



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)  
Accredited by NAAC with 'A' Grade

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

### CIVIL ENGINEERING

#### SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

**I/IV B.TECH**

**I-SEMESTER**

(With effect from **2019-2020** Admitted Batch onwards)

Subject Code	Name of the Subject	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19 HS 1101	English	HS	3	3	--	--	25	75	100
B19 BS 1101	Mathematics-I	BS	3	3	--	--	25	75	100
B19 BS 1103	Engineering Physics	BS	3	3	--	--	25	75	100
B19 CE 1101	Engineering Mechanics	ES	4	3	1	--	25	75	100
B19 ME 1101	Engineering Drawing	ES	2.5	1		3	25	75	100
B19 BS 1106	Engineering Physics Lab	ES	1.5	--	--	3	20	30	50
B19 HS 1102	English Lab	HS	1.5	--	--	3	20	30	50
B19 CE 1102	Engineering Exploration Project	PR	1	--	--	2	--	50	50
<b>TOTAL</b>			<b>19.5</b>	<b>13</b>	<b>1</b>	<b>11</b>	<b>165</b>	<b>485</b>	<b>650</b>

Code	Category	L	T	P	C	I.M	E.M	Exam
B19HS1101	HS	3	--	--	3	25	75	3 Hrs.

### ENGLISH

(Common to CE,CSE,EEE,IT & ME)

#### Introduction:

The course is designed to train students in receptive as well as productive skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as GRE, GMAT, IELTS, TOEFL and BEC besides being able to handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

#### Course Objectives:

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.
4. Impart effective strategies for good writing and demonstrate the same in both summarizing and analyzing; writing well-organized essays, letters, e-mails, CV's and reports.
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

#### Course Outcomes:

S.No	Outcome	Knowledge Level
1	Identify the context, topic and pieces of specific information by understanding and responding to the social or transactional dialogues spoken by native speakers of English.	K3
2	Apply suitable strategies for skimming and scanning to get the main idea of a text and locate specific information.	K3
3	Build confidence and adapt themselves to the social and public discourses, discussions and presentations.	K6
4	Understand and apply the principles of writing to paragraphs, arguments, essays and formal/informal communication.	K6
5	Construct sentences using proper grammatical structures and correct word forms.	K4

### SYLLABUS

<b>UNIT-I (8 Hrs)</b>	<p><b>Lesson: A Drawer full of happiness</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing.</p>
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	<p><b>Speaking:</b> Self- introduction and introducing others. Asking and answering general questions on topics such as home, family, work, studies and interests.</p> <p><b>Reading:</b> Skimming text to get the main idea. Scanning to look for specific pieces of information.</p> <p><b>Reading for Writing:</b> Paragraph Writing (Hints Development), general essays using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing, punctuation.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20) GRE Vocabulary (20), antonyms and synonyms, word applications, verbal reasoning and sequencing of words.</p> <p><b>Grammar:</b> Content words and function words; parts of Speech, tenses, word order in sentences, sentence structures.</p> <p><b>Pronunciation:</b> Vowels, consonants, plural markers and their realizations</p>
<p><b>UNIT-II</b> <b>(8 Hrs)</b></p>	<p><b>Lesson-: Nehru's letter to his daughter, Indira on her birthday</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Answering a series of questions about main idea and supporting ideas after listening to audio texts both in speaking and writing.</p> <p><b>Speaking:</b> Discussion in pairs/ small groups on specific topics followed by short structured talks, functional English: greetings and leave takings.</p> <p><b>Reading:</b> Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.</p> <p><b>Reading for Writing:</b> Identifying the main ideas, rephrasing and summarizing them (précis writing); avoiding redundancies and repetitions.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words), antonyms and synonyms, word applications.</p> <p><b>Grammar:</b> Articles, prepositions and use of antonyms.</p> <p><b>Pronunciation:</b> Past tense markers, word stress-di-syllabic words.</p>
<p><b>UNIT-III</b> <b>(8 Hrs)</b></p>	<p><b>Lesson: Stephen Hawking-Positivity 'Benchmark'</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Listening for global comprehension and summarizing what is listened to both in speaking and writing.</p> <p><b>Speaking:</b> Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: complaining and apologizing.</p> <p><b>Reading:</b> Reading a text in detail by making basic inferences -recognizing: and interpreting specific context clues; strategies to use text clues for comprehension, critical reading.</p> <p><b>Reading for Writing:</b> Letter writing- types, format and principles of letter writing, E-mail etiquette, writing a Resume/CV and covering letter.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words. GRE. Vocabulary 20 words), antonyms and synonyms, word applications, sequencing of words.</p>

	<p><b>Grammar:</b> Active and passive Voice, question Tags, direct and indirect speech, reporting for academic purposes.</p> <p><b>Pronunciation:</b> Word stress-poly-syllabic words.</p>
UNIT-IV (8 Hrs)	<p><b>Lesson: Liking a Tree, Unbowed: Wangari Maathai-biography</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Making predictions while listening to conversations/ transactional dialogues without video (only audio), listening to audio-visual texts.</p> <p><b>Speaking:</b> Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: asking for permissions, requesting, Inviting.</p> <p><b>Reading:</b> Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.</p> <p><b>Reading for Writing:</b> Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Pamphlet writing, writing for media, writing SOP's.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words GRE Vocabulary (20 words), antonyms and synonyms, word applications, cloze encounters, foreign phrases.</p> <p><b>Grammar:</b> Quantifying expressions - adjectives and adverbs: comparing and contrasting; degrees of comparison.</p> <p><b>Pronunciation:</b> Contrastive Stress.</p>
UNIT-V (8 Hrs)	<p><b>Lesson: Stay Hungry–Stay Foolish</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.</p> <p><b>Speaking:</b> Formal oral presentations on topics from academic contexts – with/without the use of PPT slides. Functional English: Suggesting/Opinion giving.</p> <p><b>Reading:</b> Reading for comprehension, RAP Strategy - intensive reading and extensive reading techniques.</p> <p><b>Reading for Writing:</b> Report writing, writing academic proposals- writing research articles: format and style.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words GRE Vocabulary (20 words), antonyms and synonyms, word applications, coherence, matching emotions.</p> <p><b>Grammar:</b> Editing short texts — identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement).</p> <p><b>Pronunciation:</b> Stress in compound words</p>
<b>Text Books:</b>	
1.	<i>Infotech English</i> , Maruthi Publications.
<b>Reference Books:</b>	
1.	Bailey, Stephen. <i>Academic writing: A Handbook for International Students</i> . Routledge, 2014.

2.	Chase. Becky Tarver. <i>Pathways: Listening, Speaking and Critical Thinking</i> . Heinley ELT; 2nd Edition, 2018.
3.	<i>Skilful Level 2 Reading &amp; Writing Student's Book Pack (B1)</i> . Macmillan Educational.
4.	Hewing, Martin. <i>Cambridge Academic English (B2)</i> . CUP, 2012.

