GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B. TECH IN COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

COURSE STRUCTURE AND SYLLABI UNDER RG 22 REGULATIONS

DEPARTMENT VISION

To develop as a lead learning resource centre producing skilled professionals

DEPARTMENT MISSION

DM_1 Provide dynamic and application-oriented education through advanced teaching learning methodologies

DM_2 Create sufficient physical infrastructural facilities to enhance learning

DM_3 Strengthen the professional skills through effective Industry- Institute Interaction

DM_4 Organize personality development activities to inculcate life skills and ethical values

Program Educational Objectives (PEOs)

PEO1: Develop expertise in logical reasoning, analysis and design to solve Computer Science and Engineering problems.

PEO2: Competent to work as an individual or team member contributing to research and solve real world problems.

PEO3: Involve in multi-disciplinary teams by imparting interpersonal skills and ethical behavior.

PEO4: Engage in Life Long Learning for career enhancement and professional growth.

Program Outcomes

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science and Engineering principles to the solution of complex problems in Computer Science and Engineering.
PO2	**Problem analysis**: Identify, formulate, research literature, and analyses complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex Computer Science and 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.
PO4	**Conduct investigations of complex problems**: 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 related to Computer Science and Engineering problems.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Computer Science and Engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Computer Science and Engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional Computer Science and Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science and Engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex Computer Science and 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.
PO11	**Project management and finance**: 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 Computer Science and Engineering projects and in multidisciplinary environments.
PO12	**Life-long learning**: Life Long Learning: 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

PSO1 **Professional Knowledge:** Analyse and apply the concepts of Algorithms, Web Technologies and Data Analytics to meet specified requirements.

PSO2 **Software Skills:** Design and implement solutions for computing problems using Java, PHP, Python and Big Data technologies.

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B. TECH Computer Science & Engineering (Data Science)

Course Structure (RG22)

Semester 0

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

S. No	Course No	Course Name	Category	L-T-P-C
1		Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counselling	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 andmathematical 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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B. TECH Computer Science & Engineering (Data Science)

Course Structure (RG22)

Semester - 1 (Theory-5, Lab-3)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	22A0001T	Linear Algebra & Calculus	3	0	0	3
2	BSC	22A0005T	Applied Physics in Science and Engineering	3	0	0	3
3	HSC	22A0013T	Communicative English	3	0	0	3
4	ESC	22A0501T	Problem Solving using C	3	0	0	3
5	ESC	22A0302T	Engineering Drawing	1	0	4	3
6	BSC(LAB)	22A0010P	Applied Physics in Science and Engineering Lab	0	0	3	1.5
7	HSC(LAB)	22A0014P	Communicative English Lab	0	0	3	1.5
8	ESC(LAB)	22A0503P	Problem Solving using C Lab	0	0	3	1.5
			Total credits				**19.5**

Category	Credits
Basic Science Course (BSC)	7.5
Engineering Science Course (ESC)	7.5
Humanities and Social Science Course (HSC)	4.5
Total	19.5

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**	**3 Hours**	**BSC**

Course Objectives:

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.

Syllabus		**Total Hours:45**
Unit - I	**Matrices**	**9 Hrs**

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.

Unit - II	**Mean Value Theorems**	**9 Hrs**

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 Taylors and Maclaurin's series.

Unit - III	**Multivariable Calculus**	**9 Hrs**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit - IV	**Multiple Integrals**	**9 Hrs**

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.

Unit - V	**Beta and Gamma functions**	**9 Hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Text Books:

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.

APPLIED PHYSICS IN SCIENCE AND ENGINEERING (Common to CSE, AI&ML, CS, DS)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0005T	**3:0:0:0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**BSC**

Prerequisite: Student should know about fundamental and basic principles in physics.

Course Objectives:

This course will enable students to:

- To make a bridge between the physics in school and engineering courses.
- To impart the knowledge in basic concepts of the optical phenomenon like interference, diffraction and polarization.
- 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.
- To open new avenues of knowledge and understanding the basic concepts of dielectric and magnetic materials and its application in the emerging micro devices.
- Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors.
- To identify the importance of semiconductors in the functioning of electronic devices.
- To teach the concepts related to superconductivity which leads to their fascinating applications.
- To familiarize the students with smart material applications relevant to engineering branches.
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Syllabus		**Total Hours:48**
Unit - I	**Wave Optics**	**10**

Interference- 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.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum**.**

Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and doublerefraction - Nicol's Prism - Half wave and Quarter wave plates with applications.

