



**GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE  
(AUTONOMOUS)**

**NELLORE-524317 (A.P) INDIA**

**B.TECH IN CIVIL ENGINEERING  
COURSE STRUCTURE AND SYLLABI  
UNDER RG 22 REGULATIONS**

### **DEPARTMENT VISION**

To emanate as a proficient learning resource- center producing competent technocrats.

### **DEPARTMENT MISSION**

- DM<sub>1</sub>** : Provide Conceptual and practical- oriented teaching- learning approaches.
- DM<sub>2</sub>** : Offer skill based trainings through advanced and sustainable technologies.
- DM<sub>3</sub>** : Organize activities on Professional and interpersonal skills through industry interaction.
- DM<sub>4</sub>** : Establish learning environment promoting to societal, environmental and ethical values.

### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

Graduates of B. Tech in Civil Engineering Programme shall able to:

- PEO 1:** Analyse technical concepts and demonstrate, expertise in designs, analysis and implementation of infrastructural projects of civil engineering.
- PEO 2:** Engage in engineering profession with teamwork focusing on sustainable technologies and ethical practices.
- PEO 3:** Adopt innovative technologies and update skills through life long learning.

### Program Outcomes

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### Program Specific Outcomes

- PSO 1 Domain Skills:** To Apply the fundamental concepts of Structural, Geotechnical and Water resources Engineering in Civil Engineering.
- PSO 2 Industrial Skills:** Develop skills to design sustainable solutions for real time problems of civil engineering by employing modern technologies and STAAD PRO.



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## DEPARTMENT OF CIVIL ENGINEERING

Course Structure (RG22)

### Semester 0

Induction Program: 3weeks  
(Common for All Branches of Engineering)

S.No	CourseNo	CourseName	Category	L-T-P-C
1		Physical Activities-Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counseling	MC	2-0-2-0
3		Orientation to all branches—career options, tools, etc.	MC	3-0-0-0
4		Orientation on admitted Branch – corresponding labs, tools and platforms	EC	2-0-3-0
5		Proficiency Units &Productivity Tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7		Remedial Training in Foundation Courses	MC	2-1-2-0
8		Human Values & Professional Ethics	MC	3-0-0-0
9		Communication Skills—focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0



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**DEPARTMENT OF CIVIL ENGINEERING**  
Course Structure (RG22)

<b>Semester-1(Theory-5,Lab-3)</b>							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	22A0001T	Linear Algebra and Calculus	3	0	0	3
2	BSC	22A0004T	Engineering Physics	3	0	0	3
3	HSMC	22A0013T	Communicative English	3	0	0	3
4	ESC	22A0518T	C-Programming & Data Structures	3	0	0	3
5	ESC	22A0302T	Engineering Drawing	1	0	4	3
6	HSMC (Lab)	22A0014P	Communicative English Lab	0	0	3	1.5
7	BSC(Lab)	22A0008P	Engineering Physics Lab	0	0	3	1.5
8	ESC(Lab)	22A0519P	C-Programming & Data Structures Lab	0	0	3	1.5
<b>Total credits</b>							<b>19.5</b>

Category	Credits
Basic Science Course (BSC)	7.5
Engineering Science Course (ESC)	7.5
Humanities and Social Science Course (HSMC)	4.5
<b>Total</b>	<b>19.5</b>

## LINEAR ALGEBRA & CALCULUS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0001T	3: 0:0:0	3	CIE: 30 SEE:70	3Hours	BSC
<b>Course Objectives:</b>					
This course will illuminate the students in the concepts of calculus and linear algebra. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their Applications.					
<b>Syllabus</b>					<b>Total Hours:45</b>
<b>Unit - I</b>	<b>Matrices</b>				<b>9 Hrs</b>
Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non- homogeneous equations linear equations. Applications: Finding the current in electrical circuits Eigen values and Eigenvectors and their properties, Cayley- Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix.					
<b>Unit - II</b>	<b>Mean Value Theorems</b>				<b>9 Hrs</b>
Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof), Cauchy's mean value theorem (Without Proof), related problems, Taylor's and Maclaurin theorems with remainders (without proof) - related problems, Taylor's and Maclaurin series (without proof) Expansions of functions by Taylor's and Maclaurin's series.					
<b>Unit - III</b>	<b>Multivariable Calculus</b>				<b>9 Hrs</b>
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.					
<b>Unit - IV</b>	<b>Multiple Integrals</b>				<b>9 Hrs</b>
Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.					
<b>Unit - V</b>	<b>Beta and Gamma functions</b>				<b>9 Hrs</b>
Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Solving the system of linear equations, find the eigen values and eigenvectors and use this information to facilitate the calculation of matrix characteristics.</li> <li>• Translate the given function as series of Taylor's and Maclaurin's with remainders, analyze the behavior of functions by using mean value theorems.</li> <li>• Acquire the Knowledge maxima and minima functions of several variables. Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables.</li> <li>• Apply multiple integration techniques in evaluating areas and volumes bounded by the region.</li> <li>• Understand beta and gamma functions and its relations, conclude the use of special function in evaluating definite integrals.</li> </ul>					
<b>Textbooks:</b>					

1. Higher Engineering Mathematics, B. S. Grewal , 44/e, Khanna Publishers, 2017.
2. Linear Algebra & Calculus by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
3. Engineering Mathematics III by N.P. Bali, Dr. K.L. Sai Prasad, University Science Press.

**Reference Books:**

1. Advanced Engineering Mathematics”, Erwin Kreyszig, Wiley India
2. B.V.Ramana, “Higher Engineering Mathematics”, Mc Graw Hill publishers.
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand Publications.