**Weblinks:**

	<b>Grammar/Listening/Writing</b>
	1-language.com
	<a href="http://www.5minuteenglish.com/">http://www.5minuteenglish.com/</a>
	<a href="https://www.englishpractice.com/">https://www.englishpractice.com/</a>
	<b>Grammar/Vocabulary</b>
	English Language Learning Online
	<a href="http://www.bbc.co.uk/learningenglish/">http://www.bbc.co.uk/learningenglish/</a>
	<a href="http://www.better-english.com/">http://www.better-english.com/</a>
	<a href="http://www.nonstopenglish.com/">http://www.nonstopenglish.com/</a>
	<a href="https://www.vocabulary.com/">https://www.vocabulary.com/</a>
	BBC Vocabulary Games
	Free Rice Vocabulary Game
	<b>Reading</b>
	<a href="https://www.usingenglish.com/comprehension/">https://www.usingenglish.com/comprehension/</a>
	<a href="https://www.englishclub.com/reading/short-stories.htm">https://www.englishclub.com/reading/short-stories.htm</a>
	<a href="https://www.english-online.at/">https://www.english-online.at/</a>
	<b>Listening</b>
	<a href="https://learningenglish.voanews.com/z/3613">https://learningenglish.voanews.com/z/3613</a>
	<a href="http://www.englishmedialab.com/listening.html">http://www.englishmedialab.com/listening.html</a>
	<b>Speaking</b>
	<a href="https://www.talkenglish.com/">https://www.talkenglish.com/</a>
	BBC Learning English – Pronunciation tips
	Merriam-Webster – Perfect pronunciation Exercises
	<b>All Skills</b>
	<a href="https://www.englishclub.com/">https://www.englishclub.com/</a>
	<a href="http://www.world-english.org/">http://www.world-english.org/</a>
	<a href="http://learnenglish.britishcouncil.org/">http://learnenglish.britishcouncil.org/</a>
	Online Dictionaries
	Cambridge dictionary online
	MacMillan dictionary
	Oxford learner's dictionaries

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1101	BS	3	--	--	3	25	75	3 Hrs.

**MATHEMATICS-I**

**(LINEAR ALGEBRA, DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS)**

**(Common to All Branches)**

**Pre-requisites:** Calculus of functions of a single variable and Matrices.

**Course Objectives:** Students are expected to learn

1. Concepts of linear algebra and methods of solution of linear simultaneous algebraic equations.
2. Eigen values, Eigen vectors and quadratic forms.
3. First order ordinary differential equations and some simple geometrical and physical applications.
4. Orthogonal trajectories, Simple electrical circuits and Newton's law of cooling.
5. Methods of solution of linear higher order ordinary differential equations.
6. Concepts of Laplace transform and their applications for solving ODE.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1.	Solve a given system of linear algebraic equations	K2
2.	Determine Eigen values and Eigen vectors of a system represented by a matrix.	K2
3.	Solve linear ordinary differential equations of first order and first degree.	K1
4.	Apply the knowledge in simple applications such as Newton's law of cooling, orthogonal trajectories and simple electrical circuits.	K3
5.	Solve linear ordinary differential equations of second order and higher order.	K1
6.	Determine Laplace transform and inverse Laplace transform and solve linear ODE.	K2

**SYLLABUS**

<b>UNIT-I (10 Hrs)</b>	<b>Linear systems of equations:</b> Rank, Echelon form, Normal form, consistency of system of linear equations, Solution of linear systems by Gauss elimination, Jacobi and Gauss-Seidel methods.
<b>UNIT-II (10 Hrs)</b>	<b>Eigen values - Eigen vectors and Quadratic forms:</b> Eigen values, Eigen vectors, Properties, Cayley-Hamilton theorem, Inverse and powers of a matrix using Cayley-Hamilton theorem, Reduction to diagonal form, Quadratic forms, Reduction of a Quadratic form to Canonical form.
<b>UNIT-III (10 Hrs)</b>	<b>Differential equations of first order and first degree:</b> Linear, Bernoulli, Exact, Reducible to exact types. Applications: Orthogonal trajectories, Newton's Law of cooling, Simple electrical circuits. (R-L and R-C circuits only)
<b>UNIT-IV (8 Hrs)</b>	<b>Linear differential equations of higher order:</b> Linear Non-homogeneous equations of higher order with constant coefficients with source (RHS) term of the type $e^{ax}$ , $\sin ax$ , $\cos ax$ , polynomials in $x$ , $e^{ax} V(x)$ , $x V(x)$ . Simultaneous differential equations with constant coefficients, Method of Variation of parameters.

<b>UNIT-V (12 Hrs)</b>	<p><b>Laplace transformation:</b>  Laplace transforms of standard functions, properties, transforms of <math>tf(t)</math>, <math>f(t)/t</math>, transforms of derivatives and integrals, transforms of unit step function, Dirac delta function, Inverse Laplace transforms, convolution theorem (without proof).  Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.</p>
<b>Text Books:</b>	
1.	B.S.Grewal, Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	N.P.Bali&Manish Goyal, Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	V.Ravindranath&P. Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
3.	Michael Greenberg, Advanced Engineering Mathematics, 9 <sup>th</sup> edition, Pearson.
4.	Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press.
5.	Peter O'Neil, Advanced Engineering Mathematics, Cengage Learning.
6.	Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
7.	Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1103	BS	3	--	--	3	25	75	3 Hrs.

### ENGINEERING PHYSICS

(Common to CE & ME)

#### Course Objectives:

1.	Impart the knowledge of the concept of structure of solids and study the different types of structures and basic concepts of Nano materials and structure – property relationship with in the elastic limit
2.	Familiarize the student with Architectural acoustics
3.	Explore the knowledge of magnetic and dielectric materials and their utility
4.	Familiarize the student with modern technologies like Lasers, Optical fibers and Ultrasonics and their applications.

#### Course Outcomes

S.No	Outcome	Knowledge Level
1.	Explain the structure of solids and their determination	K3
2.	Demonstrate the synthesis methods and applications of nano materials	K2
3.	Understand the concepts of elasticity and different types of moduli and their relation	K2
4.	Explain the sound propagation in buildings and related aspects	K3
5.	Characterize the magnetic and dielectric materials from their basic behaviour and learn their applications.	K3
6.	Understand the basics of modern technologies ultrasonics, lasers and optical fibers and their applications in various fields	K3

### SYLLABUS

<b>UNIT-I (10 Hrs)</b>	<p><b>SCIENCE OF SOLIDS – CRYSTALLOGRAPHY AND NANOMATERIALS</b></p> <p><b>Crystallography:</b> Basis and lattice, Crystal systems, Bravais lattice, Characteristics of unit cell, Atomic packing fraction for S.C, B.C.C, F.C.C lattices, Miller indices – representation of lattice planes, Diffraction of x rays in Crystals and Bragg’s law.</p> <p><b>Nanomaterials :</b> Introduction, Salient features of Nano materials, Synthesis methods – Ball milling, Condensation, Chemical Vapour Deposition, Sol – Gel. Characterization techniques for nano materials, Carbon Nano Tubes (C N T s), Applications of Nano materials</p>
<b>UNIT-II (9 Hrs)</b>	<p><b>ACOUSTICS &amp; ULTRASONICS</b></p> <p><b>Acoustics :</b> Introduction – Reverberation time – Sabine’s formula (Derivation using growth and decay method) – absorption coefficient and its determination – factors affecting acoustics of buildings and their remedies.</p> <p><b>Ultrasonics:</b> Production of ultrasonics by Magnetostriction and piezoelectric methods – Detection of ultrasonics - acoustic grating – Non-Destructive Testing – pulse echo system through transmission and reflection modes – Applications.</p>



