTION MATERIALS AND PRACTICES

L	T	P	C
3	0	0	3

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

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

UNIT-I   INTRODUCTION TO BUILDING CONSTRUCTION   9
General: Definition of Civil Engineering-Function of Civil Engineer-Division of Civil Engineering- Types of structure - 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. Super structures: Masonry structures-Framed structures: Components of building and its function.

UNIT-II   CONCRETE MAKING MATERIALS   9
Aggregate: Classification: Fine aggregate-Bulking of sand-Fineness modulus-Types-Properties-Coarse aggregate-Properties-Testing. Binding material: Cement-Manufacturing process-Types and grade-Testing-Storage of cement.

UNIT-III   MISCELLANEOUS MATERIALS   9
Bricks: Brick earth-Composition-Manufacturing process-Classification-Testing. Timber: Market forms and Industrial products-Properties-Seasoning and Preservative treatment. Ferrous materials: Iron and steel-Composition -Manufacturing process-Market forms: Reinforcing: Grades and Sizes-Applications; Structural steel-Shapes-Applications. Flooring and roofing: Materials-Suitability-Types. Pipes: Types-Sizes-Application.

UNIT-IV   CONSTRUCTION PRACTICES   9
Specifications -Construction co-ordination -Site clearance and marking -Setting out foundation plan on ground - Damp proofing-Masonry: Bonds - Brick masonry-Stone masonry-Plastering and Pointing- Flooring: Joints; Form works: Centering and shuttering - Scaffoldings, shoring and underpinning.

UNIT-V   MISCELLANEOUS CONSTRUCTION PRACTICES   9
Lintel: Functions of lintel and sunshade-Types of lintel; Arches: Construction-Elements-Classification. Doors and Windows: Technical terms-Types and their suitability. Stair and stair cases:Terminology-Location and classification of stairs-Requirement of good stair.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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

1. Learn the internal stress acting in the system and understand the behavior of the system under all the types of forces.
2. Comprehend the state of stresses and strains in various structural components under all types of forces.
3. Draw the Shear force and bending moment diagrams for beams subjected to all the types of loading.
4. Familiarize the behavior of beam under flexure and shear.
5. Ideas of torsional stresses and how to evaluate it in circular sections and its applications in spring analysis.

UNIT-I   STRESS AND STRAIN AT A POINT   15

Introduction-Assumption made in strength of materials-Classification of materials-Stress and strain: Types; Elastic limit-Hooke's law; Stress strain curves: Brittle material-Ductile material: Mild steel- High strength steel-Determination of yield stress and Young's modulus; Elastic constants and its relation-Volumetric strain.

UNIT-II   ANALYSIS OF SIMPLE SYSTEMS AND STRAIN ENERGY   15

Analysis of bars of varying sections; Principles of superposition; Analysis of bars of composite sections subjected to normal and thermal stress. Strain energy and strain energy density-Strain energy due to: Axial load-Suddenly applied load-Impact load.

UNIT-III   SHEAR FORCE AND BENDING MOMENT   15

Beams: Types of supports and its reaction-Types of beams-Types of loads-Shear force and bending moment: Statically determinate beams subjected to transverse loading (point load and uniformly distributed load)-Shear force diagram-Bending moment diagram: Point of contra flexure.

UNIT-IV   BENDING AND SHEAR STRESSES IN BEAMS   15

Theory of simple bending-Assumptions and derivation of simple bending equation-Flexural rigidity- Bending and shear stress distribution diagram: Rectangle-Circle-Symmetric I section.

UNIT-V   TORSION IN A CIRCULAR SHAFT AND SPRINGS   15

Theory of simple torsion-Assumptions and derivation of torsion equation - Torsion rigidity - Polar modulus - Torsion in solid and hollow circular shafts-Power transmitted by a shaft. Closed coiled helical springs under axial load and axial twist-Laminated springs.

                                        TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

	L	T	P	C
U15CE303R **SURVEYING**	3	0	0	3

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

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

UNIT-I   **CHAIN AND COMPASS SURVEYING**   **9**

Principles and Concepts: Chaining and Ranging - Compass - Prismatic compass - Surveyor's Compass - Bearing systems and Conversions - Traversing - Local attraction - Magnetic Declination and Dip.

UNIT-II   **LEVELLING**   **9**

Leveling: Types of instruments-Bench marks - Temporary and permanent adjustments-Types of Levelling- Methods of Leveling. Contours: Contouring - Methods - Characteristics and uses of contours -Calculation of Areas and Volumes by Trapezoidal and Simpson's rule.

UNIT-III   **THEODOLITE AND TACHEOMETRIC SURVEY**   **9**

Theodolite - Description and uses - Horizontal angles - Heights and distances –Traversing. Tachometric systems - Tangential and stadia systems - Horizontal and inclined sights - Vertical and normal staff - Stadia constants- Anallatic lens.

UNIT-IV   **CONTROL AND ENGINEERING SURVEY**   **9**

Horizontal and vertical control points-Triangulation-Signal-Instrument and Accessories - Well-conditioned triangles. Curves: Horizontal and vertical curves-Types and uses of curves.

UNIT-V   **DIGITAL SURVEY**   **9**

Total station - Basic principle-Electro-optical system: Measuring principle - Working principle- Sources of error- Care and maintenance. EDM-Types of EDM instruments -Measuring and working principle. Basic concepts-Different segments-Space, Control and user segments-Satellite configuration- Anti spoofing and selective availability.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Punmia B.C, "Surveying, Vol. I and II", Laxmi Publications, 2016.
2. Basak N.N, "Surveying and Levelling", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2014.

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.

	L	T	P	C
U15CE304R **FLUID MECHANICS**	**3**	**0**	**0**	**3**

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

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

UNIT-I   DEFINITION AND FLUID PROPERTIES   9
Definitions-Fluid and fluid mechanics-Dimensions and units-Fluid properties: Density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension-Continuum concept of system and control volume.

UNIT-II   FLUID STATICS & KINEMATICS   9
Pascal's Law and Hydrostatic equation - Forces on plane and curved surfaces-Buoyancy-Meta centre -Pressure measurement-Fluid mass under relative equilibrium
Fluid Kinematics Stream, streak and path lines-Classification of flows-Continuity equation (one, two and three dimensional forms)- Stream and potential functions- Flow nets -Velocity measurement (Pitot tube, Current meter, Hot wire and hot film anemometer, Float technique, Laser Doppler velocimetry)

UNIT-III   FLUID DYNAMICS   9
Control Volume Approach - Euler and Bernoulli's equations- Application of Bernoulli's equation-Discharge measurement-Laminar flows through pipes and between plates-Hagen Poiseuille equation-Turbulent flow-Darcy-Weisbach formula-Moody diagram-Moment of momentum Principle

UNIT-IV   BOUNDARY LAYER AND FLOW THROUGH PIPES   9
Definition of boundary layer-Thickness and classification-Displacement and momentum thickness-Development of laminar and turbulent flows in circular pipes-Major and minor losses of flow in pipes-Pipes in series and in parallel-Pipe network analysis.

UNIT-V   SIMILITUDE AND MODEL STUDY   9
Dimensional Analysis- Rayleigh's method-Buckingham's Pi-theorem-Similitude and models-Scale effect and distorted models.

TOTAL: 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.

U15CE305R **COMPUTER AIDED BUILDING DRAWING LABORATORY**

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

1. Apply the principles of planning and bylaws used for building planning.
2. Draw plan, elevation and section for various structures.
3. Apply the technical concepts and ways to solve engineering problems by conducting experiments.

COURSE CONTENT S

Industrial Lectures:

Introduction to Building Planning: Types of buildings-Building regulations as per Indian standards-Provisions of national building code-Building bye-laws-Open area-Setbacks -Principles of planning-Orientation-Ventilation and lighting. Minimumstandard dimensions of building elements: Area limitation- Floor area ratio- Floor space index- Setback distances-Open spaces.

Preparation of building plan: Site plan-Line plan-Detailed plan-Sectional view and elevation-Preparation of blue print-Contents of plan-Signing authority-Procedure for approval of plan. Introduction to Vastu sastra- Technical back ground.

Laboratory

Preparation of line sketches in accordance with functional requirements and building rules for the following types of building as per National Building Code:
Symbols of materials and sign convention
Preparation of plan for stair case room
Detailing of rain water harvesting and septic Tank
Flat roof residential building
Pitched roof residential building
Multi-storied building
Industrial Building
Sectional view for sub and super structures: Masonry and framed structures

Detailed Drawings (Plan, Elevation and section for the following) by using software:
Preparation of site plan, line plan and detailed plan
Flat roof building with load bearing wall
Framed structures
Elevation of flat and sloping roof
Preparation of working drawing: Plumbing and electric work

Three Dimensional: Introduction to three dimensional drawing (3D) - Isometric drawings-Wire-frame Models-Surfaces - Regions-Creation of 3D model of a simple residential building.

TOTAL: 60 PERIODS

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

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

COURSE CONTENT S

1. Measurement of given area using chain and cross staff survey.
2. Measurement of bearings and calculation of included angles using prismatic and surveyors compass.
3. Reduction of levels - height of collimation and rise and fall method.
4. Measurement of horizontal and vertical angle using theodolite.
5. Measurement of height and distance by single plane method.
6. Measurement of height and distance using stadia and tangential system of tachometry.
7. Setting out of a simple curve using linear method.
8. Setting out of foundation for a given building.
9. Calculation of latitude and longitude using GPS.
10. Measurement of angles, height and area using total station.

TOTAL: 60 PERIODS

	COMMUNICATION SKILLS LABORATORY	L	T	P	C
U15ENG301R	**(Lab / Practical Course)**	0	0	2	1

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

1. Communicate confidently and effectively
2. Demonstrate active listening skills
3. Practice soft skills and interpersonal skills to excel in their jobs.
4. Use language efficiently to face interviews, participate in group discussions and present speeches.

COURSE CONTENT S

1. Listening Comprehension: Listening and typing – listening and sequencing of sentences – Filling in the blanks – Listening and answering questions.
2. Reading Comprehension: Filling in the blanks – Cloze exercises – Vocabulary building – Reading and answering questions.
3. Speaking: Phonetics: Intonation – Ear training – Correct Pronunciation – Sound recognition exercises – Common errors in English.
4. Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)
5. Making presentations: introducing oneself – introducing a topic – answering questions – individual presentation practice
6. Creating effective PPTs – presenting the visuals effectively
7. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
8. Preparing job applications - writing covering letter and résumé
9. Applying for jobs online - email etiquette
10. Participating in group discussions – understanding group dynamics - brainstorming the topic – mock GD
11. Training in soft skills - persuasive skills – people skills - questioning and clarifying skills
12. Writing Project proposals: collecting, analyzing and interpreting data / drafting the final report
13. Attending job interviews – answering questions confidently
14. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

REFERENCE BOOKS:

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.

2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.