<b>Engineering Physics (Common to CE and ME)</b>					
<b>Course Code</b>	<b>L:T:P:S</b>	<b>Credits</b>	<b>Exam Marks</b>	<b>Exam Duration</b>	<b>Course Type</b>
<b>22A0001T</b>	<b>3: 0:0:0</b>	<b>3</b>	<b>CIE: 30 SEE:70</b>	<b>3Hours</b>	<b>BSC</b>
<b>Prerequisite:</b> Student should know about fundamental and basic principles in physics					
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To make a bridge between the physics in school and engineering courses.</li> <li>• To impart knowledge in basic concepts of optical phenomenon like interference, diffraction and Polarization.</li> <li>• To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibers along with engineering applications.</li> <li>• To enlighten the periodic arrangement of atoms in crystals, Bragg's law and to provide fundamentals related to structural analysis through powder diffraction method.</li> <li>• To familiarize the basic concepts of acoustics and ultrasonics with their Engineering applications.</li> <li>• To explain the significant concept of magnetic materials leading to the emerging micro device applications.</li> <li>• To familiarize the applications of nano and smart materials relevant to engineering branches.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:45</b>
<b>Unit - I</b>	<b>Wave optics</b>				<b>10 Hrs</b>
<p><b>Interference-</b> Principle of superposition – Interference of light – Types of Interference – Path difference – Phase difference – Conditions for sustained interference- Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index of liquid.</p> <p><b>Diffraction-</b> Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.</p> <p><b>Polarization-</b> Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates with applications.</p>					
<b>Unit - II</b>	<b>Lasers and Fiber optics</b>				<b>8 Hrs</b>
<p><b>Lasers-</b> Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Ruby laser – He-Ne laser – Applications of lasers.</p> <p><b>Fiber optics-</b> Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Propagation Losses (qualitative) – Applications.</p>					
<b>Unit - III</b>	<b>Crystallography and X-ray diffraction</b>				<b>8 Hrs</b>
<p><b>Crystallography-</b> Space lattice, Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems – Packing fraction – Coordination number – Packing fraction of SC, BCC &amp; FCC – Miller indices – Separation between successive (hkl) planes.</p> <p><b>X-Ray Diffraction-</b> Bragg's law – Bragg's X-ray diffractometer – Crystal structure determination by Powder method.</p>					
<b>Unit - IV</b>	<b>Acoustics and Ultrasonic's</b>				<b>10 Hrs</b>
<p><b>Acoustics-</b> Introduction – Requirements of acoustically good hall – Reverberation – Reverberation time – Sabine's formula (Derivation using growth and decay method ) – Absorption coefficient and itsdetermination – Factors affecting acoustics of buildings and their remedies.</p> <p><b>Ultrasonics-</b> Introduction – Properties – Production by magnetostriction and piezoelectric methods –</p>					



Detection – Acoustic grating – Non Destructive Testing – Pulse echo system through transmission and reflection modes – Applications.

**Unit - V**

**Engineering Materials**

**12 Hrs**

**Magnetic Materials-** Introduction- basic definitions – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro –Hysteresis – Soft and Hard magnetic materials.

**Nano materials-** Introduction – Surface area and quantum confinement –Properties of Nano materials – Synthesis of nano materials: Top-down: Ball Milling – Bottom-up: Chemical Vapour Deposition – Applications of nano materials.

**Smart Materials-** Introduction to Smart Materials- Characteristics- Types of smart materials: Smart Memory alloys (SMA)- definition- two stable solid phases: Low temperature phase (martensite transformations) - High temperature phase (austenitic transformations)-Applications of SMA.

**Course Outcomes (CO):**

**On completion of this course, student will be able to**

- Describe the importance of Interference, Diffraction and Polarization and the engineering applications as well (L2)
- Demonstrate the properties of lasers and fibre optics to various applications in science and technology (L2)
- Explain the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction (L2)
- Explain the fundamental properties and propagation principles of ultrasonics and acoustics in diverse engineering applications (L2)
- Explain the fundamental concepts and theory related to magnetic materials (L1)
- Illustrate diverse principles and theories of nano and smart materials and their technological applications in diverse fields (L2)

**Textbooks:**

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Applied Physics for Engineers- K.Venkataramanan, R. Raja, M. Sundararajan(Scitech) [3,5] 2014

**Reference Books:**

1. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Pres.
2. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers.
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning 4. Engineering Physics – M.R. Srinivasan, New Age Publications.
4. T.Pradeep “A Text book of Nano Science and Nano Technology”- Tata Mc GrawHill 201
5. Melton K.N, Stockel,D.and Wayman, C.M., “Engineering aspects of Shapememory Alloys”, Butterworth – Heinemann, 1990.

**E-resources:**

- <https://www.textbooks.com/Catalog/MG5/Applied-Physics.php>
- [https://edurev.in/courses/9596\\_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs](https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs)
- <https://libguides.ntu.edu.sg/c.php?g=867756&p=6226561>
- <https://bookauthority.org/books/best-applied-physics-books>
- <https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2>

COMMUNICATIVE ENGLISH (Common to all Branches of Engineering)					
Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
22A0013T	3: 0: 0: 0	3	CIE:30 SEE:70	3 Hours	HSMC
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>Facilitate effective <b>listening skills</b> for better comprehension of academic lectures and English spoken by native speakers.</li> <li>Help improve <b>speaking skills</b> motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations.</li> <li>Focus on appropriate <b>reading skills</b> for comprehension of various academic texts and authentic materials.</li> <li>Impart effective strategies for good <b>writing skills</b> in summarizing, writing well organized essays, drafting formal letters and designing well structured reports.</li> <li>Broaden the knowledge base of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit - I</b>	<b>On the Conduct of Life: William Hazlitt</b>			<b>9 Hrs</b>	
<p><b>Listening:</b> Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.</p> <p><b>Speaking:</b> Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.</p> <p><b>Reading:</b> Skimming to get the main idea of a text Scanning to look for specific pieces of information.</p> <p><b>Reading for Writing:</b> Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.</p> <p><b>Grammar and Vocabulary:</b> Parts of Speech, Content words and function words; Word order in sentences; Basic sentence structures; Types of questions - Wh- questions.</p>					
<b>Unit - II</b>	<b>The Brook: Alfred Tennyson</b>			<b>9Hrs</b>	
<p><b>Listening:</b> Answering a series of questions about main idea and supporting ideas after listening to audio texts.</p> <p><b>Speaking:</b> Discussion in pairs/small groups on specific topics followed by short structured talks.</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>Writing:</b> Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.</p> <p><b>Grammar and Vocabulary:</b> Use of Articles and zero Article Prepositions Punctuation, capital letters Cohesive devices - linkers</p>					
<b>Unit - III</b>	<b>The Death Trap: Saki</b>			<b>11 Hrs</b>	
<p><b>Listening:</b> Listening for global comprehension and summarizing what is listened to.</p> <p><b>Speaking:</b> Discussing specific topics in pairs or small groups and reporting what is discussed</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.</p> <p><b>Writing:</b> Paragraph Writing , Summarizing</p>					