<b>UNIT-III (9 Hrs)</b>	<b>ELASTICITY</b> <b>Elasticity:</b> Stress, Strain; Hooke's law, stress – strain curve, generalized Hooke's law with and without thermal strain for isotropic materials, different types of moduli and their relations, bending of beams – Bending moment of a beam – Depression of cantilever.
<b>UNIT-IV (10 Hrs)</b>	<b>MAGNETICS AND DIELECTRICS</b> <b>Magnetics:</b> Introduction – Magnetic dipole moment – Magnetization – Magnet's susceptibility and permeability – Origin of permanent magnetic moment – Bohr Magneton – Classification of magnetic materials (Dia, Para and Ferro) – Domain concept of Ferromagnetism – Hysteresis – soft and hard magnetic materials – Applications of Ferromagnetic materials. <b>Dielectrics:</b> Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz internal field – Clausius-Mossotti equation – Frequency dependence of polarization – Applications of dielectrics.
<b>UNIT-V (10 Hrs)</b>	<b>LASERS AND OPTICAL FIBERS</b> <b>Lasers:</b> Introduction, Interaction of radiation with matter, conditions for light amplification, Einstein's relations. Requirements of lasers device, Types of lasers, Design and working of Ruby and He – Ne lasers, Laser characteristics and applications. <b>Fiber Optics:</b> Introduction to optical fibers, Principle of light propagation in fiber, Acceptance angle, Numerical aperture, Modes of propagations, types of fibers, classification of fibers based on refractive index profile, applications of fibers with emphasis on fiber optic communication.
<b>Text Books:</b>	
1.	A text book of Engineering Physics by M.N.Avadhannlu and PG.Kshirsagar, Schans & Company Ltd
2.	Engineering Physics by P K Palanisamy Sci Tech Publishers.
3.	Engineering Mechanics by M.K.Harbola, Cengage Publications.
4.	Engineering Physics by Gaur and Gupta, Dhanpat Rai Publications Meerut.
<b>Reference Books:</b>	
1.	Engineering Physics by M.R.Srinivasan, New Age International Publications
2.	Engineering Physics by V. Rajendran, McGraw Hill Education (India) Pvt Ltd
3.	Introduction to Solid State Physics by Charles Kittel , Weily Publications.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE1101	ES	3	1	--	4	25	75	3 Hrs.
<b>ENGINEERING MECHANICS</b>								
<b>(Civil Engineering)</b>								
<b>Course Objectives:</b>								
1.	To develop fundamental understanding of principles of Engineering Mechanics and its importance in Civil Engineering, through rigorous theoretical discussions and analytical examples.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Apply laws of mechanics for various force conditions and properties of bodies							K3
2.	Apply laws of forces for general cases in plane							K3
3.	Apply principle of virtual work for various equilibrium conditions							K3
4.	Apply laws of kinematics and kinetics to particles							K3
5.	Apply laws of kinematics and kinetics to rigid bodies							K3
<b>SYLLABUS</b>								
<b>UNIT-I (14 Hrs)</b>	Concurrent forces in a plane, parallel forces in a plane, centroid, moment of inertia, radius of gyration, parallel axis theorem, principle axes.							
<b>UNIT-II (12 Hrs)</b>	General Case of Forces in a Plane, Resultant and equilibrium of general case of forces in a plane, Statically determinate plane trusses-Method of joints and Method of sections. Friction – Coulombs laws of dry friction – Limiting friction, Problems on Wedge friction.							
<b>UNIT-III (10 Hrs)</b>	Principle of virtual work, stable and unstable equilibrium – efficiency – beams & pulley systems.							
<b>UNIT-IV (12 Hrs)</b>	Kinematics of particles – rectilinear & curvilinear motion, rectangular components, tangential & normal components. Kinetics of particles – Newton’s second law, Energy method, Impulse & momentum method.							
<b>UNIT-V (12 Hrs)</b>	Kinematics of rigid bodies – translation, rotation, plane motion, instantaneous centre of rotation. Plane motion of rigid bodies – forces & acceleration, D’Alembert’s principle, energy & momentum methods.							
<b>Text Books:</b>								
1.	Engineering Mechanics by S. Timoshenko and D. H. Young, McGraw-Hill.							
2.	Vector Mechanics for engineers by Ferdinand P. Beer and Johnston, Tata Mc-Graw Hill.							

**Reference Books:**

1.	Engineering Mechanics, Vol. 1 & 2 by J.L. Meriam and L.G. Kraige.
2.	Engineering Mechanics by Singer.
3.	Engineering Mechanics by K.L. Kumar, Tata Mc-GrawHill.
4.	Engineering mechanics by Bhavikatti, New age international.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19ME1101	ES	1	--	3	2.5	25	75	3 Hrs.
<b>ENGINEERING DRAWING</b>								
<b>(Common to CE,EEE &amp; ME)</b>								
<b>Course Objectives:</b>								
1.	Bring awareness that engineering drawing is the language of engineers							
2.	To impart basic knowledge and skills required to prepare engineering drawings.							
3.	To visualize and represent the pictorial views with proper dimensioning and scaling.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Apply principles of drawing to Construct polygons and engineering curves.							K3
2.	Apply principles of drawing to draw the projections of points and lines.							K3
3.	Apply principles of drawing to draw the projections of planes							K3
4.	Apply principles of drawing to draw the projections of solids.							K3
5.	Apply principles of drawing to represent the object in 3D view through isometric views.							K3
<b>SYLLABUS</b>								
<b>UNIT-I (8 Hrs)</b>	<b>Polygons:</b> Constructing regular polygons by general methods, inscribing and describing polygons on circles. <b>Curves:</b> Parabola, Ellipse and Hyperbola by general method (eccentricity method only), cycloids, involutes, tangents & normals for the curves.							
<b>UNIT-II (8 Hrs)</b>	<b>Orthographic Projections:</b> Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to one of the reference planes(HP,VP or PP) Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT.							
<b>UNIT-III (6 Hrs)</b>	<b>Projections of planes:</b> regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.							
<b>UNIT-IV (6 Hrs)</b>	Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.							
<b>UNIT-V (8 Hrs)</b>	Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.							
<b>Text Books:</b>								
1.	Engineering drawing by N.D Bhatt , Charotar publications.							
2.	Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers							

**Reference Books:**

1.	Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
2.	Engineering Graphics for Degree by K.C. John, PHI Publishers.
3.	Engineering Graphics by PI Varghese, McGrawHill Publishers.
4.	Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

**Web links**

1.	<a href="https://nptel.ac.in/courses/112103019/">https://nptel.ac.in/courses/112103019/</a>
2.	<a href="https://nptel.ac.in/courses/112104172/1">https://nptel.ac.in/courses/112104172/1</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1106	BS	--	--	3	1.5	20	30	3 Hrs.
<b>ENGINEERING PHYSICS LAB</b>								
<b>(Common to CE&amp; ME)</b>								
<b>Course Objectives:</b>								
1.	To impart hands-on experience to the students entering engineering / Technology education about handling sophisticated equipment / instruments.							
2.	To make the students understand the theoretical aspects of various phenomena experimentally.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Students get hands on experience in setting up experiments and using the instruments / equipment individually.							K3
2.	Get introduced to using new / advanced technologies and understand their significance.							K3
<b>LIST OF EXPERIMENTS</b>								
1.	Determination of the Rigidity modulus of elasticity of a material - Torsional pendulum.							
2.	Determination Young's modulus by single Cantilever oscillations method.							
3.	Verification of the laws of vibrations in stretched strings – Sonometer							
4.	Magnetic field along the axis of a current carrying coil –Stewart and Gee's apparatus.							
5.	Determination of Magnetic susceptibility by Quinke's method.							
6.	Determination of velocity of sound - Volume Resonator method.							
7.	Determination of dielectric constant by charging and discharging method.							
8.	Determination of wave length of lasers by diffraction grating							
9.	Determination of wave length of light from a source using Diffraction Grating by Normal incidence method.							
10.	Determination of radius of curvature of Plano convex lens – Newton's Rings.							
11.	Determination of the thickness of a thin spacer using interference – Air Wedge method.							
12.	Verification of Laws of series and parallel combinations of resistances – Carey Foster's bridge.							
13.	Resolving power of a grating.							
14.	Determination of Temperature Coefficient of Resistance of a thermistor.							
15.	Determination of resistivity of semiconductors by Four probe method.							
<b>Reference Books:</b>								
1.	Advanced Practical Physics Vol 1& 2 SP Singh & M.S Chauhan Pragati Prakashan ,Meerut							

<b>Code</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>I.M</b>	<b>E.M</b>	<b>Exam</b>
<b>B19HS1102</b>	<b>HS</b>	<b>--</b>	<b>--</b>	<b>3</b>	<b>1.5</b>	<b>20</b>	<b>30</b>	<b>3 Hrs.</b>

**ENGLISH LAB**  
**(Common to All Branches)**

**Course Objectives:**

1. Students will be exposed to a variety of self instructional, learner friendly modes of language learning
2. Students will be habituated to CALL (Computer Assisted Language Learning). Thus providing them with the required facility to face computer-based competitive exams like GRE, TOEFL, GMAT etc.
3. Students will learn better pronunciation through stress, intonation and rhythm
4. Students build their confidence in speaking skills.
5. Students learn and practice LSRW Skills.