3. D'Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.

4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.

5. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.

6. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

7. Turton, N.D and Heaton, J.B. Dictionary of Common Errors, Addision Wesley Longman Ltd., Indian reprint1998.

EXTENSIVE READING

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.

2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

TOTAL: 30 PERIODS

Semester-III	U15GE301R:SOFT SKILLS AND APTITUDE – I	L 0	T 0	P 2	C 1	Marks 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 than those in BA-I and II in stated areas of quantitative aptitude and logical reasoning
3.	Demonstrate higher than BA-I and II 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. Numbers: Finding units digit, Power rule b. Base system – Progressions: Arithmetic, geometric and harmonic c. HCF and LCM d. Averages e. Percentages f. Ratio and proportion g. Ages h. Partnership i. Profit and loss j. Mensuration: Area, perimeter, volume and Surface area k. Coding and Decoding: Numbers, alphabet, alphanumeric coding and Artificial language l. Direction Sense m. Symbols and series: Numbers, alphabet, symbols, pictures and alphanumeric n. Seating arrangement
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

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester IV under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
		Theory				
1	U15MAT401AR	Numerical Methods for Engineering Computation	3	2	0	4
2	U15CHE404R	Environmental Sciences	3	0	0	3
3	U15CE401R	Strength of Materials	3	2	0	4
4	U15CE402R	Transportation Engineering	3	0	0	3
5	U15CE403R	Applied Hydraulics and Fluid Machinery	3	0	0	3
6	U15CE404R	Concrete Technology	3	0	0	3
		Practical				
7	U15CE405R	Hydraulic Engineering Laboratory	0	0	4	2
8	U15CE406R	Material Testing Laboratory	0	0	4	2
9	U15GE 401R	Soft Skills and Aptitude-II	0	0	2	1
					Total Credits	25

Approved By

Chairperson, Civil Engineering BoS　　　**Member Secretary, Academic Council**　　　**Chairperson, Academic Council & Principal**

　Dr.R.Malathy　　　　　　　　　　**Dr.R.Shivakumar**　　　　　　　　　　　**Dr.S.R.R.Senthil Kumar**

Copy to:-

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

	L	**T**	**P**	**C**
U15MAT401AR **NUMERICAL METHODS FOR ENGINEERING COMPUTATION**	**3**	**2**	**0**	**4**

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

1. Explain the methods to solve algebraic and transcendental equations, solve the linear system of equations by direct or iterative methods and find the dominant Eigen value of a matrix.
2. Describe and apply the Newton's forward, backward and divided difference formulas, Lagrange's polynomial and cubic spline to obtain the polynomial interpolation.
3. Explain the Newton's forward, backward and divided difference formula to compute the derivatives of a tabular function at desired point and apply the Gaussian quadrature formula, Trapezoidal rule, Simpson's rule and Romberg's method to evaluate the numerical integration.
4. Solve the linear and nonlinear ordinary differential equations(ODE) of first and second order by single step methods and multi step methods.
5. Solve the boundary value problems (BVPs) in second order ODEs and elliptic, parabolic and hyperbolic PDEs by finite difference approximation.

UNIT-I   SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS   15
Solution of algebraic and transcendental equations: Regula – Falsi method – Fixed point iteration method – Newton Raphson method. Solution of linear system of equations: Gauss elimination method – Gauss – Jordan method – Gauss – Jacobi and Gauss – Seidel methods. Matrix inversion by Gauss – Jordan method – Eigen values of a matrix by Power method.

UNIT-II   INTERPOLATION AND APPROXIMATION   15
Interpolation with equal intervals: Newton's forward and backward difference formulae – Cubic spline interpolation. Interpolation with unequal intervals: Newton's divided difference interpolation – Lagrange's interpolation – inverse Lagrange's interpolation.

UNIT-III   NUMERICAL DIFFERENTIATION AND INTEGRATION   15
Numerical differentiation: Approximation of derivatives using Newton's forward, backward difference and divided difference interpolation polynomials. Numerical integration: Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rule

UNIT-IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   15
Single step methods: Taylor series method – Euler's method – Modified Euler's method – Fourth order Runge – Kutta method for solving first and second order ordinary differential equations. Multi step methods: Milne's and Adams – Bash forth predictor and corrector methods for solving first order equations.

**UNIT-V   BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL
               EQUATIONS   15**
Ordinary differential equations: Finite difference method for solving two – point linear boundary value problems governed by second order ordinary differential equations. Partial differential equations: Classification of linear second order partial differential equations – Solution of parabolic partial differential equations by Bender – Schmidt explicit and Crank-Nicolson implicit methods – Solution of hyperbolic partial differential equations by explicit method – Solution of two dimensional Laplace PDEs by Liebmann's iteration process and Poisson PDEs.

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. S. Ponnusamy, "Numerical Methods", First Edition, Sonaversity, 2009.
2. T. Veerarajan and T. Ramachandran, "Numerical Methods with programs in C", Second Edition, Tata McGraw Hill Pub. Co. Ltd., 2008.

REFERENCES:

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", Fifth Edition, S. Chand & Co. Ltd., New Delhi, 2013.
2. C. F. Gerald and P. O. Wheatly, "Applied Numerical Analysis", Seventh Edition, Pearson Education, New Delhi, 2004.
3. K. SankarRao, "Numerical Methods for Scientists and Engineers", Third Edition, Prentice Hall of India P. Ltd., New Delhi, 2007.

U15CHE404R   **ENVIRONMENTAL SCIENCE**

L	T	P	C
3	0	0	3

COURSE OUTCOMES (On completion of the course, the students 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, mineral, food, energy and land resources.
2. Explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. Define the various known kinds of environmental pollution and discuss their causes, effects and control measures.
4. Give an account of the social issues with regard to the environment.
5. Discuss the impact of human population on the environment.

UNIT-I   INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES   9
Definition, Scope and Importance – Need for public awareness – Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Timber Extraction, Dams, Benefits and their effects on forests and tribal people - Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Conflicts Over Water – Mineral Resources:- Use–Environmental Effects of Extracting and Using Mineral Resources – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources – Land Resources:- Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources.

UNIT-II   ECOSYSTEMS AND BIODIVERSITY   9
 Concepts of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Biogeochemical Processes - Ecological Succession – Food Chains, Food Webs and Ecological Pyramids.
 Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – 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   9
Definition – Causes, Effects and Control Measures of:- (A) Air Pollution - Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Solid Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes, hazardous wastes and biomedical wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management:- Floods, Earthquake, Cyclone and Landslides – Wastewater treatment methods.

UNIT-IV   SOCIAL ISSUES AND THE ENVIRONMENT   9

Sustainable Development – Urban Problems Related To energy – Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, its Problems and Concerns – Environmental Ethics:- Issues and Possible Solutions –, Nuclear Accidents and Holocaust, Case Studies – Wasteland Reclamation – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Solid Waste Management Rules– Issues Involved in enforcement of Environmental Legislation – Public Awareness.

UNIT-V   HUMAN POPULATION AND THE ENVIRONMENT   9
Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – environment and Human Health – Human Rights – Value Education – HIV /AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K. Karunakaran et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2014.
2. "Environmental Science and Engineering" by Anubha Kaushik and C.P. Kaushik, New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

REFERENCES:

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co.
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.

	L	T	P	C
U15CE401R **STRENGTH OF MATERIALS**	3	2	0	4

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

1. Familiarize the behavior of column under axial and eccentric loads.
2. Establish the slope and deflection in beams by using various methods.
3. Examine the problems related to thin and thick cylinders subjected to fluid pressure.
4. Understand the basic concepts of principle plane and stresses, theory of elasticity.
5. Determine the forces in plane truss members.

UNIT-I   COMPRESSION MEMBERS   15

Column: Types- Modes of failure-Buckling load-Factor of safety- Euler's theory- Different end conditions- Rankine's-Gordon formula. Axial and eccentric loads- Direct, bending and combined bending stress- Calculation of combined bending stress: Core section- Middle third and Middle fourth rule.

UNIT-II   DEFLECTION OF DETERMINATE BEAMS   15

Governing differential equation-Elastic curve for various types of beams-Slope and deflection: Macaulay's method- Moment area method- Conjugate beam method.

UNIT-III   CYLINDERS   15

Thin cylinder: Circumferential and longitudinal stress- Shear stress- Volumetric strain. Thick cylinder: Lame's equation- Hoop and radial stress distribution- Compound cylinders.

UNIT-IV   PRINCIPAL STRESS AND THEORIES OF ELASTIC FAILURE   15

Two dimensional state of stress at a point-Normal and shear stresses: Analytical method. Theories of failure: Maximum principal stress theory- Maximum shear stress theory- Maximum principal strain theory- Strain energy theory- Maximum shear strain energy theory-Simple Problems.

UNIT-V   ANALYSIS OF PLANE MEMBERS   15

Elements and types of a truss-Determinacy and stability- Analysis of statically determinate plane truss: Method of joints-Method of sections- Method of tension coefficient.

TOTAL (L:45+T:50): 75 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

	L	**T**	**P**	**C**
U15CE402R **TRANSPORTATION ENGINEERING**	**3**	**0**	**0**	**3**

COURSE OUTCOMES (On completion of the course, the students will be able to):
1. Explain the various highway development and design cross section elements.
2. Determine the characteristics of pavement materials and design of pavement as per IRC.
3. Design of pavement as per IRC.
4. Apply the concepts of railway planning while designing the permanent way.
5. Plan the locations and design of the airport components.

UNIT-I   INTRODUCTION TO HIGHWAY   9
Introduction to transportation systems, classification of roads, highway planning-Road cross section-Camber, gradient, super elevation- Sight distance: PIEV theory-Stopping sight distance-Over taking sight distance-Intermediate sight distance. Horizontal curves: Super elevation-Widening of pavements -Transition curves. Types of gradients-grade compensation on curves-Introduction to vertical curve.

UNIT-II   HIGHWAY MATERIALS   9
Pavement Materials: Desirable properties and testing of highway materials-Soil: California bearing ratio test, field density test; Aggregate: Crushing, abrasion, impact, water absorption, flakiness and elongation indices and stone polishing value test; Bitumen: Penetration, ductility, viscosity and softening point test.

UNIT-III   PAVEMENT DESIGN   9
Pavement Design: Rigid and flexible pavements- Components and their functions- Factors affecting the design of pavements; Design practice for flexible pavements (IRC method and recommendations-problems)-Design practice for rigid pavements (IRC recommendations - concepts only). Types of road constructions: Water Bound Macadam, bituminous and cement concrete road.

UNIT-IV   RAILWAY ENGINEERING   9
Role of Indian railways in national development- Permanent way, its components and function: Rails, sleepers and ballast- types of rails, rail fastenings, concept of gauges, coning of wheels, creeps and kinks. Geometric design of railway tracks-Gradients and grade compensation, super-elevation, widening of gauges in curves (Concepts only) - Points and crossings -Railway stations and yards - Signaling and interlocking.