<b>Grammar and Vocabulary:</b> Verbs – Tenses Subject-Verb agreement Direct & Indirect speech		
<b>Unit - IV</b>	<b>Ponnuthayi – Bama</b>	<b>10 Hrs</b>
<p><b>Listening:</b> Making predictions while listening to conversations/ transactional dialogues without video; listening with video.</p> <p><b>Speaking:</b> Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.</p> <p><b>Reading:</b> Read and Interpret graphic Information to reveal trends/patterns/relationships, communicate processes or display complicated data.</p> <p><b>Writing:</b> Letter Writing: Official Letters/Report Writing</p> <p><b>Grammar and Vocabulary:</b> Adjectives and Adverbs; Comparing and Contrasting Voice - Active &amp; Passive Voice.</p>		
<b>Unit - V</b>	<b>My Beloved Charioteer- Shasi Deshpande</b>	<b>9 Hrs</b>
<p><b>Listening:</b> Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.</p> <p><b>Speaking:</b> Formal oral presentations on topics from academic contexts- without the use of PPT slides</p> <p><b>Reading:</b> Reading for Comprehension</p> <p><b>Writing:</b> Writing structured essays on specific topics using suitable claims and evidences.</p> <p><b>Grammar and Vocabulary:</b> Identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)</p>		
<b>Course Outcomes (CO):</b>		
<b>On completion of this course, student will be able to</b>		
<ul style="list-style-type: none"> <li>• Retrieve the knowledge of basic grammatical concepts.</li> <li>• Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.</li> <li>• Apply grammatical structures to formulate sentences and correct word forms.</li> <li>• Analyze discourse markers to speak clearly on a specific topic in informal discussions.</li> <li>• Evaluate listening /reading texts and to write summaries based on global comprehension of these texts.</li> <li>• Create and develop coherent paragraph interpreting graphical description.</li> </ul>		
<b>Textbooks:</b>		
1) Language and Life: English Skills for Engineering Students - Orient Black Swan.		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. 1. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2014.</li> <li>2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.</li> <li>3. Raymond Murphy’s English Grammar in Use Fourth Edition (2012) E-book</li> <li>4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.</li> <li>5. Oxford Learners Dictionary, 12<sup>th</sup> Edition, 2011</li> <li>6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)</li> </ol>		
<b>Web links:</b>		

- [www.englishclub.com](http://www.englishclub.com)
- [www.easyworldofenglish.com](http://www.easyworldofenglish.com)
- [www.languageguide.org/english/](http://www.languageguide.org/english/)
- [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
- [www.eslpod.com/index.html](http://www.eslpod.com/index.html)

<b>C-PROGRAMMING &amp; DATA STRUCTURES</b> <b>Common to(ECE,EEE,ME,CE)</b>					
<b>Course Code</b>	<b>L:T:P:S</b>	<b>Credits</b>	<b>Exam Marks</b>	<b>Exam Duration</b>	<b>Course Type</b>
<b>22A0502T</b>	<b>3: 0:0:0</b>	<b>3</b>	<b>CIE: 30SEE:70</b>	<b>3Hours</b>	<b>ESC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• Illustrate the basic concepts of C programming language.</li> <li>• Choose a suitable C-construct to develop C code for a given problem.</li> <li>• Illustrate the fundamental concept of data structures and Arrays.</li> <li>• Emphasize the importance of data structures in developing and implementing efficient algorithms.</li> <li>• Illustrate a variety of data structures such as linked structures, stacks, queues, trees, and graphs.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:45</b>	
<b>Unit - I</b>	<b>Introduction to C Language</b>			<b>9Hrs</b>	
Structure of C program, C Tokens, Data types, Operators, Precedence and Associativity of operators, Expressions and its evaluation, control structures – sequence, selection and Iteration statements, unconditional control structures – break, goto, continue. Arrays: Introduction to arrays, types of arrays, applications of arrays, Programming examples.					
<b>Unit - II</b>	<b>Strings, Functions and Pointers</b>			<b>9Hrs</b>	
String: Declaring and Initializing string, Printing and reading strings, string manipulation functions, String input and output functions, array of strings, Programming examples.					
Functions: Defining function, user defined functions, standard functions, passing array as argument to function, recursion.					
Pointers: declaring and initializing pointers, pointers and arrays, pointer to pointer, pointer arithmetic, dynamic memory allocation, Structures and Unions.					
<b>Unit - III</b>	<b>Data Structures</b>			<b>9Hrs</b>	
<b>Introduction to Data Structures:</b> Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures.					
<b>Linked Lists:</b> Definition, Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Applications of Linked List.					
<b>Unit - IV</b>	<b>Stacks &amp; Queues</b>			<b>9Hrs</b>	
<b>Stacks:</b> Introduction, Definition, Representation of Stack, Operations on Stacks, Applications of Stacks.					
<b>Queues:</b> Introduction, Definition, Representation of Queues, Operations on Queues, Various Queue Structures, Applications of Queues.					
<b>Unit - V</b>	<b>Trees ,Graphs ,Searching and Sorting</b>			<b>9Hrs</b>	

**Trees:** Basic Terminologies, Definition and Concepts, Binary Tree, Representation of Binary Tree, operations on Binary Tree, Binary Search Tree, Heap Tree.

**Graphs:** Introduction, Graph Terminologies, Representation of graphs, Operations on Graphs, Graph, Graph Traversal Techniques: BFS and DFS.

**Searching and Sorting** – sequential search, binary search, exchange (bubble) sort, selection sort, Insertion sort.

### Course Outcomes(CO):

#### On completion of this course, student will be able to

- Illustrate and explain the basic computer concepts and programming principles of C language(L2)
- Select the best selection and loop construct for solving given problem(L2)
- Develop C programs to demonstrate the applications of derived data types such as arrays, pointers, strings.(L2)
- Implement basic operations on stack and queue using array representation(L2)
- Use linked structures, trees, and Graphs in writing programs(L2)
- Demonstrate different methods for traversing Graphs and Trees (L2)

#### Text Books:

1. C Programming & Data Structures – Behrouz A. Fourazan, Richard F. Gilberg.
2. Programming with C – Byron Gottfried, Third edition, Scham’s Outlines
3. C Programming : A Problem Solving Approach- Behrouz A. Fourazan , E.V.Prasad, Richard F. Gilberg
4. Classic Data Structures , Second Edition, Debasissamanta, PHI Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.