**Course Outcomes:**

<b>S.No</b>	<b>Outcome</b>	<b>Knowledge Level</b>
1	Remember and understand the different aspects of English language proficiency with emphasis on LSRW skills.	K2
2	Apply communication skills through various language learning activities.	K3
3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening comprehension.	K4
4	Exhibit an acceptable etiquette essential in social settings.	K6
5	Get awareness on mother tongue influence and neutralize it in order to improve fluency and clarity in spoken English.	K4

**SYLLABUS**

<b>UNIT-I</b>	Pronunciation Letters and Sounds The Sounds of English Phonetic Transcription
<b>UNIT-II</b>	Past tense markers Word stress-di-syllabic words Poly-syllabic words
<b>UNIT-III</b>	Rhythm & Intonation
<b>UNIT-IV</b>	Contrastive Stress (Homographs)
<b>UNIT-V</b>	Word Stress: Weak and Strong forms Stress in compound words

**Text Books:**

- |    |                                       |
|----|---------------------------------------|
| 1. | Infotech English, MaruthiPublications |
|----|---------------------------------------|

**Reference Books:**

- |    |   |
|----|---|
| 1. | Exercises in Spoken English Part 1,2,3,4, OUP and CIEFI.                          |
| 2. | English Pronunciation in use- Mark Hancock, CUP.                                  |
| 3. | English Phonetics and Phonology-Peter Roach, CUP.                                 |
| 4. | English Pronunciation in use- Mark Hewings, CUP.                                  |
| 5. | English Pronunciation Dictionary- Daniel Jones, CUP.                              |
| 6. | English Phonetics for Indian Students- P. BalaSubramanian, Mac MillanPublications |



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE1102	PR	--	--	2	1	--	50	3 Hrs.
<b>ENGINEERING EXPLORATION PROJECT</b>								
<b>(Civil Engineering)</b>								
<b>Course Objectives:</b>								
1.	Build mindsets & foundations essential for designers							
2.	Learn about the Human-Centered Design methodology and understand their real-world applications							
3.	Use Design Thinking for problem solving methodology for investigating illdefined problems.							
4.	Undergo several design challenges and work towards the final design challenge							
<b>Apply Design Thinking on the following Streams to</b>								
<b>Project Stream 1:</b> Electronics, Robotics, IOT and Sensors								
<b>Project Stream 2:</b> Computer Science and IT Applications								
<b>Project Stream 3:</b> Mechanical and Electrical tools								
<b>Project Stream 4:</b> Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.								
<b>HOW TO PURSUE THE PROJECT WORK?</b>								
1.	The first part will be learning-based-asking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.							
2.	The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.							
3.	The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.							
4.	The teams start with <b>Design Challenge</b> and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.							
5.	Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc							
6.	At the end, Students are required to submit the final reports, and will be evaluated by the faculty.							
<b>TASKS TO BE DONE:</b>								
<b>Task 1: Everyone is a Designer</b>								
<ul style="list-style-type: none"> <li>▪ Understand class objectives &amp; harness the designer mindset</li> </ul>								
<b>Task 2: The Wallet/Bag Challenge and Podcast</b>								
<ul style="list-style-type: none"> <li>▪ Gain a quick introduction to the design thinking methodology</li> <li>▪ Go through all stages of the methodology through a simple design challenge</li> </ul>								

<ul style="list-style-type: none"> <li>▪ Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.</li> </ul>						
<p><b>Task 3: Teams &amp; Problems</b></p> <ul style="list-style-type: none"> <li>▪ Start Design Challenge and learn about teams &amp; problems through this</li> <li>▪ Foster team collaboration, find inspiration from the environment and learn how to identify problems</li> </ul>						
<p><b>Task 4: Empathizing</b></p> <ul style="list-style-type: none"> <li>▪ Continue Design Challenge and learn empathy</li> <li>▪ Learn techniques on how to empathize with users</li> <li>▪ Go to the field and interview people in their environments</li> <li>▪ Submit Activity Card</li> </ul>						
<p><b>Task 5: Ideating</b></p> <ul style="list-style-type: none"> <li>▪ Continue Design Challenge and learn how to brainstorm effectively</li> <li>▪ Encourage exploration and foster spaces for brainstorming</li> <li>▪ Submit Activity Card</li> </ul>						
<p><b>Task 6: Prototyping</b></p> <ul style="list-style-type: none"> <li>▪ Continue Design Challenge and learn how to create effective prototypes</li> <li>▪ Build tangible models and use them as communication tools</li> <li>▪ Start giving constructive feedback to classmates and teammates</li> <li>▪ Submit Activity Card</li> </ul>						
<p><b>Task 7: Testing</b></p> <ul style="list-style-type: none"> <li>▪ Finish Design Challenge and iterate prototypes and ideas through user feedback</li> <li>▪ Evolve ideas and prototypes through user feedback and constructive criticism</li> <li>▪ Get peer feedback on individual and group performance</li> <li>▪ Submit Activity Card</li> </ul>						
<p><b>Task 8:</b></p> <ul style="list-style-type: none"> <li>▪ Final Report Submission and Presentation</li> </ul>						
<p><b>Note:</b> The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design ThinkingConcept.</p>						
<p><b>References:</b></p>						
<table border="1"> <tr> <td style="text-align: center;">1.</td> <td>Tom Kelly, <i>The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm</i> (Profile Books,2002)</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Tim Brown, <i>Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation</i> (HarperBusiness, 2009)</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Jeanne Liedtka, Randy Salzman, and Daisy Azer, <i>Design Thinking for the Greater Good: Innovation in the Social Sector</i> (Columbia Business School Publishing,2017)</td> </tr> </table>	1.	Tom Kelly, <i>The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm</i> (Profile Books,2002)	2.	Tim Brown, <i>Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation</i> (HarperBusiness, 2009)	3.	Jeanne Liedtka, Randy Salzman, and Daisy Azer, <i>Design Thinking for the Greater Good: Innovation in the Social Sector</i> (Columbia Business School Publishing,2017)
1.	Tom Kelly, <i>The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm</i> (Profile Books,2002)					
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3.	Jeanne Liedtka, Randy Salzman, and Daisy Azer, <i>Design Thinking for the Greater Good: Innovation in the Social Sector</i> (Columbia Business School Publishing,2017)					

**OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:**

Human-Centered Design Toolkit (IDEO);<https://www.ideo.com/post/design-kit>

Design Thinking Boot Camp Bootleg (Stanford D-School);  
<https://dschool.stanford.edu/resources/the-bootcamp-bootleg>

Collective Action Toolkit  
(frogdesign);[https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT\\_2.0\\_English.pdf](https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf)  
Design Thinking for Educators (IDEO);<https://designthinkingforeducators.com/>



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)  
Accredited by NAAC with 'A' Grade