UNIT-V   AIRPORT ENGINEERING   9
Introduction to air transport –Site selection- Airport obstructions and zoning. Components of air port- Runway: Orientation-Wind rose diagrams (theory only)-Runway length-Runway configuration and drainage-Taxiway -Aircraft parking configuration and parking system - Visual aids.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Khanna K, and Justo C E G, "Highway Engineering", Khanna Publishers, Roorkee, 2015.
2. Saxena Subhash C, and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2003
3. Khanna S K, Arora M G, and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.

REFERENCES:

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

	L	**T**	**P**	**C**
U15CE403R **APPLIED HYDRAULICS AND FLUID MACHINERY**	**3**	**0**	**0**	**3**

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

1. To solve problem in uniform flow in steady state condition.
2. To solve problems in gradually varied flows in steady state condition.
3. To solve problem rapidly varied flows in steady state condition.
4. Design various types of pumps.
5. Design various types of turbines.

UNIT-I   OPEN CHANNEL FLOW   9

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Specific force -Critical flow and its computation – channel transition.

UNIT-II   UNIFORM FLOW   9

Uniform flow – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections-Velocity measurement-Non-erodible channels.

UNIT-III   VARIED FLOW   9

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination –Direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges.

UNIT-IV   TURBINES   9

Turbines - Draft tube and cavitations – Application of moment of momentum principle – Impact of jets on plane and curved plates - Turbines - Classification - Radial flow turbines - Axial flow turbines – Impulse and Reaction-Specific speed of turbine.

UNIT-V   PUMPS   9

Centrifugal pump - Minimum speed to start the pump –Net positive suction head- Multistage pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions – Specific speed.

TOTAL: 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.

	L	T	P	C

U15CE404R   **CONCRETE TECHNOLOGY**   **L** 3   **T** 0   **P** 0   **C** 3

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

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

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

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

UNIT-II   **ADMIXTURES**   **9**

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

UNIT-III   **MIX DESIGN**   **9**

Mix Design-Factors influencing mix proportion-Variability in test results -Quality control -Sampling and acceptance criteria-Mix design by American concrete institute method and Indian standard code method.

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

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

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Shetty, M.S., "Concrete Technology", Theory & Practice, S.Chand and Co, 2012.
2. Santakumar A.R., "Concrete Technology", Oxford University Press, New Delhi, 2012.

REFERENCES:

1. Kumar Mehta P, Paulo, and Moteiro J. M, "Concrete-Micro Structure, Properties and Materials", 3rd Edition, Mcgraw Hill, 2006
2. Gambhir M.L, "Concrete Technology", Tata McGraw Hill, 2012.
3. Nevile, "Properties of Concrete", Longman Publishers, 2008.

	L	**T**	**P**	**C**
U15CE405R **HYDRAULIC ENGINEERING LABORATORY**	**0**	**0**	**4**	**2**

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

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

COURSE CONTENTS

1. Flow through venture 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. Characteristics of centrifugal pumps
7. Characteristics of reciprocating pump
8. Characteristics of pelton wheel turbine
9. Characteristics of francis turbine
10. Characteristics of kaplan turbine
11. Study on performance characteristics of centrifugal pumps (Constant speed / Variable speed)
12. Study on performance characteristics of reciprocating pump
13. Study of impact of jet on flat plate (normal / inclined)
14. Determination of meta centric height (Demonstration)

TOTAL: 60 PERIODS

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

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

COURSE CONTENT S

Steel: Stress-strain characteristics - Young's modulus -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.

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

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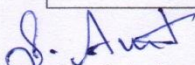
Cement: Specific gravity test- Fineness -Consistency test- Setting time- Soundness -Compressive strength of cement mortar cubes- Field test.

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

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

TOTAL: 60 PERIODS

Semester – IV	U15 GE 401R: 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. Allegation and mixture b. Time, speed and distance: Unit conversion, Average speed, Relative speed, two objects crossing each other in the same direction and opposite direction, Boats and streams, Races and games c. Clocks d. Calendars e. Blood relations f. Cubes and Dices g. Syllogism (≤3 statements) h. Ranking and order i. Company specific aptitude questions
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

2

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U15GE502R	Professional Ethics And Human Values	3	0	0	3
2	U15CE501R	Structural Analysis-I	3	2	0	4
3	U15CE502R	Environmental Engineering	3	0	0	3
4	U15CE503R	Design of Reinforced Concrete Elements	3	2	0	4
5	U15CE504R	Soil Mechanics	3	0	0	3
6	U15CE 902R	**Professional Elective:** Architecture and Town Planning	3	0	0	3
	U15CE 903R	**Professional Elective:** Construction Practices and Equipments				
	U15CE906R	**Professional Elective:** Remote Sensing and GIS				
Practical						
7	U15CE505R	Soil Mechanics Laboratory	0	0	4	2
8	U15CE506R	Concrete and Highway Laboratory	0	0	4	2
9	U15CE507R	Technical Seminar[#]	0	0	2	1
10	U15GE501R	Soft Skills and Aptitude-III	0	0	2	1
					Total Credits	**26**
[#] Internal Assessment Only						

Approved By

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

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

	L	**T**	**P**	**C**
U15GE502R **PROFESSIONAL ETHICS AND HUMAN VALUES**	**3**	**0**	**0**	**3**

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

1. Identify the core values that shape the ethical behavior of an engineer.
2. Utilize opportunities to explore one's own values in ethical issues.
3. Apply codes of ethics and standards in the engineering field.
4. Explore various safety issues and ethical responsibilities of an engineer.
5. Recognize and resolve global issues.

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 - Spirituality.

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- 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 - 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 - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Importance and consequences of whistle blowing - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination.

UNIT-V   GLOBAL ISSUES   9

Multinational Corporations - Environmental Ethics - Computer Ethics and Internet- Engineers and Technological progress - Weapons Development - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Moral Leadership - Participation in professional societies- Sample Code of Conduct (pertaining to specific professional societies).

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 2017.
2. Professional Ethics and Human values- Sonaversity, Edition 2018.
3. Charles E Harris, Michael S. Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Wadsworth Thomson Learning, United States, 2000

REFERENCES:
1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2012.
2. Charles E Harris, Michael S. Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thomson Learning, United States, 2000
   Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2016.
3. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford Press , 2000
5. R. Subramanian , "Professional Ethics ",Oxford University Press ,Reprint ,2015 .

	L	**T**	**P**	**C**
U15CE501R STRUCTURAL ANALYSIS--I	**3**	**2**	**0**	**4**

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

1. Compute the deflection of determinate beams, frames and trusses by energy principles.
2. Analyze the propped cantilever, fixed beam and continuous beam by theorem of three moments.
3. Draw the influence line diagram for statically determinate beams and trusses.
4. Analyze the three hinged and two hinged arches.
5. Analyze the continuous beams and rigid frames by slope deflection method.

UNIT-I   ENERGY METHODS   15

Strain energy in axial, shear, flexure and torsion- Castigliano's theorems- Principle of virtual -Unit load method- Application to compute deflection in statically determinate beams, frames and truss- Concept of Maxwell's reciprocal theorem.

UNIT-II   INDETERMINATE BEAMS   15

Basic assumption in structure analysis-Classification of structures. Static and kinematic indeterminacy. Basic methods of structure analysis-Analysis of statically indeterminate structures: Fixed beam-Propped cantilever- fixed end moments and reactions-Theorem of three moments- Continuous beams- Shear force diagram and bending moment diagram.

UNIT-III   MOVING LOADS AND INFLUENCE LINES   15

Moving loads for statically determinate structures-Single, two point load and several point loads: Maximum bending moment and shear force- Equivalent UDL-Absolute maximum bending moment. Enveloping curve for Maximum bending moment and shear force and determination of ILD for shear, moment and reaction for statically determinate beams and trusses.

UNIT-IV   ARCHES   15

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.

UNIT-V   SLOPE DEFLECTION METHOD   15

Slope deflection equations-Fixed end moments- Application to statically indeterminate beams and frames (with and without sway): Deformed shape, shear force and bending moment diagram (unknowns restricted to three only).

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. Vaidyanathan, R. and Perumal, P, "Comprehensive Structural Analysis-Vol. I & II", Laxmi Publications, New Delhi, 2003.
2. Negi L.S. & Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.
3. Rajput, R.K., "Strength of Materials", S.Chand and Co, New Delhi, 2015.

REFERENCES:

1. Punmia B.C, "Theory of Structures", Standard Book House, New Delhi, 2000.
2. BhavaiKatti S.S, "Structural Analysis-Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008.
3. Thandavamoorthy T.S, "Structural Analysis", Oxford University Press, New Delhi. 2011.

	L	T	P	C
U15CE502R **ENVIRONMENTAL ENGINEERING**	3	0	0	3

U15CE502R　　　　　　**ENVIRONMENTAL ENGINEERING**　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

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

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

UNIT-I　　　　WATER SUPPLY SYSTEM - SOURCE AND CONVEYANCE　　　　9

Objectives-Population forecasting-Design period-Water demand - Characteristics-Sources of water – Selection of water source-Water quality parameters & significance - standards-Intake structures -Conveyance- Laying, jointing & testing of pipes- pump selection- appurtenances-System of water supply-Distribution.

UNIT-II　　　　DESIGN PRINCIPLES OF WATER TREATMENT　　　　9

Objectives-Selection of unit operations and process-Principles of screening, flocculation, sedimentation, filtration, disinfection-Softening-demineralisation-Aeration-Iron removal-Defluoridation-Operation and maintenance aspects.

UNIT-III　　　　SEWERAGE SYSTEM:COLLECTION AND TRANSMISSION　　　　9

Sources of wastewater- Quantity of sanitary sewage-storm water runoff estimation-wastewater characteristics and significance-design of sewers -Computer application-laying, jointing and testing of sewers-sewer appurtenances-pump selection

UNIT-IV　　　　SEWEAGE TREATMENT AND DESIGN PRINCIPLES　　　　9

Objectives-Selection of unit operations and process-Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tank, activated sludge process-Modified activated sludge process and oxidation ditch- Trickling filter-Stabilization ponds-Septic tank with soak pits - Sludge: Treatment and disposal.

UNIT-V　　　　SEWAGE DISPOSAL AND RURAL SANITATION　　　　9

Disposal on land-Sewage farming-Disposal into water bodies-Oxygen sag curve-Streeter Phelps model-Wastewater reclamation techniques-Sanitary fittings-one pipe and two pipe system-general layout of house drainage connection.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL: 45 PERIODS

TEXT BOOKS:

1. Garg S.K, "Environmental Engineering Vol.I & II", Khanna Publishers, New Delhi,2009.
2. Punmia B.C, Jain A.K. and Jain A., "Environmental Engineering, Vol.I & II", Lakshmi Publications, Newsletter, 2007.
3. Birdie.G.S, " Water supply and sanitation Engineering" , Dhanpat Rai & Sons, 2003.