#### Reference Books:

1. Let us C, Yashwant Kanetkar, 6th Edition , BPB.
2. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications.
3. C Programming, E.Balagurusamy, 3rd edition, TMHPublishers.
4. Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson.
5. Data Structures: A Pseudo code Approach with C, 2<sup>nd</sup> Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning.
6. “Data Structures and Algorithm Analysis in C” by Weiss.“Data Structure Through C” by Yashavant P Kanetkar.

#### E-resources:

- <https://www.geeksforgeeks.org/c-programming-language/>
- <http://en.cppreference.com/w/c>
- [https://onlinecourses.nptel.ac.in/noc19\\_cs42/](https://onlinecourses.nptel.ac.in/noc19_cs42/)
- [https://www.linuxtopia.org/online\\_books/programming\\_books/gnu\\_c\\_programming\\_tutorial/index.html](https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.html)
- <https://codeforwin.org/>

<b>Engineering Drawing</b>					
<b>Course Code</b>	<b>L:T:P/D</b>	<b>Credits</b>	<b>Exam Marks</b>	<b>Exam Duration</b>	<b>Course Type</b>
<b>22A0302T</b>	<b>1: 0:0/4</b>	<b>3</b>	<b>CIE: 30 SEE:70</b>	<b>3Hours</b>	<b>ESC</b>
<b>Prerequisite:</b> Student should know about fundamental and basic principles in physics					
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• Bring awareness that Engineering Drawing is the Language of Engineers.</li> <li>• Familiarize how industry communicates technical information.</li> <li>• Teach the practices for accuracy and clarity in presenting the technical information.</li> <li>• Develop the engineering imagination essential for successful design.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:45</b>
<b>Unit-I</b>	<b>Introduction to Engineering Drawing</b>				<b>10Hrs</b>
<p>Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance- Conventions in drawing-lettering - BIS conventions.</p> <p>a) Draw the Conic sections including Ellipse, Parabola, Hyperbola, and the Rectangular hyperbola using general methods,</p> <p>b) Draw the Cycloid, Epicycloids, and Hypocycloid</p> <p>c) Draw the Involutés of circle, square, pentagon, and hexagon .</p>					
<b>Unit-II</b>	<b>Projections of points, lines and planes</b>				<b>10Hrs</b>
<p>Projections of points, lines, and planes: Projection of points in any quadrant, lines inclined to one and both planes, finding true lengths, finding true inclinations, angle made by line. Projections of regular plane surfaces using rotating plane method.</p>					
<b>Unit-III</b>	<b>Projections of Solids</b>				<b>10Hrs</b>
<p><b>Projections of solids:</b> Projections of regular solids inclined to one and both the principle planes using auxiliary views method.</p>					
<b>Unit-IV</b>	<b>Sections of solids</b>				<b>10Hrs</b>
<p><b>Sections of solids:</b> Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.</p>					
<b>Unit-V</b>	<b>Development of surfaces</b>				<b>10Hrs</b>
<p><b>Development of surfaces:</b> Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.</p>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Draw various curves applied in engineering. (I2)</li> <li>• Show projections of solids and sections graphically. (I2)</li> <li>• Draw the development of surfaces of solids. (I3)</li> </ul>					
<b>Textbooks:</b>					
<ol style="list-style-type: none"> <li>1. K.L.Narayana&amp;P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.</li> <li>2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.</li> </ol>					

**Reference Books:**

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008..



**COMMUNICATIVE ENGLISH LAB**  
(Common to all Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0014P	0:0:3:0	1.5	CIE:30 SEE:70	3H	HS

This course will enable students to

- Students will be exposed to a variety of self instructional, learner friendly modes of language learning.
- Students will learn better pronunciation through sounds, stress, intonation and rhythm.
- Students will be trained to use language effectively to face interviews, group discussions, public speaking.
- Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

**Syllabus**

**Total Hours: 48Hrs**

**List of Experiments**

1. Phonetics
2. Describing objects/places/persons
3. Role Play or Conversational Practice
4. JAM
5. Etiquettes of Telephonic Communication
6. Group Discussions
7. Debates
8. Oral Presentations
9. Interviews Skills
10. Reading comprehension
11. E-mail Writing
12. Resume Writing

**Course Outcomes:**

On completion of this course, the students are able to:

- Listening and repeating the sounds of English Language
- Understand the different aspects of the English language proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, syllable division, stress, rhythm, intonation for better Listening and Speaking Comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it in order to Improve fluency in spoken English.

**Suggested Software:** Walden InfoTech / Young India Films

**Reference Books:**

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T. Balasubramanyam.

**Online Learning Resources/Virtual Labs:**

- [www.esl-lab.com](http://www.esl-lab.com)
- [www.englishmedialab.com](http://www.englishmedialab.com)
- [www.englishinteractive.net](http://www.englishinteractive.net)

**Engineering Physics Lab**  
(Common to CE and ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0009P	0:0:3:0	1.5	CIE:30 SEE:70	3H	BS

**Course Objectives:**

This course will enable students to:

- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.
- Illustrates the magnetic and dielectric materials applications.

**Syllabus**

**Total Hours:48**

**Note:** In the following list, out of 12 experiments, any 2 experiments must be performed in a virtual mode

**List of Experiments**

1. Determine the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method.
3. Determination of wavelength by plane diffraction grating method.
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. Determination of particle size using LASER.
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
8. Determination of dielectric constant by charging and discharging method.
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
10. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
11. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
12. Sonometer: Verification of the three laws of stretched strings.

**Course Outcomes:**

On completion of this course, the students are able to:

- Determine the radius of a curvature and / or thickness of thin wire using microscope with the help of interference concept (L2).
- Evaluate the wavelength of various colors of grating and also dispersive power of prism by spectrometer using the principle of diffraction (L2).
- Evaluate wavelength of light source and particle size with He-Ne laser using the principle of diffraction Estimate the numerical aperture of a given optical fiber and hence to find its acceptance angle (L2)
- Estimate the dielectric constant of a given material (L2).
- Examine the hysteresis loss of the magnetic material by B- H curve and Estimate the magnetic field of a circular coil carrying current along the axis (L2).
- Estimate the mechanical properties of given string using Torsional pendulum and sonometer (L2).

**Text Books:**

1. Engineering Practical Physics B Mallick S Panigrahi, 1st, Edition, Cengage Learning Publishers
2. A Text book of Engineering Physics Practical, Dr. Ruby Das, Dr. Rajesh Kumar, C. S. Robinson, Prashant Kumar Sah, UNIVERSITY SCIENCE PRESS (An Imprint of Laxmi Publications Pvt. Ltd.).