Unit –II	**Lasers and Fiber optics**	**10**

Lasers- 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.

Fiber optics- 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.

Unit –III	**Dielectric and Magnetic Materials**	**10**

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

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

Unit –IV	Semiconductors and Superconductors	10

Semiconductors- Introduction – Classification of crystalline solids – Intrinsic semiconductors – Intrinsic Density of charge carriers- Intrinsic Conductivity-Intrinsic Fermi level- Extrinsic semiconductors– p-type and ntype- Drift and diffusion currents – Einstein's equation – Formation of p-n junction diode – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_C superconductors – Applications of superconductors.

Unit –V	New Engineering Materials	8

Nanomaterials- Introduction – Surface area and quantum confinement –Properties of Nanomaterials – Synthesis of nanomaterials: Top-down: Ball Milling – Bottom-up: Chemical Vapour Deposition –

Applications of nanomaterials.

Smart Materials: Introduction- Smart Memory alloys (SMA), photovoltaics (PV) (properties and applications)

Course Outcomes:

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

- Describe the importance of Interference, Diffraction and Polarization and the engineering applications as well (L2)
- Demonstrate the properties of lasers and fiber optics to various applications in science and technology (L2)
- Explain the fundamental concepts and theory related to dielectric and magnetic materials (L1)
- Illustrate the functioning of semiconductors in electronic devices (L2)
- Discuss the principles and theory related to superconductors and explore their technological applications(L2)
- Illustrate diverse principles and theories of nano and smart materials and their technological applications in diverse fields (L2)

Text Books:

- Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
- Engineering Physics – B.K. Pandey and S. Chaturvedi, Cengage Learning.
- Applied Physics for Engineers- K.Venkataramanan, R. Raja, M. Sundararajan(Scitech) [3,5] 2014

Reference Books:

- Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018
- Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
- Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
- Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
- T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc GrawHill 2013

E-resources:

- https://www.textbooks.com/Catalog/MG5/Applied-Physics.php
- 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	HSC

Course Objectives:

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers.
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations.
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials.
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well-structured reports.
- Broaden the knowledge base of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

Syllabus	Total Hours:48

Unit - I	On the Conduct of Life: William Hazlitt	9 Hrs

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text Scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Parts of Speech,
Content words and function words;
Word order in sentences;
Basic sentence structures;
Types of questions - Wh- questions.

Unit - II	The Brook: Alfred Tennyson	9Hrs

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Use of Articles and zero Article
Prepositions
Punctuation, capital letters
Cohesive devices - linkers

Unit - III	The Death Trap: Saki	11 Hrs

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Paragraph Writing, Summarizing

Grammar and Vocabulary: Verbs - Tenses
Subject-Verb agreement
Direct & Indirect speech

Unit - IV	Ponnuthayi – Bama	10 Hrs

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Read and Interpret Graphic Information to reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters/Report Writing
Grammar and Vocabulary: Adjectives and Adverbs; Comparing and Contrasting
Voice - Active & Passive Voice.

Unit - V	My Beloved Charioteer- Shasi Deshpande	9 Hrs

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts- without the use of PPT slides
Reading: Reading for Comprehension
Writing: Writing structured essays on specific topics using suitable claims and evidences.
Grammar and Vocabulary: Identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Course Outcomes (CO):

On completion of this course, student will be able to

- Retrieve the knowledge of basic grammatical concepts
- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate listening /reading texts and to write summaries based on global comprehension of these texts.
- Create and develop coherent paragraph interpreting graphical description.

Textbooks:

1) Language and Life: English Skills for Engineering Students - Orient Black Swan

Reference Books:

1. 1. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)

Web links:

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html

PROBLEM SOLVING USING C

Common to (CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0501T	3:1:0:0	3	CIE: 30 SEE:70	3 Hours	ESC

Course Objectives:

This course will enable students to:

- Formulate the algorithms and draw flowcharts for solving simple problems
- Convert the algorithms/flowcharts to C programs.
- Illustrate the basic concepts of C programming language.
- Choose a suitable C-construct to develop C code for a given problem.
- Develop simple C programs to illustrate the applications of different data types such as arrays, structures, pointers, functions.