REFERENCES:

1. Metcalf and Eddy - Wastewater Engineering – Treatment and Reuse, Tata McGraw-Hill Company, New Delhi, 2003
2. Manual on Wastewater and Treatment CPHEECO, Ministry of Urban Affairs and employment, Government of India New Delhi, 1990.
3. Shan.C.S, " Water supply and sanitation", Galgotia Publishing Company , New Delhi 1994.

	L	**T**	**P**	**C**
U15CE503R **DESIGN OF REINFORCED CONCRETE ELEMENTS**	**3**	**2**	**0**	**4**

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

1. Explain the basic concepts of reinforced concrete.
2. Design beams subjected to moment, shear and torsion.
3. Design slab for various boundary conditions.
4. Design columns with different end conditions.
5. Design different types of RC footing.

UNIT-I   INTRODUCTION   15

Material strength and properties – Stress- strain characteristics of concrete and steel -grades of concrete and steel, fatigue effects. Types of loads and load combinations. Factor of Safety. Evolution of different design philosophies on design of RCC sections. Limit state method: Limit state-Characteristic strength - Loads and load combination- Partial safety factor- moment of resistance of singly and doubly reinforced rectangular and flanged beam sections.

UNIT-II   DESIGN OF BEAM   15

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   15

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   15

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   15

Introduction -Types of footing- Selection of footing- Soil pressures under isolated footings-General design considerations and Code requirements-Design of Isolated square and rectangular footing - Combined rectangular footing –Strap footing-Mat footing-Detailing of reinforcement.

TOTAL (L:45+T:30): 75 PERIODS

TEXT BOOKS:

1. UnnikrishnaPillai S,DevdasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd,New Delhi 2016.
2. Krishna RajuN,"Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi2010.

REFERENCES:

1. VargheseP.C,"Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd, New Delhi 2010.
2. Gambhir M.L,"Fundamentals of Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd, New Delhi 2012.
3. Ashok Kumar Jain, "Reinforced Concrete Limit State Design", Nem Chand Brothers, 2015.
4. SinhaS.N,"Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd, New Delhi 2014.

	L	**T**	**P**	**C**
U15CE504R **SOIL MECHANICS**	**3**	**0**	**0**	**3**

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

1. Characterize the soil based on index and engineering properties.
2. Examine the soil water and water flow through soil.
3. Compute the stress distribution of soil under different loading conditions.
4. Determine shear strength parameters of soils.
5. Estimate the time rate of settlement due to consolidation..

UNIT-I   **INTRODUCTION**   **9**

Soil formation-Soil description and classification for engineering purposes, their significance - Phase relationships-Index properties of soils - BIS Classification system-Field identification and classification of soil.

UNIT-II   **EFFECTIVE STRESS AND PERMEABILITY**   **9**

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.

UNIT-III   **VERTICAL STRESS DISTRIBUTION IN SOIL**   **9**

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**   **9**

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.

UNIT-V   **COMPACTION AND CONSOLIDATION**   **9**

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

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Arora K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors Pvt. Ltd, New Delhi, 2015
2. Gopal Ranjan and Rao A.S.R, "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2016.

REFERENCES:
1. Venkatramaiah C, "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017.
2. Murthy V.N.S, "Textbook of Soil Mechanics and Foundation Engineering; Geotechnical Engineering series", CBS Publishers Distribution Ltd, New Delhi. 2016.
3. Punmia B.C, "Soil Mechanics and Foundations", Laximi Publications Pvt. Ltd, New Delhi, 2017.
4. Donald p. coduto, Man-Chu Ronald Yeung and William A. Kitch, Geotechnical Engineering, principles and practices, PHI Learning Private limited 2nd edition, 2011.

	L	**T**	**P**	**C**
U15CE 902R **ARCHITECTURE AND TOWN PLANNING**	**3**	**0**	**0**	**3**

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

1. Recognize the basic elements and principles of architectural design.
2. Explain about site planning, survey, site analysis and layout.
3. Summarize the various rules and regulation of town planning and development authorities.
4. Interpret various aspects of environment and climate in civil engineering projects& illustrate the principles of landscape design.
5. Discuss the concepts related to town planning and Urban renewal

UNIT-I   ARCHITECTURAL DESIGN   9

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

UNIT-II   SITE PLANNING   9

Surveys-Site analysis-Building Bye Laws -objectives - Key/site plan -Development control- Layout - Zoning - Objective - Principles-Aspects - NBC for deign of layout.

UNIT-III   BUILDING TYPES   9

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

UNIT-IV   CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN   9

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rangwala S.C, "Town Planning" Charotar Publishing House, Anand, 2016.
2. Muthu Shoba Mohan G, "Principles of Architecture" Oxford University Press, New Delhi, 2010.
3. VRA. Saathappan and K. Yogeshwari, Principles of Architecture, Raamalingaa Publication, 2005

REFERENCES:

1. Francis D.K.Ching, "Architecture: Form, Space and Order", John Wiley & Sons, Inc. 2007.
2. Arvind Krishnan, Nick Baker, Simos Yannas, and Szokolay S.V, "Climate Responsive Architecture- A Design Hand Book for Energy Efficient Building", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2007.
3. National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005.

	L	**T**	**P**	**C**
U15CE903R **CONSTRUCTION PRACTICES AND EQUIPMENTS**	**3**	**0**	**0**	**3**

COURSE OUTCOMES (On completion of the course, the students will be able to):
1. List the sequence of activities in building construction.
2. Explain the method of construction of masonry works.
3. Describe the techniques in centering, plastering, flooring and roofing.
4. Discuss the methods of construction for special structures like off shore platforms, tunnels etc.
5. Explain the operating principles and uses of different construction equipments.

UNIT-I   CONSTRUCTION PRACTICES   9

Specifications, details and sequence of activities-Construction methodology - Construction Co-ordination - Construction joints-Movement and expansion joints-Building foundations-Basements –Temporary infrastructure establishment -Fabrication and erection of steel trusses-Frames-Braced domes –Weather and water proof-Roof finishes- Acoustic and fire protection-Green materials-Site logistics

UNIT-II   FORM WORK AND SCAFFOLDING   9

Introduction: Formwork and false work - Requirements of Formwork, Loads carried by Formwork, Types of Formwork: Timber, Steel, Modular shuttering - Centering and shuttering– slip forms-scaffolding-de-shuttering forms. Introduction about formworks-Various Types of Formworks Systems & Technologies-Formworks Methods & Procedures-Formwork Design & Scheme

UNIT-III   SUB STRUCTURE CONSTRUCTION   9

Piling techniques - Driving well and caisson - Sinking cofferdam-Soil nailing and gunnetting - Cable anchoring and grouting-Driving diaphragm walls and sheet piles - Shoring for deep cutting-Tunneling techniques.

UNIT-IV   SUPER STRUCTURE CONSTRUCTION   9

Launching girders, bridge decks, off shore platforms - Special forms for shells-In-situ prestressing in high rise structures, Braced domes and space decks-Chimney, Silos, TG Deck-Finishes-Plastering-Flooring-Roofing-Joineries and Painting

UNIT-V   CONSTRUCTION EQUIPMENTS   9

Selection of equipment for earthwork-Earth moving operations-Types of earthwork equipments –Equipment for foundation and pile driving- Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching-Standard Productivity norms for equipment for arriving P&M cost

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Arora S.P., and Bindra S.P., "Building Construction Planning Techniques and Method of Construction", DhanpatRai and Sons, 1997
2. Punmia B.C., "Building Construction", Laxmi Publication, New Delhi, Latest Edition , 2010

REFERENCES:
1. Jha J and Sinha S.K., Construction and Foundation Engineering, Khanna Publishers, 1993.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 1988.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.
4. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi-, 1983.

U15CE906R   **REMOTE SENSING AND GIS**

L	**T**	**P**	**C**
3	**0**	**0**	**3**

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

1. Explain EMR, principles of remote sensing, and the components of remote sensing system.
2. Describe various types of maps, components of GIS, and the types of data used in GIS.
3. Analyse GIS data and use the results in decision-making.
4. Eliminate errors in GIS works.
5. Apply RS and GIS techniques to evaluate and manage natural resources.

UNIT-I   REMOTE SENSING   9

Definition - Physics of Remote Sensing - Electromagnetic Radiation (EMR) - Blackbody Radiation - Planck's Law - Stefan-Boltzmann Law - Wien's Displacement Law - Components of Remote Sensing - Atmospheric Windows and Blinds - Interaction of EMR with atmosphere, and Earth's surface: soil, water and vegetation - Remote Sensing Platforms and Sensors - Image Interpretations

UNIT-II   GEOGRAPHICAL INFORMATION SYSTEM   9

Maps - Classification of Maps - Map Scale - Map Projections - Grouping of Map Projections - Commonly used Map Projections and their Comparison- GIS - Historical Development of GIS - Components of GIS - Data - Types of Data - Spatial and Non-spatial - Vector Data - Point, Line, Polygon - Raster Data - Database Structures - Vector and Raster Data Structures - Files - File Formats

UNIT-III   DATA ANALYSIS AND MODELLING   9

Data Retrieval - Query - Spatial Analysis - Overlay - Vector Data Analysis - Raster Data Analysis - Modelling in GIS - Digital Elevation Model - Cost and Path Analysis - Network Analysis - Expert Systems - Artificial Intelligence - Integration with GIS

UNIT-IV   DATA OUTPUT AND ERROR ANALYSIS   9

Data Input Output Devices - Raster and Vector Data Display Devices - Printers, Plotters. - Sources of Errors - Types of Errors - Elimination of Errors - Precision and Accuracy

UNIT-V   GIS APPLICATIONS IN RESOURCE MANAGEMENT   9

Integration of Remote Sensing and GIS - Fields of Applications - Natural Resources: Soil, Water, Wasteland, Agriculture, Wasteland Management - Social Resources - Cadastral Records - Land Information System - AM/FM - Automated Mapping/Facilities Management Utility Network Management

TOTAL: 45 PERIODS

TEXT BOOKS:
1.   Elangovan K., "GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi, 2006
2.   Kang- Tsung Chang ," Introduction to Geographical Information System", Tata McGraw Hill, 2002

REFERENCES:
1.   Kumar S., " Basics of Remote Sensing and GIS", Laxmi Publication (P) Ltd
2.   John R. Jensen, "Remote Sensing of the Environment- An Earth Resource Perspective", Pearson Education Inc., Prentice Hall, Seventh Impression, 2007
3.   Paul A Longley, Michael F Goodchild et al., "Geographical Information Systems", Volume I and II, Second Edition, John Wiley Publications, 1999
4   Lillesand and Keifer, "Remote Sensing and Image Interpretations", Wiley Student Edition , Fifth Edition
5   C. P. Lo and Albert K. W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice-Hall of India Private limited, New Delhi- 110001, 2004

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

1. Determine the index properties and consistency limit of soils.
2. Apply the technical concepts and ways to solve engineering problems by conducting field and laboratory experiments.
3. Determine the engineering properties and shear strength of soils.