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

### CIVIL ENGINEERING

#### SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

**I/IV B.TECH**

**II-SEMESTER**

(With effect from **2019-2020** Admitted Batch onwards)

Subject Code	Name of the Subject	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19 BS 1201	Mathematics-II	BS	3	3	--	--	25	75	100
B19 BS 1202	Mathematics-III	BS	3	3	--	--	25	75	100
B19 BS 1204	Engineering Chemistry	BS	3	3	--	--	25	75	100
B19 CS 1201	Programming for Problem Solving using C	ES	3	3	--	--	25	75	100
B19 CE 1201	Computer Aided Engineering Drawing	ES	2.5	1	--	3	25	75	100
B19 BS 1207	Engineering Chemistry Lab	BS	1.5	--	--	3	20	30	50
B19 HS 1202	Communication Skills Lab	HS	1.5	--	--	3	20	30	50
B19 CS 1204	Programming for Problem Solving using C Lab	ES	1.5	--	--	3	20	30	50
B19 ME 1205	Workshop Practice Lab	ES	1.5	--	--	3	20	30	50
B19 MC 1201	Environmental Science	MC	0	3	--	--	--	--	--
<b>TOTAL</b>			<b>20.5</b>	<b>16</b>	<b>--</b>	<b>15</b>	<b>205</b>	<b>495</b>	<b>700</b>

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1201	BS	3	--	--	3	25	75	3 Hrs.
<b>MATHEMATICS – II</b>								
<b>(NUMERICAL ANALYSIS, PARTIAL DIFFERENTIAL EQUATIONS)</b>								
<b>(Common to CE, EEE &amp; ME)</b>								
<b>Pre requisites:</b> Calculus of functions of a single variable and Geometry								
<b>Course Objectives:</b> Students are expected to learn:								
1.	The concept of interpolation and its use for equally and unequally spaced data points							
2.	Numerical methods to solve algebraic and transcendental equations, methods for numerical evaluation of integrals and for solving first order ODEs.							
3.	Partial differentiation and Jacobians.							
4.	Application of Partial differentiation for maxima/ minima and for evaluation of real definite integrals.							
5.	Formation and solution of linear partial differential equations							
6.	Solution of one-dimensional wave equation and one-dimensional heat equation by the method of separation of variables.							
<b>Course Outcomes:</b> At the end of the course students will be able to								
S.No	Outcome							Knowledge Level
1.	Fit an interpolation formula and perform interpolation for an equally spaced data as well as unequally spaced data.							K2
2.	Find a real root of algebraic and transcendental equations, evaluate numerically certain definite integrals & solve a first order ordinary differential equation by Euler and RK methods.							K3
3.	Compute partial derivatives, total derivative and Jacobian							K1
4.	Find maxima/minima of functions of two variables and evaluate some real definite integrals.							K2
5.	Form partial differential equations and solve Lagrange linear equation. Solve linear higher order homogeneous and non-homogeneous PDEs.							K1
6.	Find theoretical solution of one-dimensional wave equation and one-dimensional heat equation							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Interpolation:</b> Interpolation, forward differences, backward differences, Central differences and relations between the operators, Differences of a polynomial, Newton's formulae for interpolation, Interpolation with unequal intervals, Lagrange interpolation.							
<b>UNIT-II</b> <b>(12 Hrs)</b>	<b>Solution of Algebraic and Transcendental Equations &amp; Numerical Integration and solution of Ordinary Differential equations:</b> Introduction, Bisection method, Method of false position, Iteration method & Newton-Raphson method. Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule, Solution of ordinary differential equations by Taylor's method, Picard's method, Euler's method, Modified Euler's method, Fourth order Runge-Kutta method.							

<b>UNIT-III (10 Hrs)</b>	<b>Partial differentiation:</b> Introduction, Homogeneous functions, Euler's theorem, Chain rule, Total derivative, Jacobians and their properties. Applications: Taylor series expansion for a function of two variables, Maxima and Minima of functions of two variables with and without constraints, Lagrange's method. Leibnitz's rules for differentiation under integral sign.
<b>UNIT-IV (10 Hrs)</b>	<b>First order and higher order partial differential equations:</b> Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of Lagrange linear equation. Solutions of Linear homogeneous and non-homogeneous partial differential equations with constant coefficients –source (RHS) terms of the type $e^{ax+by}$ , $\sin(ax+by)$ , $\cos(ax+by)$ , $x^m y^n$ .
<b>UNIT-V (10 Hrs)</b>	<b>Applications of partial differential equations:</b> Method of separation of variables, One –dimensional wave equation, the D'Alembert's solution, one- dimensional heat equation
<b>Text Books:</b>	
1.	B.S.Grewal, Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	N.P.Bali & Manish Goyal, A Text book of Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press.
2.	V.Ravindranath and P. Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
3.	Erwin Kreyszig, Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
4.	David Kincaid, Ward Cheney, Numerical Analysis-Mathematics of Scientific Computing, 3 <sup>rd</sup> Edition, Universities Press.
5.	Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6.	Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1202	BS	3	--	--	3	25	75	3 Hrs.
<b>MATHEMATICS-III</b>								
<b>(Multivariable Calculus and Fourier analysis)</b>								
<b>(Common to CE,CSE,ECE,EEE &amp; IT)</b>								
<b>Prerequisites:</b> Concepts of Calculus								
<b>Course Objectives:</b> The students are expected to learn:								
1.	How to expand a periodic function in a Fourier series.							
2.	How to find Fourier transform for a given function and evaluate some real definite integrals.							
3.	Evaluation of Multiple integrals; definitions of Beta, Gamma and error functions.							
4.	Concepts of Gradient, divergence and curl and second order operators.							
5.	To evaluate line integral, compute work done by a force and Flux of a vector function							
6.	Green's, Stokes' and Gauss divergence theorems.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Determine Fourier series and half range series of functions.							K2
2.	Find different Fourier transforms of non-periodic functions and also use them to evaluate integrals.							K3
3.	Use the knowledge of Beta and Gamma functions in evaluating improper integrals.							K2
4.	Evaluate double integrals, simple triple integrals & find areas and volume.							K2
5.	Find the gradient of a scalar function, divergence and curl of a vector function. Determine scalar potential.							K2
6.	Apply Green's, Stokes' and Gauss divergence theorems to solve problems.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Fourier Series</b> Introduction, Periodic functions, Fourier series of a periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half-range sine and cosine series.							
<b>UNIT-II</b> <b>(10 Hrs)</b>	<b>Fourier Transforms</b> Fourier integral theorem (without proof), Complex form of Fourier integral, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Finite Fourier transforms, properties, inverse transforms, Parseval's Identities.							
<b>UNIT-III</b> <b>(12 Hrs)</b>	<b>Single and Multiple integrals</b> Beta and Gamma functions, Properties, Relation between Beta and Gamma functions, Applications: evaluation of improper integrals, error function and the complimentary error function. Double and triple integrals, change of variables, Change of order of integration. Applications: Areas and volumes.							

<b>UNIT-IV (10 Hrs)</b>	<b>Vector Differentiation</b> Gradient, directional derivative, Divergence, Curl, Incompressible flow, solenoidal and irrotational vector fields, vector identities.
<b>UNIT-V (10 Hrs)</b>	<b>Vector Integration</b> Line integral, Work done, Potential function; Area, Surface and volume integrals, Flux. Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related Problems.
<b>Text Books:</b>	
1.	<b>B.S.Grewal</b> , Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	<b>N.P.Bali &amp; Manish Goyal</b> , Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	<b>Michael Greenberg</b> , Advanced Engineering Mathematics, 9 <sup>th</sup> edition, Pearson edn.
2.	<b>Erwin Kreyszig</b> Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
3.	<b>Peter O'Neil</b> , Advanced Engineering Mathematics, 7 <sup>th</sup> edition, Cengage Learning.
4.	<b>D.W. Jordan and T. Smith</b> , Mathematical Techniques, Oxford University Press.
5.	<b>Srimanta Pal, Subodh C. Bhunia</b> , Engineering Mathematics, Oxford University Press.
6.	<b>Dass H.K., Rajnish Verma. Er.</b> , Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.