Syllabus		Total Hours:45
Unit - I	**Introduction to Programming Paradigms, Algorithms and Flowcharts**	**9Hrs**

Introduction to programming paradigms - Programming environment, Demonstration of Assemblers, Compilers, interpreters, Linker, Loaders, Number systems

Introduction to Algorithms and flowcharts: what is an algorithm, Representation of Algorithm, Flowchart/Pseudo code with examples, error debugging

Unit - II	**Introduction to C Language, Control Structures**	**9Hrs**

Introduction to C Language: Structure of C program, C character set, C tokens, variables, data types, operators, Formatted I/O

Control structures: Sequence, Selection, Iterative, Expressions, Precedence and Associativity, Expression evaluation, type casting, Type Qualifiers, Pre-processor directives

Unit - III	**Arrays, Strings**	**9Hrs**

Arrays: Introduction, Types of arrays - one dimensional arrays, two dimensional arrays, creating, accessing and manipulating elements of 1d and 2d arrays, Applications of arrays.

Strings: Introduction to strings, string input/output functions, arrays of strings, string manipulation Functions.

Unit - IV	**Functions, Structures & Unions**	**9Hrs**

Functions: Defining Function, user defined functions, standard functions, inter function communication, passing arguments to functions, Parameter passing mechanisms, Recursion, Scope, Storage classes

Structures and Unions: Defining structures, declaration and initialization of structures, Array of structures, Nested structures, Passing structure to function, Unions, Structure vs Union

User defined data types – type definition, enumerated, Bit fields

Unit - V	**Pointers, Files**	**9Hrs**

Pointers: Introduction, Pointer declaration and Initialization, Arrays and pointers, array of pointers, pointer to a function, pointer to a structure, pointer to pointer, void pointers, pointer arithmetic, Self-referential structures, dynamic memory allocation, command line arguments.

Files: Concept of a file, Streams, Text files and Binary files, file operations, File input / output functions, Sequential Access and Random-Access Functions in files.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand basic programming paradigms and system software required for developing C programs and also develop an algorithm/flowchart for the problems.
- Illustrate and explain the basic computer concepts and programming principles of C language and select the best selection and loop construct for solving given problem
- Develop C programs to demonstrate the applications of derived data types such as arrays, strings.
- Decompose a problem into functions and to develop modular reusable code and also understand the concepts of structures, unions, user defined data types.
- Demonstrate the concepts of pointer and perform I/O operations in files.

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

Reference Books:

1. Let us C,YashwantKanetkar, 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

E-resources:

1. https://www.geeksforgeeks.org/c-programming-language/
2. http://en.cppreference.com/w/c
3. https://onlinecourses.nptel.ac.in/noc19_cs42/
4. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.html
5. https://codeforwin.org/

ENGINEERING DRAWING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0302T	1: 0: 0/4 :3	3	CIE: 30 SEE:70	3 Hours	ESC

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.

Syllabus		Total Hours: 50
Unit - I	**Introduction to Engineering Drawing**	**10 Hrs**

Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance- Conventions in drawing-lettering - BIS conventions.

a) Draw the Conic sections including Ellipse, Parabola, Hyperbola, and the rectangular hyperbola using general methods

b) Draw the Cycloid, Epicycloids, and Hypocycloid

c) Draw the Involutes of circle, square, pentagon, and hexagon

Unit - II	Projections of points, lines and planes	10 Hrs

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.

Unit - III	Projections of Solids	10 Hrs

Projections of solids: Projections of regular solids inclined to one and both the principle planes using auxiliary views method.

Unit - IV	Sections of solids	10 Hrs

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Unit - V	Development of surfaces	10 Hrs

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Course Outcomes (CO):

On completion of this course, student will be able to

- Draw various curves applied in engineering. (l2)
- Show projections of solids and sections graphically. (l2)
- Draw the development of surfaces of solids. (l3)

Textbooks:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

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.

APPLIED PHYSICS IN SCIENCE AND ENGINEERING Lab

(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0010P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	BSC

Course Objectives:

This course will enable students to:

- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in asemiconductor.
- Illustrates the magnetic and materials applications.
- Apply the principles of semiconductors in various electronic devices

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. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
10. To determine the resistivity of semiconductor by Four probe method
11. To determine the energy gap of a semiconductor
12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.