COURSE CONTENTS

1. 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. Differential free swell tests

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS
   a. Insitu density Test (Sand replacement method and Core cutter method)
   b. Determination of moisture – density relationship using standard proctor compaction test.

 3. 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: 60 PERIODS

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

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

COURSE CONTENTS

TESTS ON FRESH CONCRETE:
   a) Concrete mix design ACI & IS methods (10262-2009)
   b) Slump cone test
   c) Flow table test
   d) Compaction factor test
   e) Vee bee 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
   f) UPV test

TEST ON AGGREGATES
   a) Specific Gravity
   b) Los Angeles Abrasion Test
   c) Water Absorption of Aggregates

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

TESTS ON BITUMINOUS MIXES
   a) Stripping Test
   b) Determination of Binder Content
   c) Marshall Stability and Flow Values

                                                                TOTAL: 60 PERIODS

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

1. Select a topic relevant to analysis, design and management of a civil engineering system.
2. Carry out a critical review of the literature on the chosen topic
3. Prepare and present a technical report

COURSE CONTENTS

To kindle as well as measure the ability of the student to study a topic in Civil Engineering, of current relevance, from technical literature and present a seminar on that topic. Arousing their field of interest in civil engineering, individual students are guided to choose a topic. Give a seminar on that topic for about fifteen minutes. It enables the students to gain knowledge in any of the technically relevant current topics and imparts confidence in the students in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring to papers published in reputed journals and conference proceedings. The seminar coordinator for the respective class is appointed by the Head of the Department. Respective seminar coordinator of the section will monitor the attendance for the technical seminar hours. With the approval of the Head of the Department, the respective seminar coordinator will arrange for reviewing the seminar. Each student has to submit a seminar report, based on the papers he/she has studied; the report should not be a reproduction of any original paper. Instead the student should evolve and construct his/her own ideas and enrich the seminar presentation and report. The candidate is expected to submit the seminar report on or before the last working day of the semester. The report will be duly acknowledged by Head of the Department. Final evaluation will be conducted in the form of project viva voce and also seminar will be evaluated on an internal assessment basis. The method of evaluation will be as follows:

Internal Continuous Assessment
25% - Relevance of the topic and literature survey
50% - Presentation and discussion
25% - Regularity in the class and Active Participation in the seminar

TOTAL: 30 PERIODS

Semester –V	U15 GE 501R:SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

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

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches

2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests

1.Soft Skills	Demonstrating soft-skill capabilities with reference to the following topics: a. Career planning b. Resume writing c. Group discussion d. Teamwork e. Leadership skills f. Interview skills g. Mock interview **h. Mock GDs**
2.Quantitative Aptitude and **Logical Reasoning Topics**	Solving problems with reference to the following topics : a. Numbers: Remainder concept b. Time and work: Fraction technique, Efficiency technique, Pipes and cisterns and Chain rule c. Simple interest d. Compound interest e. Set theory: Venn diagram f. Puzzles g. Mathematical operators h. Syllogism (≥4 Statements) i. Data sufficiency j. Statement and assumptions k. Statement and conclusions **l. Company specific aptitude questions**
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**

Department of Placement Training

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester VI under Regulations 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
		Theory				
1	U15CE601R	Structural Analysis-II	2	2	0	3
2	U15CE602R	Design of Steel Structures (Limit State Design)	2	2	0	3
3	U15CE603R	Foundation Engineering	3	0	0	3
4	noc21-ce13	**Professional Elective** - Maintenance and Repair of Concrete Structures	3	0	0	3
5	U15CE914R	**Professional Elective** - Housing Planning and Management	3	0	0	3
6	U15CE915R	**Professional Elective** - Prefabricated Structures	3	0	0	3
		Open Electives				
7	U15CS1003R	Internet of Things	3	0	0	3
8	U15EC1006R	Sensors and Smart Structures Technologies	3	0	0	3
9	U15EE1006R	Renewable Energy Systems	3	0	0	3
10	U15EE1007R	Innovation IPR and Entrepreneurship Development	3	0	0	3
11	U15IT1003R	Problem Solving Techniques using Java Programming	3	0	0	3
12	U15IT1004R	Python Programming	3	0	0	3
13	U15MC1002R	3D Printing Technology	3	0	0	3
14	U15ME1004R	Industrial Safety	3	0	0	3
		Practical				

15	U15CE604R	Civil Engineering Software Application Laboratory	0	0	4	2
16	U15CE605R	Environmental Engineering Laboratory	0	0	4	2
17	U15GE601AR	Professional Development Skills	0	0	2	1
					Total Credits	**23**

Approved By

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

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

	L	**T**	**P**	**C**
U15CE601R **STRUCTURAL ANALYSIS-II**	**2**	**2**	**0**	**3**

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

1. Analyze the indeterminate structures by moment distribution method.
2. Analyze the indeterminate structures by flexibility matrix method.
3. Analyze the indeterminate structures by stiffness matrix method.
4. Analyze the multi storey frames by approximate methods.
5. Apply the finite element method to structural analysis.

UNIT-I   MOMENT DISTRIBUTION METHOD   12

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

UNIT-II   FLEXIBILITY MATRIX METHOD   12

Basic concepts of flexibility method-Formulation of structure flexibility matrix- Application to statically indeterminate beams, rigid and pin jointed frames (redundancy restricted to two only).

UNIT-III   STIFFNESS MATRIX METHOD   12

Basic concepts of stiffness method- Formulation of structure stiffness matrix- Application to statically indeterminate beams, Rigid and pin jointed frames (unknowns restricted to two only).

UNIT-IV   APPROXIMATE METHOD OF ANALYSIS   12

Introduction - Analysis of multistory frames for gravity and lateral loads by approximate methods- Substitute frame-Portal and cantilever methods.

UNIT-V   FINITE ELEMENT METHOD   12

Introduction-Discretization of structure-Displacement function-Truss element-Concepts of: Beam element-Plane stress and plane strain-Triangular elements.

TOTAL (L:30+T:30): 60 PERIODS

TEXT BOOKS:

1. Vaidyanathan R. and Perumal, P' "Comprehensive structural Analysis-Vol. I & II", Laxmi Publications, New Delhi, 2003.
2. Negi L.S. and Jangid R.S, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.

REFERENCES:

1. Punmia B.C, "Theory of Structures", Standard Book House, New Delhi, 2000.
2. BhavaiKatti S.S, "Structural Analysis-Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd, New Delhi, 2008.
3. Thandavamoorthy T.S, "Structural Analysis", Oxford university press, New Delhi. 2011.
4. Pandit G.S, and Gupta S. P, "Structural Analysis a Matrix Approach", Tata McGraw Hill Publications, New Delhi, 2008.
5. Senthil S, Panneerdhass, " Finite Element Analysis", Lakshmi Publication, Chennai,2017.

	L	T	P	C

U15CE602R   **DESIGN OF STEEL STRUCTURES (Limit State Design)**   L 2   T 2   P 0   C 3

COURSE OUTCOMES (On completion of the course, the students will be able to):
1. Apply the IS code practice for the design of steel structural elements, analyses and design tension members.
2. Design compression members and base plates.
3. Design various types of flexural members.
4. Design various members of roof truss.
5. Design the bolted and welded connection for both axial and eccentric forces.

UNIT-I   INTRODUCTION AND DESIGN OF TENSION MEMBERS   12

Review of concepts of plastic analysis. 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. Tension members-Various forms-Modes of failure-Analysis and design of axially loaded tension members.

UNIT-II   DESIGN OF COMPRESSION MEMBERS   12

Design of axially loaded compression members: Section classifications - Effective length - Slenderness ratio- Classification of column-Modes of failure; Design of axially loaded: Simple section-built-up sections - Design of lacings and battens- Design of single and double angle strut-Continuous and discontinuous strut. Design of column bases: Types - Slab base.

UNIT-III   DESIGN OF BEAMS   12

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. Welded plate girder: Components-Stiffener-Analysis and design using IS 800-2007of welded plate girder. Design principles of gantry girder.

UNIT-IV   DESIGN OF INDUSTRIAL STRUCUTRES   12

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.

UNIT-V   DESIGN OF CONNECTION   12

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:

TOTAL (L:30+T:30): 60 PERIODS

TEXT BOOKS:
1. Duggal S.K, "Design of Steel Structures", Tata McGraw-Hill Education, 2009.
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, 2010
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

	L	**T**	**P**	**C**
U15CE603R **FOUNDATION ENGINEERING**	**3**	**0**	**0**	**3**

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

1. Conduct sub surface investigation and select foundation based on soil condition.
2. Estimate the bearing capacity of soil based on shear and settlement criteria.
3. Analyze the proportion of various shallow foundations.
4. Calculate the load carrying capacity of piles.
5. Determine the earth pressure of retaining wall.

UNIT-I   SITE INVESTIGATION AND SELECTION OF FOUNDATION   9

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, Stationery piston sampler-Penetration tests (SPT and SCPT) - Bore log report- Selection of foundation based on soil condition.

UNIT-II   SHALLOW FOUNDATION   9

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

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

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   RETAINING WALLS   9

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 PERIODS

TEXT BOOKS:

1. Punmia B.C, "Soil Mechanics and Foundations", Laximi Publications Pvt. Ltd, New Delhi, 16th edition, 2017.
2. Gopal Ranjan and Rao A.S.R, "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2016.

REFERENCES:

1. Venkatramaiah, C, "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017.
2. Murthy V.N.S, "Textbook of Soil Mechanics and Foundation Engineering; Geotechnical Engineering Series", CBS Publishers Distribution Ltd, New Delhi. 2016.
3. Braja m.das, principles of foundation Engineering, Thomson Asia pvt.ltd, Singapore, 2016.
4. Shenbaga R kaniraj, Design aids in Soil mechanics and Foundation, Tata Mc Graw –Hill Education-2011.

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

1. Competently use the software packages for structural analysis.
2. Competently uses excel to undertake engineering calculations.
3. Acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in civil engineering practice.

COURSE CONTENTS

Analysis of structural member using Standard Software Package: Analysis of 2D beams, columns, slab and footing; Analysis of 2D and 3D frames- Analysis of single and two storey building -Roof trusses.

Development of Program using Excel (RCC and Steel) : Design of Flexural members-Beams and slabs-Design of compression members-Column-Design of isolated footing-Design of staircase-Design of roof trusses-Concrete mix design.

Detailing of structural element using Standard Drafting Package: Detailing of reinforced concrete beams-Detailing of reinforced concrete slabs-Detailing of column-Detailing of isolated footing-Detailing of staircase-Detailing of roof trusses.