Sub. Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1204	BS	3	--	--	3	25	75	3 Hrs.
<b>ENGINEERING CHEMISTRY</b>								
<b>(Common to CE &amp; ME)</b>								
<b>Course Objectives:</b>								
1.	To understand the physical and mechanical properties of Polymers/Plastics/elastomers helps in selecting suitable materials for different purpose.							
2.	To create awareness on fuels as a source of energy for industries like thermal power stations, steel industry, fertilizer industry etc.							
3.	To understand the concept of galvanic cells and corrosion with theories like electro chemical theory.							
4.	To understand the importance of water.							
5.	To understand about the materials which are used in major industries like steel and metallurgical manufacturing industries, construction and electrical equipment manufacturing industries.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	At the end of the course the students learn the advantages and limitations of plastics materials and their use in design.							K3
2	Fuels which are used commonly and their economics, advantages and limitations are discussed.							K4
3	Students gained knowledge reasons for corrosion and some methods of corrosion control.							K4
4	Students understands the impurities present in raw water, problems associated with them and how to avoid them.							K3
5	Similarly students understand liquid crystals and semi conductors. Students can gain the building materials, solar materials, lubricants and energy storage devices.							K4
<b>SYLLABUS</b>								
<b>UNIT-I (8Hrs)</b>	<b>Water and its treatment:</b> Introduction – source of water – impurities of water – Hardness of water – Estimation of water hardness by EDTA method – Boiler troubles: Sludge and scale formation ion boilers; caustic embrittlement; Boiler corrosion; Priming and foaming – Water softening : Lime – Soda Process, Zeolite Process; Demineralization by Ion – Exchange Process. Municipal Water treatment – Desalination of Brackish water: Electrodialysis; Reverse osmosis. Indian standards and WHO standards of drinking water. Design of drinking water plant							
<b>UNIT-II (10 Hrs)</b>	<b>Fuels and Lubricants:</b> Fuels: Introduction – classification of fuels – calorific value: HCV and LCV; Determination of calorific value of solid fuel by bomb calorimeter; Proximate and ultimate analysis of coal; coke: Manufacture of coke by Otto – Hoffmann’s by product coke oven process; Refining of Petroleum; cracking FB MB Knocking – octane number of gasoline; cetane number of diesel oil. Synthetic Petrol; LPG, CNG. Lubricants: Definition ; Mechanism of lubrication; Properties of Lubricants (Definition and Significance)							

<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Corrosion and its Prevention:</b> Definition- Theories of corrosion (i) Dry Corrosion (ii)Wet Corrosion. Types of Electrochemical corrosion : Pitting corrosion, Differential variation corrosion galvanic corrosion, Stress corrosion. Factors influencing corrosion; Protection from corrosion-material selection and design cathodic Protection, corrosion inhibitors Protective coatings – Galvanizing, Tinning. Inorganic coatings – Anodizing; organic coatings – Paints Varnishes – Special Paints.
<b>UNIT-IV</b> <b>(10 Hrs)</b>	<b>High Polymers and Plastics; Rubber &amp; Elastomers</b> Definition – Types of polymerisation – Free radical mechanism of addition Polymerisation; - Plastics as engineering materials, Thermo Plastics and thermosetting Plastics – compounding of Plastics – Fabrication of Plastics – Preparation, Properties and applications of Polyethene , PVC, Nylon 6,6; - Bullet Proof Plastics: Kelvar and Polycarbonate – Fiber reinforced Plastics – Conducting Polymers; Biodegradable Polymers – PHBV; Nylon-2 nylon – 6; Natural rubber: Vulcanization – compounding of rubber, Preparation, Properties and applications of Bu Na – S; Bu Na – N.
<b>UNIT-V</b> <b>(12 Hrs)</b>	<b>Building &amp; Construction Materials</b> <b>Ceramics:-</b> Definition – Characteristics – Classification of Ceramics – Application of Ceramics. <b>Portland Cement:-</b> Manufacture of Portland Cement – Setting and hardening of Portland Cement – Mortar- Concrete – Reinforced Cement Concrete(RCC); Decay of Concrete – Special Cements. <b>Refractories:-</b> Definition – Characteristics – Classification – Properties and failure of refractories. <b>Insulators:</b> Thermal and electrical insulators.
<b>Text Books:</b>	
1.	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing co.
2.	Engineering Chemistry by Willy India Pvt Ltd.
3.	Engineering chemistry by Dr.K.Anji Reddy and Dr.M.S.R.Reddy ; Silicon Publications.
<b>Reference Books:</b>	
1.	Engineering Chemistry by Shikha Aharwal; Cambridge University Press, 2015 edition.
2.	A text of Engineering Chemistry by S.S.Dara; S.Chand & Co Ltd.
3.	Chemistry in Engineering and Technology by JC Kuriacose and J. Rajaram Mc. Graw Hill edition.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS1201	ES	3	--	--	3	25	75	3 Hrs.
<b>PROGRAMMING FOR PROBLEM SOLVING USING C</b>								
<b>(Common to CE,EEE &amp; ME)</b>								
<b>Course Objectives:</b>								
1.	To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program							
2.	To gain knowledge of the operators, selection, control statements and repetition in C							
3.	To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.							
4.	To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.							
5.	To assimilate about File I/O and significance of functions							
<b>Course Outcomes :</b>								
S.No	Outcome							Knowledge Level
1	Students will learn about computer systems, computing environments, developing of a computer program and Structure of a C Program							K2
2	Students will learn to use different operators, data types and loops for developing C Programs.							K3
3	Students will able to write programs using Arrays ,Strings, enumerated types, Structure and Union							K3
4	Students will able to design and implement programs to analyze the different pointer applications							K3
5	Students will able to decompose a problem into functions and to develop modular reusable code							K3
<b>SYLLABUS</b>								
<b>UNIT-I (10 Hrs)</b>	<p><b>Introduction to Computers:</b> Computer Systems, Computing Environments, Computer languages, Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers</p> <p><b>Introduction to the C Language:</b> Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.</p> <p><b>Structure of a C Program:</b> Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.</p>							
<b>UNIT-II (9 Hrs)</b>	<p><b>Bitwise Operators:</b> Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.</p> <p><b>Selection &amp; Making Decisions:</b> Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions</p> <p><b>Repetition:</b> Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples</p>							