**Reference Books:**

- 1.S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

**E-resources:**

- <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University
- <https://www.scribd.com/doc/81569075/Physics-Lab-Manual>  
<http://www.mlritm.ac.in/assets/img/Lab%20manual%20Physics.pdf>
- [https://bmsit.ac.in/public/assets/pdf/physics/studymaterial/Physics%20lab%20manual\\_cbc%20-%20kavichintu.pdf](https://bmsit.ac.in/public/assets/pdf/physics/studymaterial/Physics%20lab%20manual_cbc%20-%20kavichintu.pdf)

**C-PROGRAMMING & DATA STRUCTURES LAB**  
(Common to ECE, EEE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0502P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	ESC

**Course Objectives:**

This course will enable students to:

- Work with an IDE to create, edit, compile, run and debug programs
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Design & develop of C programs using arrays, strings, pointers & functions.
- Exploring basic data structures such as stacks and queues.
- Introduces variety of data structures such as hash linked list, trees and graphs.
- Introduces searching and sorting algorithms .

**Syllabus**

**Total Hours: 48**

**List of Experiments**

1. a) Write an algorithm to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm).  
b) Write an algorithm to calculate area and Circumference of a circle.  
c) Write an algorithm to calculate simple interest for a given P, T, and R ( $SI = P \cdot T \cdot R / 100$ )
2. a) Write a C program to find both the largest and smallest number in a list of integers.  
b) Write a C program that uses functions to perform the following:  
i) Addition of Two Matrices ii) Multiplication of Two Matrices
3. a) Write a C program that uses functions to perform the following operations:  
i) To insert a sub-string in to a given main string from a given position.  
ii) To delete n characters from a given position in a given string.
4. a) Write a C program to find sum and average of three numbers.  
b) Write C program to evaluate each of the following equations
5. a) Write a program in C to print individual characters of string in reverse order.  
b) Write a program in C to compare two strings without using string library functions.  
c) Write a C program to determine if the given string is a palindrome or not
6. a) Write C program to find GCD of two integers by using recursive function.  
b) Write C program to find GCD of two integers using non-recursive function
7. Write C programs that implement stack (its operations) using  
i) Arrays ii) Pointers
8. Write C programs that implement Queue (its operations) using

i) Arrays ii) Pointers

9. Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

10. Write a C program that uses functions to perform the following operations on singly linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

11. Write a C program that uses functions to perform the following operations on Doubly linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

12. Write a C program that uses functions to perform the following operations on circular linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

13. Write a C program that uses functions to perform the following:

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, in order and post order.

14. Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers:

i) Linear search ii) Binary search

15. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort

**Course Outcomes:**

On completion of this course, the students are able to:

- Use conditional and iterative statements for writing the C programs(L2)
- Make use of different data-structures like arrays, strings, structures for solving problems.(L2)
- Use basic data structures such as arrays, Stacks and Queues
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals
- Use various searching and sorting algorithms.

**Use linked structures, trees, and Graphs in writing programs****Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Classic Data Structures , Second Edition, Debasissamanta, PHI Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press

**Reference Books:**

1. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications
2. C Programming, E.Balagurusamy, 3rd edition, TMHPublishers
3. Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson
4. Data Structures: A Pseudo code Approach with C, 2<sup>nd</sup> Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning.
5. "Data Structures and Algorithm Analysis in C" by Weiss
6. "Data Structure Through C" by Yashavant P Kanetkar "Problem Solving in Data Structures and Algorithms Using C: The Ultimate Guide to Programming Interviews" by Hemant Jain



GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY  
(AUTONOMOUS)  
NELLORE – 524137 (A.P) INDIA

**DEPARTMENT OF CIVIL ENGINEERING**  
Course Structure (RG22)

<b>Semester-2(Theory-5,Lab-3)</b>							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	22A0007T	Engineering Chemistry	3	0	0	3
2	BSC	22A0002T	Differential Equations and Vector Calculus	3	0	0	3
3	ESC	22A0203T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ESC	22A0101T	Strength of Materials-I	3	0	0	3
5	ESC	22A0102T	Building Materials & construction	3	0	0	3
6	ESC(Lab)	22A0304T	Engineering Workshop	0	0	3	1.5
7	BSC(Lab)	22A0012P	Engineering Chemistry Lab	0	0	3	1.5
8	ESC(Lab)	22A0103P	Strength of Materials Lab	0	0	3	1.5
<b>Total credits</b>							<b>19.5</b>

Category	Credits
Basic Science Course (BSC)	7.5
Engineering Science Course (ESC)	12
Total	19.5



ENGINEERING CHEMISTRY (ME and CE)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0007T	3:0:0:0	3	CIE:30 SEE:70	3H	BSC
<b>Prerequisite: Student should know fundamental concepts about Engineering Chemistry</b>					
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>➤ To familiarize engineering chemistry and its applications</li> <li>➤ To impart the concept of soft and hard waters, softening methods of hard water</li> <li>➤ To train the students on the principles and applications of electrochemistry, polymers, and cement.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48</b>
<b>Unit I</b>	<b>Water and its treatment</b>				<b>10 Hrs</b>
Introduction - hardness of water - causes of hardness - types of hardness: temporary and permanent - expression and units of hardness - Estimation of hardness of water by EDTA method. Numerical problems, Boiler troubles- Sludges, scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning - Softening of water: Zeolite process, ion-exchange process, Desalination of water - Reverse osmosis and Electro dialysis.					
<b>Unit –II</b>	<b>Electrochemistry and Applications</b>				<b>10</b>
Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (Ni Cad), and lithium ion batteries- working of the batteries including cell reactions; Fuel cells: hydrogen-oxygen, methanol-oxygen fuel cells – working of the cells. <b>Corrosion:</b> Introduction to corrosion, electrochemical theory of corrosion, metal oxide formation by dry corrosion-Pilling Bedworth Rule, differential aeration cell corrosion, galvanic corrosion, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).					
<b>Unit –III</b>	<b>Polymers</b>				<b>10</b>
Introduction to polymers, functionality of monomers, Types of polymerization- Addition, condensation and coordination polymerization with Mechanism. Plastics - Definition and characteristics- thermoplastic and thermosetting plastics.Preparation, properties and applications of PVC and Nylons. Rubbers- Natural rubber and its vulcanization - compounding of rubber. Elastomers-Preparation, properties and applications of Buna S, Buna N, Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio degradable polymers : poly lactic acid, Nylon-2-Nylon-6.					
<b>Unit –IV</b>	<b>Fuels and Combustion</b>				<b>8</b>
Fuels – Types of fuels, solid fuels-classification Calorific value of fuel - HCV, LCV and numerical problems based on calorific value, determination of calorific value by bomb calorimeter. Analysis of coal, Liquid Fuels- refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, cracking of oils, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels - composition and uses of natural gas, Producer gas and water gas.					