TOTAL: 60 PERIODS

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

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

COURSE CONTENTS

1. Sampling and preservation methods and significance of characterization of water and waste water.
2. Determination of – pH, turbidity and Hardness
3. Determination of iron & fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

TOTAL: 60 PERIODS

noc21-ce13	Maintenance and Repair of Concrete Structures	L	T	P	C
		3	0	0	3

COURSE LAYOUT

Module 1 : Embedded metal corrosion
Module 2 : Deterioration in cementitious systems
Module 3 : Condition assessment of concrete structures
Module 4 : Strategies and materials for surface repair
Module 5 : Surface preparation and protective treatments
Module 6 : Waterproofing
Module 7 : Structural repair
Module 8 : Special topics and case studies

	TOTAL: 45 PERIODS

BOOKS & REFERENCE	
1.	"Maintenance Repair & Rehabilitation & Minor Works of Buildings" P.C. Varghese, PHI Learning Pvt. Ltd., New Delhi
2.	"Concrete Repair to EN1504 – Diagnosis, Design, Principles and Practice" Michael Raupach and Till Buttner, CRC Press., Taylor and Francis Group, Boca Raton, FL, USA
3	"Concrete Structures – Protection, Repair and Rehabilitation" R. Dodge Woodson, Butterworth-Heinemann – Elsevier, UK

		L	**T**	**P**	**C**
U15CE914R	**HOUSING PLANNING AND MANAGEMENT**	**3**	**0**	**0**	**3**

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

1. Plan and design the housing projects as per development control regulations.
2. Design the various housing programme with sustainability concepts.
3. Formulate and design the housing layouts by conducting site analysis.
4. Evaluate the suitability of various cost effective construction materials.
5. Perform the economic analysis. Based project appraisal of housing projects.

UNIT-I   INTRODUCTION TO HOUSING   9

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

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

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

New constructions techniques - Cost effective modern materials and methods of construction- Green building concept- Building centers - Concept, functions and performance evaluation.

UNIT-V   HOUSING FINANCE AND PROJECT APPRAISAL   9

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 o f housing units (Problems).

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.

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

		L	**T**	**P**	**C**
U15CE915R	**PREFABRICATED STRUCTURES**	**3**	**0**	**0**	**3**

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

1. Apply the various types of prefabrication systems.
2. Calculate the handling and erection stresses.
3. Prepare dimensioning and detailing of joints.
4. Perform erection of the prefab structure.
5. Design pre-fabricated units.

UNIT-I   INTRODUCTION   9

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

UNIT-II   HANDLING AND ERECTION STRESSES   9

Handling and erection stresses - Application of pre stressing of roof members-Floor systems - Two way load bearing slabs - Wall panels.

UNIT-III   DIMENSIONING AND DETAILING OF JOINTS   9

Dimensioning and detailing of joints for different structural connections-Construction joints and expansion joints.

UNIT-IV   ERECTION OF STRUCTURES   9

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Hubert Bachmann, Alfred Steinle, "Precast Concrete Structures", Ernst and Sohn GMBH & Co., K.G., 2011.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009.

REFERENCES:

1. Lewicki B, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam / London / New York, 1966.
2. Levi M, (2000), Precast concrete materials, Manufacture properties and usage, Applied Science Publishers, London.
3. Kim S. Elliott, "Precast Concrete Structures" Butter-Heinemann, 2002.
4. LassloMokk, "Prefabricated Concrete for Industrial and Public Sectors, AkademiaiKiado", Budapest, 1964.

Semester –VI	U15GE601AR: Professional Development Skills (For Civil Dept only)	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. Explain the values of career planning and prepare a resume.
2. Demonstrate interview skills and undergo mock interviews and group discussions.
3. State entrepreneurship and prepare business plan.

Demonstrating Soft -Skills capabilities in the following areas:

a. Career planning (Employment) – Resume writing - Tips for a great resume

b. Interview Skills - Importance of body language in an interview – Confidence building – FAQs

c. Mock interview, mock stress interview

d. Mock Group Discussion

e. Career Planning (Self Employment) Understanding Entrepreneurship - Advantages of being an Entrepreneur - Create a Business plan.

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

OPEN ELECTIVE
CIVIL

PREAMBLE
To
Building Services and Safety Regulations

- Building services engineers are responsible for the design, installation, operation and monitoring of the mechanical, electrical and public health systems required for the safe, comfortable and environmentally friendly operation of modern buildings.

- Building services engineers work closely with other construction professionals such as architects, structural engineers and quantity surveyors. They influence the architecture of a building and play a significant role on the sustainability and energy demand of a building.

- Within building services engineering, new roles are emerging, for example in the areas of renewable energy, sustainability, low carbon technologies and energy management.

- With buildings accounting for around 50% of all carbon emissions, building services engineers play a significant role in combating climate change.

	L	**T**	**P**	**C**
U15CE1001R **BUILDING SERVICES AND SAFETY REGULATIONS**	**3**	**0**	**0**	**3**

COURSE OUTCOMES (On completion of the course, the students will be able to):
1. Describe the basics of electrical systems in buildings
2. Explain the principles of illumination and design of these systems
3. Describe the basics of thermodynamics, refrigeration principles and air conditioning systems
4. Discuss the fire safety regulations and installation of fire safety equipments and systems
5. Explain the water supply and sewerage systems for buildings

UNIT-I   ELECTRICAL SYSTEMS IN BUILDINGS   9
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
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

Thermodynamics- Heat- Temperature, measurement transfer- Change of state- Sensible heat- Latent heat of fusion, evaporation, sublimation- saturation temperature- Super heated 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
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
Plumbing fixtures and fixture fittings- Water conserving fittings- Over flows- Strainers and connectors- Prohibited fixtures- Special fixtures- Installation of water closet- Urinals - Flushing devices- Floor drains- Shower stall- Bath tub- Bidets- Minimum plumbing facilities- Rain water harvesting systems- Necessity- Construction- Different types

TOTAL: 45 PERIODS

TEXT BOOKS:
1. David V. Chadderton Building Services Engineering Taylor & Francis, 2000
2. John Knight , W.P.Jones "Newnes Building services" Routledge 2003

REFERENCES:
1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2009
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2011
3. Philips Lighting in Architectural Design, McGraw-Hill, New York, Latest edition
4. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1972
5.   William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988
6. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2007

We observe that during the last three decades, disaster both natural and man-made occur frequently and their impact on life, live hoods, natural resources, property, infrastructure and facilities is very severe. Though hazards and disasters could not be prevents, by taking preparedness activities, we can minimize their harmful effects.

This course on disaster management emphasizes the need for disaster preparedness rather than emergency response. It throws light on risk assessments, risk resolution and risk sharing and transfer. The importance of community participation, building self-reliant resilient communities and awareness creation is highlights in this course. Application of modern communication tools, remote sensing and GIS technologies in search and resource operations and stream lining activities is elaborated. Way and means of financial arrangements to carry out disaster management activities are discussed.

The physics of earthquake and tsunamis is explained. Safety measures against tsunamis are described. The functioning and tsunamis warning system is described.

	L	**T**	**P**	**C**
U15CE1002R **DISASTER MANAGEMENT**	**3**	**0**	**0**	**3**

COURSE OUTCOMES (On completion of the course, the students will be able to):
1. Distinguish various types of disasters, their causes and impacts on environment and society
2. Explain different phases of disaster management cycle
3. Assess vulnerability and prepare disaster risk reduction measures
4. Explain the vulnerability profile of India
5. Prepare hazard zonation maps for all types of hazards

UNIT-I   INTRODUCTION TO DISASTERS   9

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

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

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

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

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 PERIODS

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.

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.

		L	T	P	C
U15CE1003R	**ENERGY EFFICIENCY AND GREEN BUILDING**	3	0	0	3

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

UNIT-I   INTRODUCTION   9

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

UNIT-II   ENERGY EFFICIENT BUILDINGS   9

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

UNIT-III   CONSTRUCTION MATERIALS AND PRACTICES   9

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

UNIT-IV   BUILDING ASSESSMENT SCHEMES   9

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

UNIT-V   CLEAN DEVELOPMENT MECHANISM   9

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

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Sustainable Building, Design Manual: Published by The Energy and Resources Institute, Darbari Seth block, IHC Complex, Lodhi Road, New Delhi-110003.
2. KILBERT, Charles , (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

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.

	L	**T**	**P**	**C**
U15CE1004R **MUNICIPAL SOLID WASTE MANAGEMENT**	**3**	**0**	**0**	**3**

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

1. Identify the sources, types and characteristics of solid wastes.
2. Choose the on-site storage methods and processing techniques.
3. Summarize the methods of collection and its components.
4. Outline the off-site processing techniques & equipments and resource recovery from solid wastes.
5. Evaluate the processing techniques and disposal methods for managing the municipal solid wastes.

UNIT-I   SOURCES AND TYPES   9

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 - social and economic aspects; Public awareness; Role of NGOs; Solid waste management rules 2016 - case studies.

UNIT-II   ON-SITE STORAGE AND PROCESSING   9

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

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

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

UNIT-V   DISPOSAL   9

Dumping of solid waste; Sanitary landfills - Site selection, design and operation of sanitary landfills -Leachate collection and treatment.

TOTAL: 45 PERIODS

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
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000

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. Bhide A.D, and Sundaresan, B.B, "Solid Waste Management in Developing Countries", INSDOC, 2003.
4. Ramachandra T.V, "Management of Municipal Solid Waste", TERI press, New Delhi, 2009.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester VII 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U15CE701R	Construction Management	3	0	0	3	45
2	U15CE702R	Earth Quake Resistant Structures and Management	3	0	0	3	45
3	U15CE919R	**Elective** - Prestressed Concrete Structures	3	0	0	3	45
4	U15CE922R	**Elective** - Contracts Laws and regulations	3	0	0	3	45
	U15CE923R	**Elective** - Traffic Engineering and Management					
5	U15CE927R	**Elective** -Water Resources and Irrigation Engineering	3	0	0	3	45
Open Elective							
6	U15CS1005R	Object Oriented Programming and Data Structures	3	0	0	3	45
	U15EE1004R	Energy Conservation and management					
	U15EE1006R	Renewable Energy Systems					
	U15IT1003R	Problem Solving Techniques using Java Programming					
	U15MC1002R	3D Printing Technology					
	U15ME1002R	Renewable Energy Sources					
	U15ME1004R	Industrial Safety					
	U15ME1005R	Maintenance Engineering					
	U15ME1010R	3D Printing					
Practical							
7	U15CE703R	Estimation and quantity surveying	0	0	4	2	60
8	U15CE704R	Design Project	0	0	4	2	60
9	U15CE705R	Internship	0	0	0	1	30
					Total Credits	**23**	