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)
- Measure the type of conductivity, hall voltage and hall coefficient of a given semiconductor using hall effect and also measure the energy band gap of a given semiconductor material (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 ChandPublishers, 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_cbcs%20%20-%20kavichintu.pdf

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**	**3 Hours**	**HSC**

Course Objectives

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.

List of Experiments | Total Hours: 48

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. 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; 2nd 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
www.englishmedialab.com
www.englishinteractive.net

PROBLEM SOLVING USING C LAB
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0503P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	ESC

Course Objectives:

This course will enable students to:

- 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*T*R/100)
2. a) Write a C program to find sum and average of three numbers.
   b) Write C program to evaluate each of the following equations.
   (i) V = u + at.
   (ii) $S = ut+1/2at^2$
   (iii) $T=2*a+\sqrt{b}+9c$
   (iv) $H = \sqrt{b^2}+p^2$

3. a) Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class,60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
   b) Write a C program to find the roots of a quadratic equation.

4. a) Write a C program to find the sum of individual digits of a given positive integer.
   b) Write a C program to generate the first n terms of the Fibonacci Sequence.
   c) Write a C program to check whether a given number is an Armstrong number or not.

5. Write a C program to read in two numbers, x and n, and then compute the sum of this Geometric progression: 1+x+x^2+x^3+……. +x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

6. a) Write a C program to find the minimum, maximum and average in an array of integers.
   b) Write a program in C to sort elements of array in ascending order

7. a) Write a C program to perform addition of two matrices.
   b) Write a C program that uses functions to perform multiplication of two Matrices.

8. 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

9. a) Write a C program to find factorial of a given integer using non-recursive function.
   b) Write a C program to find factorial of a given integer using recursive function.

10. 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

11. Write a C program to Calculate Total and Percentage marks of a student using structure.

12. Write a C program that uses functions to perform the following operations:
i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

13.a) Write a program for display values reverse order from array using pointer.
b) Write a program through pointer variable to sum of n elements from array.
c) Write a program in C to find the largest element using Dynamic Memory Allocation.

14. Write a C program to check whether given number is even or odd; number is given as Input through command line.

15. a) Write a C program to copy contents of one file to another file
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Course Outcomes:

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

CO1: Convert the algorithms/flowcharts to C programs.
CO2: Use conditional and iterative statements for writing the C programs.
CO3: Make use of different data-structures like arrays, strings, structures for solving problems.
CO4: Decompose a problem into functions so that they can be reused.
CO5: Develop basic C programs that uses pointers and files

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)

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

E-resources:

- https://onlinecourses.nptel.ac.in/noc19_cs42/
- http://learn-c.org/
- https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.html
- https://www.geeksforgeeks.org/c-programming-language/
- https://codeforwin.org/

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

B. TECH Computer Science & Engineering (Data Science)

Course Structure (RG22)

Semester - 2 (Theory-4, Lab-5)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0002T	Differential Equations & Vector Calculus	3	0	0	3
2	BSC	22A0006T	Chemistry	3	0	0	3
3	ESC	22A0203T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ESC	22A0504T	Data Structures	3	0	0	3
5	ESC(LAB)	22A0304P	Engineering Workshop	0	0	3	1.5
6	ESC (LAB)	22A0502P	IT Workshop	0	0	3	1.5
7	BSC(LAB)	22A0011P	Chemistry Lab	0	0	3	1.5
8	ESC(LAB)	22A0204P	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5
9	ESC(LAB)	22A0505P	Data Structures Lab	0	0	3	1.5
			Total credits				**19.5**

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

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0002T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**BSC**

Course Objectives:

To enlighten the learners in the concept of differential equations and multivariable calculus, to furnishthe learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Syllabus		**Total Hours:45**
Unit - I	**Linear Differential Equations of Higher Order (Constant Coefficients)**	**9 Hrs**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskean, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.

Unit - II	**Partial Differential Equations**	**9 Hrs**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method. Nonlinear equations of first order – Type I, II, III, IV.

Unit - III	**Applications of Partial Differential Equations**	**9 Hrs**

Classification of PDE, method of separation of variables 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.

Unit - IV	**Vector Differentiation**	**9 Hrs**

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.

Unit - V	**Vector Integration**	**9 Hrs**

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.

Course Outcomes (CO):

On completion of this course, student will be able to

- Solve the linear differential equations with constant coefficients by appropriate method.
- Apply a range of techniques to find solutions of standard partial differential equations.
- Calcify the PDE, learn the applications of PDEs
- Apply del to Scalar and vector point functions, illustrate the physical interpretation of Gradient, Divergence and Curl.
- Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals.