<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Arrays:</b> Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages <b>Strings:</b> String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code <b>Enumerated, Structure, and Union:</b> The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application
<b>UNIT-IV</b> <b>(10 Hrs)</b>	<b>Pointers:</b> Introduction, Pointers to pointers, Compatibility, L value and R value <b>Pointer Applications:</b> Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application <b>Processor Commands:</b> Processor Commands
<b>UNIT-V</b> <b>(12 Hrs)</b>	<b>Functions:</b> Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion <b>Text Input / Output:</b> Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions <b>Binary Input / Output:</b> Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.
<b>Text Books:</b>	
1.	Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2.	The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson
3.	Programming in C, Reema Thareja, OXFORD
<b>Reference Books:</b>	
1.	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE1201	ES	1	--	3	2.5	25	75	4 Hrs.
<b>COMPUTER AIDED ENGINEERING DRAWING</b>								
<b>(Civil Engineering)</b>								
<b>Course Objectives:</b>								
1.	Develop the engineering imagination essential for successful design.							
2.	Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.							
3.	Instruct graphical representation of Building component.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Apply principles of drawing to draw the projections of solids.							K3
2.	Apply principles of drawing to draw sections of solids and sectional views.							K3
3.	Apply principles of drawing to draw the development of solids							K3
4.	Apply the principles of drawing to draw the intersection of right regular solids.							K3
5.	Apply the principles of drawing to draw the perspective views of points, lines, plane figures and simple solids.							K3
6.	Draw isometric and orthographic drawings using CAD packages.							K3
<b>SYLLABUS</b>								
<b>PART-A: Conventional Drawing</b>								
<b>UNIT-I (6 Hrs)</b>	<b>PROJECTIONS OF SOLIDS:</b> Projections of Regular Solids inclined to both planes – Auxiliary Views.							
<b>UNIT-II (8 Hrs)</b>	<b>SECTIONS OF SOLIDS:</b> Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views. <b>DEVELOPMENT OF SOLIDS:</b> Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.							
<b>UNIT-III (8 Hrs)</b>	<b>INTERPENETRATION OF RIGHT REGULAR SOLIDS:</b> Intersection of Cylinder Vs Cylinder, Prism Vs Prism and Cylinder Vs Cone. <b>PERSPECTIVE PROJECTIONS:</b> Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).							
<b>PART-B: Computer Aided Drawing</b>								
<b>UNIT-IV (6 Hrs)</b>	<b>INTRODUCTION TO COMPUTER AIDED DRAFTING:</b> Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling, <b>VIEW POINTS AND VIEW PORTS:</b> view point coordinates and view(s) displayed, examples to exercise different options like save, restore and delete.							
<b>UNIT-V (8 Hrs)</b>	<b>COMPUTER AIDED SOLID MODELING:</b> Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Building&Building Parts.							

**Text Books:**

- |    |   |
|----|---|
| 1. | Engineering drawing by N.D Bhatt , Charotar publications. |
| 2. | Engineering Graphics, K.C. john, PHI Publications         |

**Reference Books:**

- |     |   |
|-----|---|
| 1.  | Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex                        |
| 2.  | Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.  |
| 3.  | Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas                     |
| 4.  | Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age                      |
| 5.  | Engineering Drawing – RK Dhawan, S Chand  |
| 6.  | Engineering Drawing – MB Shaw, BC Rana, Pearson   |
| 7.  | Engineering Drawing – KL Narayana, P Kannaiah, Scitech                                    |
| 8.  | Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill                                   |
| 9.  | Engineering Graphics – PI Varghese, Mc Graw Hill  |
| 10. | Text book of Engineering Drawing with auto-CAD , K.venkata reddy/B.S . publications.      |
| 11. | Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications                   |
| 12. | Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications |

**Web links:**

- |    |   |
|----|---|
| 1. | <a href="https://nptel.ac.in/courses/112103019/">https://nptel.ac.in/courses/112103019/</a>   |
| 2. | <a href="https://nptel.ac.in/courses/112104172/1">https://nptel.ac.in/courses/112104172/1</a> |

**NOTE: End Semester Examination shall be conducted for Four hours with the following pattern:**

- a) Two hours- Conventional Drawing
- b) Two hours- Computer Aided Drawing.

**Marks Distribution is as follows:**

Examination	Internal Marks	External Marks
Part-A:Conventional Drawing	15 ( Day to daywork-9 marks+ internal tests-6 marks)	45 (3×15=45)
Part-B: Computer Aided Drawing.	10 ( Day to daywork-6 marks+ internal tests-4 marks)	30 (2×15=30)

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1207	BS	--	--	3	1.5	20	30	3 Hrs.
<b>ENGINEERING CHEMISTRY LAB</b>								
<b>(Common to CE &amp; ME)</b>								
<b>Course Objectives:</b>								
1.	To investigate and understand Physical behaviour in the laboratory using scientific reasoning and logic and interpret the result of simple experiments and demonstration of chemical Principle and also evaluate the impact of chemical discoveries on how we view the world.							
2.	Effectively communicate experimental results and solutions to application problems through oral and written reports.							
3.	Understand the basic concepts, definitions, characteristics and phenomena.							
4.	Recognize the classical ideas and chemical phenomena and also define and analyse the concepts.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	An understanding of Professional and develop confidence on recent trends.							K3
2.	Able to gain technical knowledge of measuring, operating and testing of chemical instruments and equipments.							K4
3.	Acquire ability to apply real time knowledge of chemistry.							K3
4.	Exposed to the real time working environment.							K3
5.	Demonstrate the ability to learn Principles, design and conduct experiments.							K3
6.	Ability to work on laboratory and multidisciplinary tasks.							K3
<b>LIST OF EXPERIMENTS</b>								
1.	Estimation of HCL using standard Sodium Hydroxide.							
2.	Determination of total hardness of water by EDTA method.							
3.	Estimation of Ferrous Iron by $\text{KMnO}_4$ .							
4.	Estimation of oxalic acid by $\text{KMnO}_4$ .							
5.	Estimation of Mohr's salt by $\text{K}_2\text{Cr}_2\text{O}_7$ .							
6.	Estimation of Dissolved oxygen by Winkler's method.							
7.	Determination of pH by pH meter and universal indicator method.							
8.	Conductometric titration of strong acid Vs strong base.							
9.	Conductometric titration of strong acid Vs weak base.							
10.	Potentionmetric titration of strong acid Vs strong base.							
11.	Potentionmetric titration of strong acid Vs weak base.							
12.	Preparation of Phenol formaldehyde resin.							
13.	Determination of saponification value of oils.							
14.	Determination of pour and cloud points of lubricating oil.							
15.	Determination of Acid value of oil.							
<b>Demo:</b>								
1.	Biodiesel from used cooking oil.							
2.	Construction of electrochemical cells.							
3.	Synthesis of semiconductors.							

**Reference Books:**

1.	Engineering Chemistry Lab Manual Prepared by Chemistry Faculty of S.R.K.R.Engineering College.
2.	Laboratory manual on Engineering Chemistry by Dr.Sudha Rani; Dhanpat Rai Publishing Company.
3.	Engineering Chemistry Laboratory manual – I & II by Dr.K.Anji Reddy; Tulip Publications.



<b>Code</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>I.M</b>	<b>E.M</b>	<b>Exam</b>
<b>B19HS1202</b>	<b>HS</b>	<b>--</b>	<b>--</b>	<b>3</b>	<b>1.5</b>	<b>20</b>	<b>30</b>	<b>3 Hrs.</b>

**COMMUNICATION SKILLS LAB**  
(Common to CE,ECE,EEE & ME)

**Course Objectives:**

1. Students will be exposed to a variety of formal discussions.
2. Students will be habituated to CALL (Computer Assisted Language Learning). Thus providing them with the required facility to face computer-based competitive exams like GRE, TOEFL, GMAT etc.
3. Students will equip themselves with professional communication.
4. Students build their confidence in speaking skills.
5. Students learn and enhance LSRW Skills.