Unit –V	Advanced Engineering Materials	10
<p><b>Composites:</b> Definition, classification with examples and applications.</p> <p><b>Cement:</b> Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening of Portland cement</p> <p><b>Refractories:</b> Classification, characteristics of good refractories, properties- Refractoriness, refractoriness under load, porosity and chemical inertness – applications of refractories.</p> <p><b>Lubricants:</b> Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure) - properties of lubricants: viscosity, cloud point, pour point, flash point and fire point and Aniline point.</p>		
<p><b>Course Outcomes:</b></p> <p>On completion of this course, the students are able to:</p> <ul style="list-style-type: none"> <li>➤ Recognize the basic properties of water and its significance in domestic and industrial purposes.(L2)</li> <li>➤ Discuss the principles of electrochemistry in batteries.(L2)</li> <li>➤ Discuss the knowledge of corrosion of metals and methods for its prevention towards the technological applications.(L2)</li> <li>➤ Explain polymerization and the preparation, properties, and applications of thermoplastics &amp; thermosetting, elastomers, &amp; conducting polymers.(L1)</li> <li>➤ Explain calorific values, octane number, refining of petroleum and cracking of oils and Select suitable fuels for IC engines. (L1)</li> <li>➤ Describe the various engineering materials.(L1)</li> </ul>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.</li> <li>2. Peter Atkins, Julio de Paula and James Keeler, Atkins’ Physical Chemistry, 10/e, Oxford University Press, 2010.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Skoog and West G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, McGraw Hill, 2020.</li> <li>2. Principles of Instrumental Analysis, 6/e, Thomson, 2007.</li> <li>3. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.</li> <li>4. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.</li> </ol>		
<p><b>E-resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://libguides.humboldt.edu/openedu/chem">https://libguides.humboldt.edu/openedu/chem</a></li> <li>2. <a href="https://libraryguides.unh.edu/oer/chemistry">https://libraryguides.unh.edu/oer/chemistry</a></li> <li>3. <a href="https://libraries.etsu.edu/research/guides/chemistry/oer">https://libraries.etsu.edu/research/guides/chemistry/oer</a></li> </ol>		

<b>Differential Equations &amp; Vector Calculus</b>					
<b>Course Code</b>	<b>L:T:P:S</b>	<b>Credits</b>	<b>Exam marks</b>	<b>Exam Duration</b>	<b>Course Type</b>
<b>22A0002T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>BSC</b>
<b>Course Objectives:</b>					
To enlighten the learners in the concept of differential equations and multivariable calculus, to furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.					
<b>Syllabus</b>					<b>Total Hours:45</b>
<b>Unit - I</b>	<b>Linear Differential Equations of Higher Order (Constant Coefficients)</b>				<b>9 Hrs</b>
Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.					
<b>Unit - II</b>	<b>Partial Differential Equations</b>				<b>9 Hrs</b>
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method. Non linear equations of first order – Type I, II, III, IV.					
<b>Unit - III</b>	<b>Applications of Partial Differential Equations</b>				<b>9 Hrs</b>
<b>Classification of PDE, method of separation of variables</b> for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation (Without Derivation), Solutions one Dimensional Wave equation by the method of separation of variables and related Problems.					
<b>Unit - IV</b>	<b>Vector Differentiation</b>				<b>9 Hrs</b>
Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.					
<b>Unit - V</b>	<b>Vector Integration</b>				<b>9 Hrs</b>
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Solve the linear differential equations with constant coefficients by appropriate method.</li> <li>• Apply a range of techniques to find solutions of standard partial differential equations.</li> <li>• Calcify the PDE, learn the applications of PDEs</li> <li>• Apply del to Scalar and vector point functions, illustrate the physical interpretation of</li> <li>• Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals Gradient, Divergence and Curl..</li> </ul>					
<b>Textbooks:</b>					
1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017. 2. Differential Equations & Vector Calculus by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganathamand M.V.S.S.N.Prasad S. Chand publication.					
<b>Reference Books:</b>					
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.					

2. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
3. Engineering Mathematic I & II, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.

Basic Electrical and Electronics Engineering (Common for all branches)					
Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0203T	3:0:0	3	CIE:30 SEE:70	3 Hours	ESC
<b>Course Objectives:</b>					
To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.					
<ul style="list-style-type: none"> <li>To understand the basic principles of all semiconductor devices.</li> <li>To be able to solve problems related to diode circuits, and amplifier circuits.</li> <li>To analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers.</li> <li>To be able to compare the performance of BJTs and MOSFETs.</li> <li>To design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48</b>
<b>Unit –I</b>	<b>DC&amp;AC Circuits</b>				<b>9</b>
<b>DC&amp;AC Circuits :</b> Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, Resonance.					
<b>Unit –II</b>	<b>DC &amp; AC Machines</b>				<b>10</b>
<b>DC &amp; AC Machines : A: DC Machines :</b> Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC shut Motor. <b>B: AC Machines:</b> Principle and operation of Single Phase Transformer-EMF equation - OC and SC tests on transformer - Principle and operation of 3-phase induction motor and alternator, [ Elementary treatment only.					
<b>Unit –III</b>	<b>Basics of Power Systems</b>				<b>9</b>
<b>Basics of Power Systems:</b> Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.					
<b>Unit –IV</b>	<b>Basic Electronic Devices</b>				<b>10</b>
<b>Basic Electronic Devices : P-N Junction Diode:</b> Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator. <b>Rectifiers :</b> P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier. <b>Bipolar Junction Transistor (BJT):</b> Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations <b>Junction Field Effect Transistor and MOSFET:</b> Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.					
<b>Unit –V</b>	<b>Digital Electronics &amp; Micro processors</b>				<b>10</b>
<b>Digital Electronics &amp; Micro processors :</b> <b>Digital Electronics:</b> Logic Gates, Simple combinational circuits–Half and Full Adders, BCD Adder.Latches and Flip-Flops (S-R, JK and D), Shift Registers and Counters <b>8085 Micro processor:</b> 8085 Micro processors architecture					

**Text Books:**

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, “ **Basic Electrical and Electronics Engineering**”, S.Chand and Company Limited, New Delhi, 1<sup>st</sup> Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, “**Electronic Devices & Circuit Theory**”, Pearson Education, 2007.