Text Books:

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.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.

Reference Books:

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 Mathmatic I & II, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.

CHEMISTRY (Common to CSE, AI&ML, CS, ECE, EEE, DS)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0006T	**3:0:0:0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**BSC**

Course Objectives: Student will be able to

- To familiarize engineering chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods.

Syllabus	**Total Hours: 48 Hrs**

Unit- I	**Structure and Bonding**	**9Hrs**

Planck's quantum theory, dual nature of matter, Schrodinger wave equation, significance of Ψ and Ψ^2, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

Unit-II	**Modern Engineering materials**	**10Hrs**

Coordination compounds: Crystal field theory – salient features – splitting of d-orbitals in octahedral and tetrahedral geometry.

Basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.

Super capacitors: Introduction, Basic Concept-Classification – Applications.

Nano chemistry: Introduction, classification of nanomaterials, properties and applications of Fullerenes, and carbon nanotubes.

Unit-III	**Electrochemistry and Applications**	**10Hrs**

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), conductometric titrations (acid-base titrations).

Primary cells: Zinc-air battery, Secondary cells: lead acid and lithium-ion batteries-working of the batteries including cell reactions, Fuel cells: hydrogen-oxygen, methanol -oxygen fuel cells – working principle of the cells.

Unit-IV	**Polymer Chemistry**	**10Hrs**

Introduction to polymers, functionality of monomers, Types of polymerization-addition, condensation and copolymerization with specific examples and mechanisms of polymerization.

Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of – PTFE, Bakelite, Calculation of molecular weight of polymer by weight average and number average method, Polydispersity Index.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and

applications.

Biodegradable polymers: polylactic acid, poly dioxanone, starch, cellulose.

Unit-V	**Instrumental Methods and its applications**	**9Hrs**

EMR spectra, Beer-Lambert's law, Basic Principle, Instrumentation and applications of UV-visible spectrophotometer and FTIR, Chromatography-Introduction**,** Principle and instrumentation of Gas Chromatography (GC), retention time, TLC, R_f factor.

Course Outcomes (CO): After completion of the course, students will be able to

- Describe Planck's quantum theory, dual nature of matter, Schrodinger equation, molecular orbital Theory and molecular orbital energy level diagram of different molecules
- Explain Crystal field theory, splitting in octahedral and tetrahedral geometry and the magnetic behavior, Oxidation state, coordination and color of complexes.
- Explain the principle of Band diagrams of conductors, superconductor, semiconductors and insulator and nonmaterial
- Discuss the principles of electrochemistry in potentiometry, conductometry, battery and electrochemical sensors
- Explain polymerization and the preparation, properties, and applications of thermoplastics &thermosetting, elastomers, & conducting polymers
- Discuss the different applications of analytical instruments

Text Books:

1. P. C. Jain & Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K. N. Jayaveera, G. V. Subba Reddy and C. Ramachandriah, Engineering Chemistry, Mc.Graw Hill Publishers, New Delhi.
3. Energy scenario beyond2100,by S.Muthu Krishna Iyer.

Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, Oxford University Press, 5th edition 2010.
2. Skoog and West, Principles of Instrumental Analysis, Thomson, 6th edition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, Atkins' Physical Chemistry, Oxford University Press, 10th edition, 2010.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common for all branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0203T	3: 0:0:0	3	CIE: 30 SEE:70	3 Hours	ESC

Course Objectives: Student will be able to

1. Introduce the concept of electrical circuits and its components.
2. Introduce the characteristics of various electronic devices.
3. Impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

Unit - I	DC&AC Circuits	9 Hrs

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Recall Kirchoff laws
- Analyze simple electric circuits with DC excitation
- Apply network theorems to simple circuits
- Analyze single phase AC circuits consisting of series RL - RC - RLC combinations

Unit - II	DC & AC Machines	9 Hrs

A: DC Machines: 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: AC Machines: 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]

Learning Outcomes: At the end of this unit, the student will be able to

- Explain principle and operation of DC Generator & Motor.
- Perform speed control of DC Motor
- Explain operation of transformer, EMF equation
- Explain construction & working of induction motor, alternators - DC motor

Unit - III	Basics of Power Systems	10 Hrs

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand working operation of various generating stations
- Explain the types of Transmission and Distribution systems

Unit - IV	P-N Junction Diode	10 Hrs

P-N Junction Diode: 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.

Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

Bipolar Junction Transistor (BJT): 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

Learning outcomes: At the end of this unit, the student will be able to

- Remember and understand the basic characteristics of semiconductor diode. (L1)
- Understand principle of operation of Zener diode and other special semiconductor diodes. (L1)
- Analyze BJT based biasing circuits. (L3)
- Design an amplifier using BJT based on the given specifications. (L4)

Unit - V	Junction Field Effect Transistor& Digital Electronics	10 Hrs

Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

Digital Electronics: Logic Gates, Simple combinational circuits–Half and Full Adders, BCD Adder.

Latches and Flip-Flops (S-R, JK and D), Shift Registers and Counters. Introduction to Microcontrollers and their applications (Block diagram approach only).

Learning outcomes: At the end of this unit, the student will be able to

- Explain the functionality of logic gates. (L2)
- Apply basic laws and De Morgan's theorems to simplify Boolean expressions. (L3)
- Analyze standard combinational and sequential circuits. (L4)
- Distinguish between 8085
- & 8086 microprocessors also summarize features of a microprocessor. (L5)

Course Outcomes (CO): After completion of the course, students will be able to

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

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, 1st 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", 3 rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - Resources

1. https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/
2. https://www.eeweb.com/passives
3. http://nptel.ac.in/courses/108108076/
4. http://nptel.ac.in/downloads/108105053/

DATA STRUCTURES
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0504T	3:0:0	3	CIE:30 SEE:70	3 Hours	ESC

Course Objectives:

- Introduce the fundamental concept of data structures and Arrays
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Introduces a variety of data structures such as linked structures, stacks, queues, trees, and graphs

Syllabus	48 Hours

Unit –I	10 Hours

Introduction to Data Structures: Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures

Arrays: Definition, terminology, One Dimensional array, multi-Dimensional arrays, Pointer Arrays, Linear Search, Binary Search

Unit –II	9 Hours

Linked Lists: Definition, Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Applications of Linked List

Unit –III	10 Hours

Stacks: Introduction, Definition, Representation of Stack, Operations on Stacks, Applications of stack: Expression Evaluation, Conversion of Infix to postfix and prefix expression, Tower of Hanoi

Queues: Introduction, Definition, Representation of Queues, Operations on Queues, Various Queue Structures, Applications of Queues

Unit –IV	10 Hours

Trees: Basic Terminologies, Definition and Concepts, Binary Tree, Representation of Binary Tree, Operations on Binary Tree, Binary Search Tree, Operations in BST: insertion, deletion, finding min and max, finding the kth minimum element. Heap Tree, Height Balanced Binary Tree, Red-Black Tree, Splay Tree, B Trees, B+ Trees

Unit –V	9 Hours

Graphs: Introduction, Graph Terminologies, Representation of graphs, Operations on Graphs, Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS)

Sorting: Insertion sort, Selection sort, Bubble sort, Counting sort, Quick sort, Merge sort, heap sort

Text Books:

1. Classic Data Structures, Second Edition, Debasissamanta, PHI
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press

References:

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning.
2. "Data Structures and Algorithm Analysis in C" by Weiss
3. "Data Structure Through C" by Yashavant P Kanetkar
4. "Problem Solving in Data Structures and Algorithms Using C: The Ultimate Guide to Programming Interviews" by Hemant Jain

Course Outcomes:

After the completion of the course students will able to

CO1: Ability to select the data structures that efficiently model the information in a problem
CO2: Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3: Implement basic operations on stack and queue using array representation.
CO4: Use linked structures, trees, and Graphs in writing programs
CO5: Demonstrate different methods for traversing Graphs and Trees

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

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system.
- To provide technical training to the students on Productivity tools like Word processors Spreadsheets, Presentations and LaTeX.
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

Syllabus

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process. Networking and Internet.

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating email account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet

Task 11: LaTeX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

References:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

CHEMISTRY LAB

(**Common to CSE, AI&ML, CS, ECE, EEE, DS**)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0011P	0:0:1.5:0	1.5	CIE:30 SEE:70	3 Hours	BSC

Course Objectives:

This course will enable students to:

- The objective of the laboratory sessions is to enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.