**Course Outcomes:**

<b>S.No</b>	<b>Outcome</b>	<b>Knowledge Level</b>
1	Learn different aspects of English language proficiency in LSRW skills.	K4
2	Apply communication skills through various language learning activities.	K3
3	Draft job application letters.	K6
4	Adopt a professional etiquette in formal settings.	K6
5	Improve fluency and clarity in both spoken and written English.	K3

**SYLLABUS**

<b>UNIT-I</b>	JAM, Common Errors Neutralizing accent
<b>UNIT-II</b>	Telephonic Etiquette, Role Plays, Poster Presentations
<b>UNIT-III</b>	Presentation Skills Public Speaking Data Interpretation
<b>UNIT-IV</b>	Group Discussion Do's and Don'ts
<b>UNIT-V</b>	Curriculum Vitae Covering Letter Interview Skills Mock Interviews, FAQ's

**Reference Books:**

1.	Exercises in Spoken English Part 1,2,3,4, OUP and CIEFI.
2.	English Pronunciation in use- Mark Hancock, CUP.
3.	English Phonetics and Phonology-Peter Roach, CUP.
4.	English Pronunciation in use- Mark Hewings, CUP.
5.	English Pronunciation Dictionary- Daniel Jones, CUP.
6.	English Phonetics for Indian Students- P. BalaSubramanian, Mac Millan Publications.
7.	Technical Communication- Meenakshi Raman, Sangeeta Sharma, OUP.
8.	Technical Communication- Gajendra Singh Chauhan, Smita Kashiramka, cengage Publications

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS1204	ES	--	--	3	1.5	20	30	3 Hrs.
<b>PROGRAMMING FOR PROBLEM SOLVING USING C LAB</b>								
<b>(Common to CE,EEE &amp; ME)</b>								
<b>Course Objectives:</b>								
1.	Apply the principles of C language in problem solving.							
2.	To design flowcharts, algorithms and knowing how to debug programs.							
3.	To design & develop of C programs using arrays, strings pointers & functions.							
4.	To review the file operations, preprocessor commands.							
<b>Course Outcomes: By the end of the Lab, the student</b>								
S.No	Outcome							Knowledge Level
1.	Gains Knowledge on various concepts of a C language.							K2
2.	Able to draw flowcharts and write algorithms.							K2
3.	Able design and development of C problem solving skills.							K3
4.	Able to design and develop modular programming skills.							K3
5.	Able to trace and debug a program							K3
<b>LIST OF EXPERIMENTS</b>								
<b>Exercise 1:</b>								
1.	Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.							
2.	Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.							
3.	Write a C program to display multiple variables.							
<b>Exercise 2:</b>								
1.	Write a C program to calculate the distance between the two points.							
2.	Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".							
<b>Exercise 3:</b>								
1.	Write a C program to convert a string to a long integer.							
2.	Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.							
3.	Write a C program to calculate the factorial of a given number.							
<b>Exercise 4:</b>								
1.	Write a program in C to display the n terms of even natural number and their sum.							
2.	Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.							
3.	Write a C program to check whether a given number is an Armstrong number or not.							

<b>Exercise 5:</b>	
1.	Write a program in C to print all unique elements in an array.
2.	Write a program in C to separate odd and even integers in separate arrays.
3.	Write a program in C to sort elements of array in ascending order.
<b>Exercise 6:</b>	
1.	Write a program in C for multiplication of two square Matrices.
2.	Write a program in C to find transpose of a given matrix.
<b>Exercise 7:</b>	
1.	Write a program in C to search an element in a row wise and column wise sorted matrix.
2.	Write a program in C to print individual characters of string in reverse order.
<b>Exercise 8:</b>	
1.	Write a program in C to compare two strings without using string library functions.
2.	Write a program in C to copy one string to another string.
<b>Exercise 9:</b>	
1.	Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2.	Write a program in C to demonstrate how to handle the pointers in the program.
<b>Exercise 10:</b>	
1.	Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2.	Write a program in C to add two numbers using pointers.
<b>Exercise 11:</b>	
1.	Write a program in C to add numbers using call by reference.
2.	Write a program in C to find the largest element using Dynamic Memory Allocation.
<b>Exercise 12:</b>	
1.	Write a program in C to swap elements using call by reference.
2.	Write a program in C to count the number of vowels and consonants in a string using a pointer.
3.	
<b>Exercise 13:</b>	
1.	Write a program in C to show how a function returning pointer.
2.	Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.
<b>Exercise 14:</b>	
1.	Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2.	Write a program in C to convert decimal number to binary number using the function.

<b>Exercise 15:</b>	
1.	Write a program in C to check whether a number is a prime number or not using the function.
2.	Write a program in C to get the largest element of an array using the function.
<b>Exercise 16:</b>	
1.	Write a program in C to append multiple lines at the end of a text file.
2.	Write a program in C to copy a file in another name.
3.	Write a program in C to remove a file from the disk.
<b>Reference Books:</b>	
1.	Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE
2.	The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson
3.	Programming in C, Reema Thareja, OXFORD
4.	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
5.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
6.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

Code	Category	L	T	P	C	I.M	E.M	Exam
B19ME1205	ES	--	--	3	1.5	20	30	3 Hrs.
<b>WORK SHOP PRACTICE LAB</b>								
<b>(Civil Engineering)</b>								
<b>Course Objectives:</b>								
1.	To familiarize students with wood working skills.							
2.	To familiarize students with sheet metal operations.							
3.	To familiarize students with fitting operations.							
4.	To familiarize students with electrical house wiring skills							
<b>Course Outcomes: By the end of the Lab, the student</b>								
S.No	Outcome							Knowledge Level
1.	Apply wood working skills in real world applications.							K3
2.	Build different parts with metal sheets in real world applications.							K3
3.	Apply fitting operations in various applications.							K3
4.	Apply different types of basic electric circuit connections.							K3
<b>LIST OF EXPERIMENTS</b>								
<b>CARPENTRY</b>								
1.	T-Lap Joint							
2.	Cross Lap Joint							
3.	Dovetail Joint							
4.	Mortise and Tenon Joint							
<b>FITTING</b>								
1.	Vee Fit							
2.	Square Fit							
3.	Half Round Fit							
4.	Dovetail Fit							
<b>TIN SMITHY</b>								
1.	Taper Tray							
2.	Square Box without lid							
3.	Open Scoop							
4.	Funnel							
<b>HOUSE WIRING</b>								
1.	Parallel / Series Connection of three bulbs							
2.	Stair Case wiring							
3.	Florescent Lamp Fitting							
4.	Measurement of Earth Resistance							
<b>Note: At least THREE exercises to be done from each trade.</b>								
<b>Reference Books:</b>								
1.	Elements of workshop technology, Vol.1 by S. K. and H. K. Choudary.							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC1201	MC	3	--	--	--	--	--	--
<b>ENVIRONMENTAL SCIENCE</b>								
<b>(Common to CE,ECE &amp; EEE)</b>								
<b>Course Objectives:</b> The objectives of the course are to impart:								
1.	Overall understanding of the natural resources.							
2.	Basic understanding of the ecosystem and its diversity.							
3.	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.							
4.	An understanding of the environmental impact of developmental activities.							
5.	Awareness on the social issues, environmental legislation and global treaties.							
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(8 Hrs)</b>	<p><b>Multidisciplinary nature of Environmental Studies:</b> Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.</p> <p><b>Ecosystems:</b> Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.</p>							
<b>UNIT-II</b> <b>(8 Hrs)</b>	<p><b>Natural Resources: Natural resources and associated problems.</b></p> <p>Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.</p> <p>Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.</p> <p>Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.</p> <p><b>Food resources:</b> World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.</p> <p>Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.</p>							

<b>UNIT-III (8 Hrs)</b>	<b>Biodiversity and its conservation:</b> Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.
<b>UNIT-IV (8 Hrs)</b>	<b>Environmental Pollution:</b> Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Man and his well being.  <b>Solid Waste Management:</b> Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.
<b>UNIT-V (8 Hrs)</b>	<b>Social Issues and the Environment:</b> Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.-Public awareness.
<b>UNIT-VI (8 Hrs)</b>	<b>Environmental Management:</b> Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Greenpolitics.  <b>The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.</b>
<b>Text Books:</b>	
1.	Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada Rani; Pearson Education, Chennai
2.	Environmental Studies, R. Rajagopalan, 2 <sup>nd</sup> Edition, 2011, Oxford University Press.
3.	Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula
<b>Reference Books:</b>	
1.	Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2.	A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3.	Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014