Approved By

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

Copy to:-

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

COURSE CODE	COURSE NAME	L	T	P	C
U15CE701R	CONSTRUCTION MANAGEMENT	3	0	0	3

	Course Objective (s): The Purpose of learning this course is to:
1.	To make them understand the concepts of Construction Management for planning to execution of projects.
2.	To make them understand the feasibility analysis in Construction Management and network analysis tools for cost
3.	To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
4.	Make them capable to analyze, apply and appreciate contemporary Construction management tools and methodologies in Indian context.
5.	utilize basic structural concepts to analyze engineering design problems

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

CO1	Discuss the principles of construction management**(K1)**
CO2	Explain the steps involved in the Construction Planning and Management**(K3)**
CO3	Describe the network planning methods and cost control **(K2)**
CO4	Discuss the different methods of execution of works in the Construction Industry. **(K3)**
CO5	Explain the transaction of accounts and maintenance **(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	2	1		2				3	3	3	3	
CO2	2	1	2	1		2	2	2	1	3	3	3	2	2
CO3	3	2	3	2	3	2	2	2	1	3	3	3	1	1
CO4	2	3	2	2		2		2	2	3	3	3	3	1
CO5	2	3	1	3		2				3	3	3	3	
CO	2.4	2	2	1.8	0.6	2	0.8	1.2	0.8	3	3	3	2.4	0.8

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

UNIT-I	INTRODUCTION TO CONSTRUCTION MANAGEMENT	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- Process group mapping- Process level interaction- Trinities of project- Project life cycle- four squares of management Construction management services- Time cost and resource management

UNIT-II	CONSTRUCTION PLANNING AND SCHEDULING	9 Hours

Management planning construction scheduling from s0-s12 -Time planning, Master Construction Program in MS Project- Resource Planning, Men, Material & Machinery, Cost planning, Zero Cost & Budget

UNIT-III	SCOPE MANAGEMENT	9 Hours

Understanding BOQ and specifications- Scope of work- Sequence of constructions- Work breakdown structure- Standard Coefficient for various works- Phases of construction- Coordination between different agencies

UNIT-IV	MANAGEMENT PLANNING AND CONTROL SYSTEMS	9 Hours

Master Construction Scheduling and Planning-Month wise planning- Week wise planning - Day wise Planning-Monitoring-Tracking

UNIT-V	COST 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.

	TOTAL: 45 Hours

TEXT BOOKS:

1.	SeetharamanS,"Construction Engineering and Management", Umesh Publications, 1997
2.	Sengupta,B, and "GuhaH, Construction Management and Planning", Tata McGraw Hill Co, 1995

1.	Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control,TataMcGraw Hill Publishing Co., New Delhi, 2005
2.	Chris Hendrickson and Tung Au, "Project Management for Construction-FundamentalsConcepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
3.	WillisE.M,"Scheduling Construction projects", John Wiley and Sons, 1986.
4.	Barbara J.Jackson. " Construction Management Jumpstart: The best first step toward a carrier in construction management" 2nd Edition, Wiley,2010.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE702R	**EARTH QUAKE RESISTANT STRUCTURES AND MANAGEMENT**	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:		
	1.	Explain the basics of earthquake engineering.
	2.	Demonstrate the dynamics of structural system under earthquake load.
	3.	Apply codal provisions on different types of structures.
	4.	Categorize the new concepts on different types of base isolation and strengthening techniques.
	5.	Describe the type of disaster and mitigation measures.

Course Outcome (s) (COs): At the end of this course, the students will be able to:	
CO1	Able to explain the different types of seismic waves and occurrence of earthquake (K2)
CO2	Explain the free and forced vibration on structural system (K1)
CO3	To calculate the base shear and lateral force on the structures (K4)
CO4	Apply repair techniques on structures and explain base isolation techniques (K5)
CO5	Explain the role of Government, NGO and public during a natural disaster (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		2			2	2					1		1	1
CO2	3				3								2	
CO3		3	3	2	3	2	2	2	1	1	1	1	3	
CO4				2	1			1	1	1			2	1
CO5				3	1			3						
CO	0.6	1	0.6	1	1.6	1.6	0.4	1.2	0.4	0.4	0.4	0.2	1.6	0.4

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

UNIT-I	**FUNDAMENTALS OF EARTHQUAKE ENGINEERING**	**9 Hours**

Definition of disaster, hazard, vulnerability, risk-Types-Natural disasters: Earthquake, landslides, flood, cyclones, tsunami and drought- Manmade disasters: Chemical, nuclear and biological. Earthquake characterizations-Elements of engineering seismology-Seismic waves-Magnitude-Intensity and Energy release - Indian and world seismicity

UNIT-II	**THEORY OF VIBRATIONS**	**9 Hours**

 Difference between static loading and dynamic loading-Degree of freedom-Idealisation of structure as single degree of freedom system-Formulation of Equations of motion of SDOF system-D'Alemberts principles-Effect of damping-Free and forced vibration of damped and undamped structures-Response to harmonic and periodic forces

UNIT-III	**PRINCIPLES OF ASEISMIC DESIGN AND DETAILING**	**9 Hours**

Codal provision for design (IS 1893-2016) - Aspects in planning and layout - Regular and irregular buildings- Structural systems-Principles of design-Choice of materials -Ductility based design -Lateral load estimation - Seismic co-Efficient method -Response spectrum- Design spectrum. Codal provision for ductile detailing of Structural members as per IS13920:1993

UNIT-IV	**VIBRATION CONTROL AND STRENGTHENING TECHNIQUES**	**9 Hours**

Seismic damage ratings - Passive and Active control of vibration - Repair and Rehabilitation techniques - New and favorable materials - Case studies in repair and rehabilitation

UNIT-V	**DISASTER MANAGEMENT**	**9 Hours**

Need and concept of disaster management-Disaster management cycle-Prevention, mitigation, preparedness, relief, recovery-Post-disaster environmental response (water, sanitation, food safety, waste management, disease control)-Role and responsibilities of government, community, local institutions and NGOs

	TOTAL: 45 Hours

TEXT BOOKS:	
1.	Damodarasamy S.R, and Kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning Pvt. Ltd, New Delhi. 2009
2.	Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", PHI Pvt. Ltd, New Delhi, 2008.
REFERENCES:	
1.	Anil K Chopra, "Dynamics of Structures-Theory and Applications to Earthquake Engineering", Pearson Education, 2011.
2.	Agarwal P and Shrikhande M, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007.
3.	Duggal S.K, "Earthquake resistant design of structures", Oxford University Press, New Delhi, 2015.
4.	George G Penelis and Andreas J Kappos-"Earthquake Resistant Concrete Structures" Taylor & Francis e-Library 2010.
5.	R.BiSingh"Natural Hazards & Disaster Management", Pawat Publications 2006.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE703R	ESTIMATION AND QUANTITY SURVEYING	0	0	4	2

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

1.	Impart the basic knowledge on the types of estimate for RC building and Steel structures.
2.	Compute the quantities for sewerage and water supply systems
3.	Apply the knowledge to prepare the valuation reports for different types of structures.

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

CO1	Explain the basic concept of quantity estimation for different types of structures **(K3)**
CO2	Develop the quantities for sewerage and water supply systems **(K3)**
CO3	Identify the valuation for different types of structures **(K3)**

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

CO – PO Mapping

COs	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	POS
CO1	3	3	3	3	3	3	2	3	2	3	3	3	3	
CO2	3	3	3	3	3	3	2	3	2	3	3	3	3	
CO3	3	2	2	3	3	3	2	3	2	2	2	3	3	
CO	3	2.67	2.67	3	3	3	2	3	2	2.67	2.67	3	3	

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

Introduction to estimation - Types of estimate- Necessity-Overview of specification - Detailed and Drawing-Method of measurements- Calculation of quantities of brick work, RCC, PCC, Steel and Stone masonry - Plastering - Rate analysis - Tenders - Contracts-Types of contracts. Introduction to Valuation- Types of valuation - Necessity- Capitalized value- Depreciation value- Scarp value- Salvage value - Value of the building- Calculation of Standard rent- Mortgage- Lease. Estimation of load bearing walls.

1. Estimation of R.C.C framed structures
2. Estimation of steel framed structures
3. Estimation of septic tanks and soak pit
4. Estimation of water supply systems
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
U15CE704R	**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	Acquire the basics understanding of Civil Engineering project at initial level**(K1)**
CO2	Understand the various design steps involved in Civil Engineering project. **(K3)**
CO3	Design the various elements involved in the structural design process**(K4)**
CO4	Carry out the quantity calculation based on the nature of the project **(K3)**
CO5	Calculate the total estimation of the project based on prevailing market rate **(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	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
CO4	2	3	3	1	2	1	1	1	2	2	-	1	2	1
CO5	2	3	3	1	3	1	1	1	2	2	-	1	2	1
CO	**2.4**	**2.4**	**3**	**1**	**2.6**	**1**	**1**	**1**	**2**	**2**	**-**	**1.4**	**2.4**	**1.2**

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

		60 Hours

- Every project work shall have a guide who is a member of the Faculty of Civil Engineering of the College. The project guide of the design project is appointed by the Head of the Department.
- The project coordinator for the respective deign project is appointed by Head of the Department.
- The number of students in each team should not exceed three.
- The hours allotted for this course shall be utilized by the students to receive directions from the guide, in library reading, laboratory work, and computer analysis or field work. The student should also present his/her progress made in the project in the periodical reviews.
- Each student/team shall finally produce a comprehensive report including background information, literature survey, problem statement, project work details, and conclusions. The candidate/team is expected to submit the project report on or before the last working day of the semester. After scrutiny, the report will be duly acknowledged by Head of the Department.

COURSE CODE	COURSE NAME		L	T	P	C
U15CE705R	**INTERNSHIP**		**0**	**0**	**0**	**1**

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

1.	Provides a real time exposure on the latest and trending technologies in the core companies
2.	Refine and clarify professional and career goals through critical analysis of the internship experience
3.	Gain an understanding of workplace dynamics, professional expectations, and the influence of culture on both

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

CO1	Understand the intricacies of implementation of textbook knowledge into practice **(K2)**
CO2	Grasp new developments and update himself or herself**(K3)**
CO3	Prepare himself/herself for the implementation of new techniques (**K5**)

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

CO – PO Mapping

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

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

COURSE CONTENT	**4 weeks**

The students will individually undertake training in reputed civil engineering companies for a duration of four weeks 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
U19CE919R	**PRESTRESSED CONCRETE STRUCTURES**	3	0	0	3

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

1.	Provide knowledge on the prestressed concrete and its concepts.
2.	Impart the basic knowledge of prestresslosses in prestressed concrete members.
3.	Instruct the design principles of flexural prestressed beams.
4.	Aware the students about composite beams and its applications.
5.	Provide the general design features of special prestressed structures.