**References:**

1. V.K. Mehtha and Rohit Mehta, “Principles of Electrical Engineering and Electronics”, S.Chand & Co., 2009.
2. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), “Electronic Devices and Circuits”,

**Course Outcomes:**

After the completion of the course students will able to

1. Apply KCL, KVL and network theorems to analyse DC circuit.
2. Analyze the single-phase AC Circuits, the representation of alternating quantities and determining the power and power factor in these circuits..
3. Comprehend the construction and Operation of DC and AC machines.
4. Understand the operation of PN Junction diode and its application in rectifier circuits.
5. Compare the different configurations of BJT and draw the V-I characteristics of BJT, JFET and MOSFET.

## STRENGTH OF MATERIALS-I

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
	<b>3: 0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>ESC</b>

### Course Objectives:

**This course will enable students to:**

- To make the student understand how to resolve forces and moments in a given system.
- To analyse the trusses and determination of axial forces by Method of Joints.
- To demonstrate the student to determine the centroid and second moment of area.
- To understand the concepts of stresses and nature of stress development in simple objects.
- To impart procedure for drawing shear force and bending moment diagrams for beams.
- To make the student able to analyze flexural stresses in beams due to different loads.

Syllabus		Total Hours: 48Hrs
<b>Unit-I</b>	<b>FORCE SYSTEM AND EQUILIBRIUM</b>	<b>10</b>

Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems for concurrent forces. Lami's Theorem, Graphical method for the Equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces, condition of equilibrium.

Unit -II	ANALYSIS OF TRUSSES	10
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**ANALYSIS OF TRUSSES:** Analysis of Trusses by method of Joints & method of Sections.

**CENTRE OF GRAVITY AND MOMENT OF INERTIA:** Introduction – Centroids of rectangular, circular, I, L and T sections - Centroids of built up sections-Definition of Moment of Inertia of rectangular, circular, I, L and T sections - Radius of gyration. Moments of Inertia of Composite sections.

Unit - III	SIMPLE STRESSES & STRAINS	10
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Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – stresses in composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

Unit - IV	SHEAR FORCE & BENDING MOMENTS	10
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Definition of beam – Types of beams – Concept of shear force and bending moment – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

Unit –V	FLEXURAL AND SHEAR STRESSES IN BEAMS	08
<p><b>Flexural Stresses:</b> Theory of simple bending – Assumptions – Derivation of bending equation: <math>M/I = f/y = E/R</math>, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.</p> <p><b>Shear Stresses:</b> Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.</p>		
<p><b>Course Outcomes:</b></p> <p><b>On completion of this course, the students are able to:</b></p> <ol style="list-style-type: none"> <li>1. Draw free body diagrams and use appropriate equilibrium equations, unknown forces in a plane by resolution of forces &amp; equilibrium equations.</li> <li>2. Determine the axial forces in the members of trusses.</li> <li>3. Solve the centroid, center of gravity &amp; moment of inertial problems.</li> <li>4. Discuss the basic materials behavior under the influence of different external loading conditions.</li> <li>5. Sketch the diagrams indicating the variation of the key performance features like bending moment and shear forces.</li> <li>6. Calculate stresses developed in beams due to bending and shearing.</li> </ol>		
<p style="text-align: center;"><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Mechanics -S.Timoshenko&amp;D.H.Young.,4thEdn , Mc Graw Hill publications.</li> <li>2. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11thEdn – Pearson Publ.</li> <li>3. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand &amp; Co, NewDelhi.</li> <li>4. Strength of materials by R. K. Bansal, Lakshmi Publications.</li> </ol>		
<p style="text-align: center;"><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Mechanics, statics and Dynamics, J.L.Meriam, 6thEdn – Wiley India Pvt Ltd.</li> <li>2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and JaanKiusalaas, Cengage Learning publishers.</li> <li>3. Engineering Mechanics, dynamics, Bhavikatti S.S – NewAge International Publishers.</li> <li>4. Mechanics of Materials- by R. C.Hibbler, Pearson publishers.</li> <li>5. Mechanics of Solids – E P Popov, Prentice Hall.</li> <li>6. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition,Universities Press.</li> <li>7. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.</li> </ol>		



## BUILDING MATERIALS & CONSTRUCTION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>22A0102T</b>	<b>3: 0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>ESC</b>

### Course Objectives:

**This course will enable students to:**

- To impart knowledge on basic building materials such as stone and clay products.
- To teach properties of binding materials such as gypsum, lime and cement.
- To disseminate knowledge on ferrous and non ferrous materials and its applications.
- To explain basic concepts of building components such as stair case and masonry.
- To give knowledge about various building elements and their specifications.
- To understand the building rules, building bye laws and acoustics of building.

Syllabus		Total Hours: 48hrs
<b>Unit-I</b>	<b>Basic Building Materials</b>	<b>10</b>

Properties and characteristics of Basic building materials – Stone –characteristics of good building stone-types of stone masonry - bricks –characteristics of good quality bricks manufacturing of bricks-types of bonds in brick work- Cavity wall & hollow block construction - tiles-types of tiles based on present scenario-sand –sources of sand – properties of sand-Timber & Wood based products-Aluminum and its uses.

<b>Unit –II</b>	<b>Gypsum, Lime, Cement and Other Materials</b>	<b>10</b>
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Properties and characteristics of Binding materials – **Gypsum:** properties of gypsum plaster, Building products made of gypsum and their uses. **Lime:** Manufacture of lime, classifications of limes, properties of lime- putty-characteristics and usage **Cement:** Raw materials used, Process of Manufacturing, Chemical composition, Bouge’s Compounds - Types of cement, Tests on cement – Uses of cement.

<b>Unit – III</b>	<b>Ferrous &amp; Non-Ferrous Materials</b>	<b>10</b>
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**Steel** – characteristics of reinforcing steel – Hardness, Tensile, Compression, Impact, wear, and corrosion testing, Micro hardness and indentation fracture toughness, Creep and stress rupture tests, fatigue testing – steel fibers and its applications – **Plastics:** classification, advantages of plastics, Mechanical properties and use of plastic in construction – polypropylene fibers and its applications – **Glass:** Ingredients, properties, types and use in construction – Glass fibers and its Applications.