Syllabus	Total Hours: 48

List of Experiments

1. Conduct metric titration of strong acid vs. strong base,
2. Determination of cell constant and conductance of solutions
3. Potentiometry - determination of redox potentials and emfs
4. pH metric titration of strong acid vs. strong base
5. Determination of Strength of an acid in Pb-Acid battery
6. Preparation of a polymer
7. Verification of Lambert-Beer's law
8. Preparation of Nanomaterials
9. Separation of organic mixtures by Thin Layer chromatography
10. Identification of simple organic compounds by IR.
11. Estimation of Ferrous Iron by Dichrometry.
12. Determination of Copper by EDTA method.

(**Any 10 experiments from the above list)**

Course Outcomes:

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

- Determine the cell constant and conductance of solutions and the strength of an acid by conductometry
- Synthesize of advanced polymer materials
- Measure the strength of an acid present in secondary battery and Ferrous ion using volumetric analysis
- Determine the potentials and EMFs of solutions by Potentiometry
- Identify some organic and inorganic compounds by instrumental methods
- Synthesize of nanomaterials by simple methods

Text Book(s):

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Jain & Jain. Engineering Chemistry: Dhanapath rai Publications., 2015.
3. S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised edition, 2008.

Reference Book(s):

1. S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.
2. Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria& Sons, New Delhi, 2nd edition.

Basic Electrical and Electronics Engineering Lab

(Common for all branches excluding EEE & ECE)

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0240P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyze the performance of DC Motors, AC Motors and Transformers.

Syllabus

LIST OF EXPERIMENTS: (**Conduct all experiments**).

Note: All the experiments shall be implemented using both Hardware and Software.

Equipment Required:

1. Verification of Kirchhoff's Laws.
2. Verification of Superposition Theorem.
3. Magnetization characteristics of DC Shunt Generator.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves.
5. OC & SC Tests on Single Phase Transformer.
6. V-I Characteristics of Solar Cell
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics Zener Diode
9. Half Wave Rectifier and Full Wave rectifier.
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

Additional Experiments:

13. Speed control of DC Shunt Motor
14. Brake Test on Three Phase Induction Motor.

Course Outcomes:

After the completion of the course students will able to,

1. Experimentally verify the basic circuit theorems, KCL and KVL
2. Draw the Open circuit characteristics of DC Shunt Generator circuits experimentally.
3. Acquire hands on experience of conducting various tests on dc shunt motor, single phase transformers obtaining their performance indices using standard analytical as well as graphical methods
4. Experimentally verify the V-I characteristics of Solar cell
5. Draw the characteristics of different semiconductor devices like PN junction Diode, Zener Diode, BJT and JFET by conducting suitable experiments.
6. Experimentally verify the working of half and full wave rectifier by using PN Junction diodes

DATA STRUCTURES LAB
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0505P	0:0:3:0	1.5	CIE:30 SEE:70	3H	ESC

Course Objectives:

This course will enable students to:

- 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. Write C program that use both recursive and non-recursive functions to perform Linear search for a key value in a given list.
2. Write C program that use both recursive and non-recursive functions to perform Binary search for a key value in a given list.
3. Write a C program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a C program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a C program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
6. Write a C program that implement stack (its operations) using
   i) Arrays ii) Pointers
7. Write a C program that implement Queue (its operations) using
   i) Arrays ii) Pointers
8. Write a C program that Uses Stack Operations to Convert Infix expression into Postfix expression
9. Write a C program that Uses Stack Operations to Evaluate the Postfix expression
10. 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, inorder and post order
11. Write a C program that uses functions to perform the following operations on Binary search Tree.:
    i) Creation ii) Insertion iii) Deletion
12. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Quick sort ii) Merge sort
13. Write a program to implement the graph traversal methods.

Course Outcomes:

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

CO1: Use basic data structures such as arrays, Stacks and Queues

CO2: Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals

CO3 Use various searching and sorting algorithms.

CO4: Use linked structures, trees, and Graphs in writing programs

Text Book(s):

1. Classic Data Structures, Second Edition, Debasissamanta, PHI
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press 3. Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018

Reference Book(s):

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning.
2. "Data Structures and Algorithm Analysis in C" by Weiss
3. "Data Structure Through C" by Yashavant P Kanetkar
4. "Problem Solving in Data Structures and Algorithms Using C: The Ultimate Guide to Programming Interviews" by Hemant Jain