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

CO1	Understand the requirement of prestressed concrete and its systems and methods.**(K2)**
CO2	State the different types of losses in prestressed concrete members and the factors affecting it.**(K3)**
CO3	Design the flexural prestressed members for flexural, shear and anchorage requirements. **(K5)**
CO4	Analyse and design the composite beams and methods in achieving continuity in continuous beams. **(K5)**
CO5	Explain the designfeatures of Prestressed concrete water tanks, pipes, sleepers and concrete bridge decks. **(K2)**

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

CO – PO Mapping

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

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

UNIT-I	**PRINCIPLES OF PRESTRESSING**	**9 Hours**

Introduction-Materials for prestressed concrete- Systems and methods of prestressing -Analysis of sections: Stress, strength and load balancing concept.

UNIT-II	**LOSSES AND DEFLECTION OF PRESTRESSED CONCRETE MEMBERS**	**9 Hours**

Losses-Types of losses: Elastic shortening- Shrinkage of concrete-Creep of concrete-Friction-Anchorage slip- Relaxation of steel. Deflection-Factors affecting deflection-Effect of tendon profile on deflections-short and long term deflection.

UNIT-III	**DESIGN OF FLEXURAL MEMBERS AND ANCHORAGE ZONES**	**9 Hours**

Behaviour of flexural members-Determination of ultimate flexural strength as per BIS. Design concepts of flexural members. Design for shear based on BIS. Anchorage zone- Concepts of bond stress- Determination of anchorage zone stresses in post-tensioned beams- IS code method; Design of anchorage zone reinforcement.

UNIT-IV	**COMPOSITE BEAMS AND CONTINUOUS BEAMS**	**9 Hours**

Analysis and design of composite beams-Methods of achieving continuity in continuous beams-Analysis for secondary moments-Concordant cable and linear transformation-Calculation of stresses-Principles of design.

UNIT-V	**MISCELLANEOUS STRUCTURES**	**9 Hours**

Introduction-General features and design principles of: Prestressed concrete water tanks, pipes, sleepers and concrete bridge decks.

	TOTAL: 45 Hours

TEXT BOOKS:

1.	Krishna Raju N., "Prestressed Concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2.	Pandit G.S, and Gupta S.P, "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

REFERENCES:	
1.	Rajagopalan N, "Prestressed Concrete", Narosa Publishing House, 2002.
2.	Dayaratnam P, "Prestressed Concrete Structures", Oxford and IBH, 2013
3.	Lin T.Y, Ned. H, and Burns, "Design of Prestressed Concrete Structures", Wiley India Pvt. Ltd, New Delhi, 2013.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE922R	**CONTRACT LAWS AND REGULATIONS**	3	0	0	3

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

1.	Provide knowledge on the construction contract.
2.	Impart the basic knowledge in terms of tender and bidding.
3.	Provide the fundamental knowledge of claims and time extension.
4.	Provide knowledge about arbitration and contractual disputes.
5.	Impart basic knowledge on the legal requirements followed in the construction industry.

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

CO1	Create the contract documents with respect to Indian contracts act and regulations (K1)
CO2	Process tender documentation and formation of contract. (K3)
CO3	Describe the laws and regulation and arbitrator's power and responsibility. (K2)
CO4	Explain the various legal requirements for implementing approved projects. (K4)
CO5	Illustrate an awareness of labour welfare legislation and laws (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	2	1	1	1	-	1	3	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	1	-	1	3	1	1	1	1	2	1	1
CO4	1	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)	1.6	2	2.2	1.6	-	1.6	3	1.4	1.4	1	1	2	1.2	1.2

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

UNIT-I	CONSTRUCTION CONTRACTS	9 Hours

Indian contracts act - Elements of contracts - Types of contracts - Features - Suitability - Design of contract documents-FIDIC - Standard contract document - Law of torts.

UNIT-II	TENDERS AND BIDDING	9 Hours

General conditions of contract - Special conditions of contract-Quantity variation clause-Escalation and Price variation clause-Liquidated damage clause - Prequalification - Bidding - Accepting - Evaluation of tender from technical, contractual and commercial points of view - Contract formation and interpretation - Potential contractual problems - World bank procedures and guidelines - Transparency in tenders act.

UNIT-III	EXTENSIONS OF TIME AND CLAIMS	9 Hours

Establishment of delays-Extension of time-Extended stay cost-Escalation-Contractual Claims

UNIT-IV	ARBITRATION AND CONTRACT DISPUTES	9 Hours

Comparison of actions and laws - Agreements - Subject matter - Violations - Appointment of arbitrators - Conditions of arbitration - Powers and duties of arbitrator - Rules of evidence - Enforcement of award-Costs-Discrepancy in contract Misinterpretation of contract.

UNIT-V	LEGAL AND STATUTORY REQUIREMENTS	9 Hours

Insurance and bonding - Laws governing sale, purchase and use of urban and rural land - Land revenue codes - Tax laws - income tax, sales tax, excise and custom duties and their influence on construction costs - Legal requirements for planning - Property law - Agency law - Local government laws for approval - Statutory regulations.

	TOTAL: 45 Hours

TEXT BOOKS:

1.	Gajaria G.T, "Laws Relating to Building and Engineering Contracts in India", M.M.Tripathi Private Ltd., Bombay, 1982.
2.	Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2000.

REFERENCES:

1.	Tamilnadu PWD Code, 1986
2.	Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE923R	**TRAFFIC ENGINEERING AND MANAGEMENT**	3	0	0	3

Course Objective (s): The Purpose of learning this course is to:	
1.	Inculcate the traffic characteristics and assess the related traffic problems in India
2.	Impart the basic knowledge in the concepts of traffic surveys and its level of service.
3.	Impart skills in characterizing traffic design of facilities to control and manage traffic.
4.	Aware the students about road accidents, traffic and environment hazards in transportation interaction.
5.	Develop a strong knowledge base of traffic planning and its management in any transportation area.

Course Outcome (s) (COs): At the end of this course, the students will be able to:	
CO1	Analyse traffic problems and plan for traffic systems various uses.(**K3**)
CO2	Design Channels, Intersections, signals and parking arrangements.(**K4**)
CO3	Develop Traffic management Systems.(**K3**)
CO4	Analyse the causes and report the accident. (**K2**)
CO5	Manage the traffic congestion using the available management measures. (**K2**)

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

CO – PO Mapping

COs	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	POS
CO1	3	1	2	3	1	1	2	1	1	-	-	3	2	2
CO2	3	2	2	3	2	1	2	1	1	-	-	3	2	2
CO3	3	3	3	3	2	1	3	3	2	-	-	3	2	2
CO4	3	3	3	3	2	3	3	3	3	-	-	3	3	2
CO5	3	3	3	3	2	2	3	3	3	1	-	3	3	3
CO	3	2.4	2.6	3	1.8	1.6	2.6	2.2	2	0.2	-	3	2.4	2.2

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

UNIT-I	TRAFFIC PLANNING AND CHARACTERISTICS	9 Hours

Road Characteristics - Road user characteristics - PIEV theory - Vehicle - Performance characteristics - Fundamentals of traffic flow - Urban traffic problems in India - Integrated planning of town ,country ,regional and all urban infrastructure - Towards sustainable approach.- land use & transport and modal integration.

UNIT-II	TRAFFIC SURVEYS	9 Hours

Traffic surveys - Speed, journey time and delay surveys - Vehicles volume survey including non-motorized transports - Methods and interpretation - Origin destination survey - Methods and presentation - Parking survey - Accident analyses - methods, interpretation and presentation - Level of service - Concept, applications and significance.

UNIT-III	TRAFFIC DESIGN AND VISUAL AIDS	9 Hours

Intersection-Types-Channelization, rotary, intersection design - Signal design - Coordination of signals -Grade separation - Traffic signs including VMS and road markings - Significant roles of traffic control personnel

UNIT-IV	TRAFFIC SAFETY AND ENVIRONMENT	9 Hours

Road accidents - Causes, effect, prevention, and cost - Street lighting - Traffic and environment hazards - Air and noise pollution, causes, abatement measures - Promotion and integration of public transportation - Promotion of non-motorized transport.

UNIT-V	TRAFFIC MANAGEMENT	9 Hours

Area traffic management system - Traffic system management with IRC standards -- Traffic regulatory measures-Travel demand management - Direct and indirect methods - Congestion and parking pricing - Coordination among different agencies - Intelligent transport system for traffic management, enforcement and education.

	TOTAL: 45 Hours

TEXT BOOKS:	
1.	Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013.
2.	Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

REFERENCES:	
1.	Fred L, and Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd, New Delhi, 2011.
2.	Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.
3.	Hobbs F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE927R	WATER RESOURCES AND IRRIGATION ENGINEERING	3	0	0	3

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

1.	Understand the basic components of Hydrological cycle, interpreting rainfall data and surface water availability.
2.	Learn the groundwater movement beneath the earth and various quality improving techniques.
3.	Analyze and choose irrigation techniques based on crop and irrigation requirements.
4.	Have insight about various distribution systems for canal irrigation and the basic design of unlined and lined Canal.
5.	Impart knowledge on Cross Drainage Works, Salinity and Water Logging, and Canal losses for effective irrigation management.

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

CO1	Plan and design the water resources systems (K2)
CO2	Design the ground water resource systems (K4)
CO3	Identify the different types & methods of irrigation for better water management (K3)
CO4	Design the different types of cross drainage works (K4)
CO5	Design various river training 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	2	2	1	1	1	-	1	2	1
CO2	3	1	2	1	1	1	2	1	1	1	2	1	1	2
CO3	3	2	2	2	2	2	2	1	2	2	-	1	2	1
CO4	3	1	2	1	1	1	2	2	1	1	2	1	1	2
CO5	2	1	2	3	2	2	2	1	2	2	2	1	2	1
CO (Avg	2.8	1.4	2.2	2	1.6	1.6	2	1.2	1.4	1.4	2	1	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 of irrigation projects. Irrigation methods: Canal irrigation-Lift irrigation-Tank irrigation-Flooding methods-Sprinkler irrigation-Drip irrigation.

UNIT-IV	DISTRIBUTION SYSTEM	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-Hydraulic design 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, 2008.
2.	Punmia B.C, "Irrigation and Water Power Engineering", Laxmi Publishers, New Delhi,2008
REFERENCES:	
1.	Arora K.R, "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, New Delhi, 2009.
2.	Subramanya, Engineering Hydrology, Tata-McGraw Hill,2004.
3.	Ragunath H.M, "Hydrology", Willey Eastern Limited, New Delhi, 2000.
4.	Asawa G.L, "Irrigation Engineering", New Age International Publishers, New Delhi,2009
5.	Sharma R.K, and Sharma T.K, "Irrigation Engineering", S. Chand and Company, New Delhi, 2008.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE1002R	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.

COURSE CODE	COURSE NAME	L	T	P	C
U15CE1003R	**ENERGY EFFICIENCY AND GREEN BUILDING**	3	0	0	3

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

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

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E. / B.Tech. Semester VIII 2015R (CBCS)
Branch: Civil Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Practical					
1	U15CE801R	Project Work	0	0	24	12	360
					Total Credits	**12**	

Approved By

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

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