<b>Unit – IV</b>	<b>Building Components</b>	<b>10</b>
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Lintels, Arches and Vaults – Staircases, Lifts – Types. Different types of flooring-Concrete, Mosaic, Terrazo floors; Different types of roofs- Pitched, Flat and Curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs - King and Queen Post Trusses. Doors & Windows- Types and Specifications.

<b>Unit –V</b>	<b>Building Rules and Bye-Laws</b>	<b>08</b>
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Zoning regulations; Regulations regarding layouts or subdivisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index. Building

Information System – Green building concepts.

**Course Outcomes:**

**On completion of this course, the students are able to:**

1. Differentiate brick masonry, stone masonry construction and bonds used in construction of walls of buildings.
2. Understand the properties of binding materials Gypsum, Lime & cement.
3. Conduct various tests for determining the characteristics of steel.
4. Understand the properties of Plastics, glass as building material.
5. Discuss the importance of different building components used in construction practices.
6. Describe capable of understanding building rules and knowledge about, bye-laws and building elements.

**Textbooks:**

1. Engineering Materials by Rangawala, Charotar Publications, Fortieth Edition: 2013
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, 'Building Construction' - Laxmi Publications (P) Ltd., New Delhi.
3. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGraw-Hill, New Delhi, 2009.

**Reference Books:**

1. P.C. Varghese, 'Building Materials and Construction' by Prentice-Hall of India Private Ltd, 3rd Edition, New Delhi. Ltd, 3rd Edition, New Delhi.
2. Building Materials, S. K. Duggal, New Age International Publications.
3. N. Kumaraswamy, A. Kameswara Rao, building planning and drawing, 7th Ed, Charotar.
4. Building Materials and Construction, S.S. Bhavikatti, Vices publications House private ltd.

**Engineering Workshop Lab**  
(Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0304T	0: 0:3:0	1.5	CIE:30 SEE:70	3Hours	ESC

**Course Objectives:**

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

**Syllabus**

**Total Hours: 48Hrs**

**Wood Working:**

Familiarity with different types of woods and tools used in wood working and make following joints

- a) Half – Lap joint
- b) Mortise and Tenon joint
- c) CornerDovetail joint or Bridle joint

**Sheet Metal Working:**Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

- a) Tapered tray
- b) Conical funnel
- c) Elbow pipe
- d) Brazing

**Fitting:**

Familiarity with different types of tools used in fitting and do the following fitting exercises

- a)V-fit
- b) Dovetail fit
- c) Semi-circular fit
- d) Bicycle tire puncture and change of two wheeler tyre

**Electrical Wiring:**

Familiarities with different types of basic electrical circuits and make the following connections

- a) Parallel and series
- b) Two-way switch
- c) Godown lighting
- d) Tube light
- e) Three phase motor
- f) Soldering of wires

**Text books**

**Note: In each section a minimum of three exercises are to be carried out.**

**ENGINEERING CHEMISTRY LAB**  
(ME and CE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0012P	0:0:1.5:0	1.5	CIE:30 SEE:70	3H	BS

**Course Objectives:**

This course will enable students to:

- To Verify the fundamental concepts with experiments.

**Syllabus**

**Total Hours: 36**

**Note:** In the following list, out of 13 experiments conduct any 10 experiments from the below list.

**List of Experiments**

1. Determination of Hardness of a groundwater sample and mineral water sample.
2. Determination of Copper by EDTA method.
3. Conductometric estimation of strong acid using standard sodium hydroxide solution.
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
6. PH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
7. Estimation of Dissolved Oxygen by Winkler's method.
8. Potentiometry - determination of redox potentials and emfs.
9. Determination of Strength of an acid in Pb-Acid battery.
10. Colorometric estimation of manganese.
11. Preparation of a polymer.
12. Determination of Viscosity of lubricating oil by Redwood Viscometer- 1
13. Determination of Viscosity of lubricating oil by Redwood Viscometer -2
14. Determination alkalinity of water sample.

**Course Outcomes:**

On completion of this course, the students are able to:

- Measure the strength of an acid present in secondary battery and Determine the rate of corrosion for mild steel in hydrochloric acid medium.(L2)
- Determine the Hardness of a groundwater sample and estimate the Copper by EDTA method. (L1)
- Determine the cell constant and conductance of solutions using conductivity meter and different acid-base titrations by pH meter. (L1)
- Synthesize of advanced polymer materials. (L2)
- Determine the potentials and EMFs of solutions by Potentiometry and Estimate the iron (II) using diphenylamine indicator. (L1)
- Determine the viscosity of different lubricants using Redwood Viscometer. (L1)

**Text Books:**

- 1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.

**Reference Books:**

1. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.
2. Engineering Chemistry Laboratory Manual, For B.Tech. I year (ME, CE)Students, Dr. A. Ravikrishna, Dr. B. Tirumalarao Sri Krishna Hitech Publishing company, Chennai, 2019.

**E-resources:**

1. <https://guides.lib.purdue.edu/chemlabs>.
2. <https://chemcollective.org/>.
3. <http://chemistry.alanearhart.org/Lab/index.html>.
4. <https://www.acs.org/content/acs/en/education/students/highschool/chemistryclubs/activities/simulations.html>.
5. <https://instr.iastate.libguides.com/oer/chemistry>.

## STRENGTH OF MATERIALS LABORATORY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0103P	0: 0:3:0	1.5	CIE:30 SEE:70	3Hours	ESC

### Course Objectives:

By performing this laboratory, the student will be able to know the structural behavior of Various materials.

### Syllabus

**Total Hours: 48Hrs**

#### List of Experiments

1. Tensile strength of steel bars.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
5. Hardness test.
6. Compression test on Open coiled springs
7. Compression test on Closely coiled springs
8. Compression test on wood/ concrete
9. Izod / Charpy Impact test on metals
10. Shear test on metals
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

#### List of Major Equipment:

1. Universal Testing Machine
2. Torsion testing machine
3. Brinnell's / Rock well's hardness testing machine
4. Setup for spring tests
5. Compression testing machine
6. Izod Impact machine
7. Shear testing machine
8. Beam setup for Maxwell's theorem verification.
9. Electrical Resistance gauges
10. Simply Supported beam setup
11. Cantilever beam setup

#### Course Outcomes:

##### On completion of this course, the students are able to:

By performing the various tests in this laboratory the student will be able to know the structural behavior various structural elements when subjected to external loads.