DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PROGRAM STRUCTURE AND SYLLABUS

For

B.TECH (COMPUTER SCIENCE & ENGINEERING)

(Applicable from the Academic Year 2023-24 onwards)

ADITYA COLLEGE OF ENGINEERING & TECHNOLOGY (A)

(An Autonomous Institution)

Approved by AICTE, Affiliated to JNTUK, Accredited by NBA,
Accredited by NAAC A+ Grade with CGPA 3.4
Recognized by UGC under sections 2(f) and 12(B) of UGC act 1956
Aditya Nagar, ADB Road, Surampalem – 533 437, Kakinada District, A.P.
Email: office@acet.ac.in, www.acet.ac.in

VISION & MISSION OF THE INSTITUTE

VISION

To induce higher planes of learning by imparting technical education with

- International standards
- Applied research
- Creative Ability
- Value based instruction and to emerge as a premiere institute.

MISSION

Achieving academic excellence by providing globally acceptable technical education by forecasting technology through

- Innovative Research and development
- Industry Institute Interaction
- Empowered Manpower

VISION & MISSION OF THE DEPARTMENT

VISION

To become a center for excellence in Computer Science and Engineering education and innovation.

MISSION

M1: Provide state of art infrastructure.
M2: Adapt Skill based learner centric teaching methodology.
M3: Organize socio-cultural events for better society.
M4: Undertake collaborative works with academia and industry.
M5: Encourage students and staff self-motivated, problem solving individuals using Artificial Intelligence.
M6: Encourage entrepreneurship in young minds.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1:	Capability to design and develop new software products as per requirements of the various domains and eligible to take the roles in various government, research organizations and industry.
PEO2:	More enthusiastic to adopt new technologies and to improve existing solutions by reducing complexity which serves society requirements as per timeline changes.
PEO3:	With good hands on basic knowledge and ready improve academic qualifications in India or abroad.
PEO4:	Ability to build and lead the team to achieve organizational goals.

PROGRAMME OUTCOMES (POS)

After successful completion of the program, the graduates will be able to

PO1:	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2:	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:	**Design/development of solutions:** 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.
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.
PO5:	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex 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 engineering practice.
PO7:	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8:	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the 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 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 projects and in multidisciplinary environments.
PO12:	**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.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO1:	The ability to design and develop computer programs for analysing the data.
PSO2:	The ability to analyse data & develop Innovative ideas and provide solution by adopting emerging technologies for real time problems of software industry.
PSO3:	To encourage the research in software field that contribute to enhance the standards of human life style and maintain ethical values.

INDUCTION PROGRAMME

S.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 -- correspondinglabs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematicalskills	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

PROGRAM STRUCTURE

B.Tech. – I Year I Semester

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	231BS1T01	BSC	Engineering Physics	3	0	0	3
2	231BS1T02	BSC	Linear Algebra & Calculus	3	0	0	3
3	231ES1T03	ESC	Basic Civil & Mechanical Engineering	3	0	0	3
4	231ES1T04	ESC	Introduction to Programming	3	0	0	3
5	231HS1T01	HSMC	Communicative English	2	0	0	2
6	231ES1L03	ESC	Engineering Workshop	0	0	3	1.5
7	231ES1L04	ESC	Computer Programming Lab	0	0	3	1.5
8	231BS1L01	BSC	Engineering Physics Lab	0	0	2	1
9	231HS1L01	HSMC	Communicative English Lab	0	0	2	1
10	231HS1L02	HSMC	Health and wellness, Yoga and sports	0	0	1	0.5
Total				**14**	**0**	**11**	**19.5**

B.Tech. – I Year II Semester

S.No.	Course Code	Category	Title	L/D	T	P	Credits
1	231BS2T03	BSC	Chemistry	3	0	0	3
2	231BS2T02	BSC	Differential Equations & Vector Calculus	3	0	0	3
3	231ES2T03	ESC	Basic Electrical and Electronics Engineering	3	0	0	3
4	231CS2T01	PCC	Data Structures	3	0	0	3
5	231ES2T04	ESC	Engineering Graphics	1	0	4	3
6	231ES2L03	ESC	Electrical and Electronics Engineering Workshop	0	0	3	1.5
7	231CS2L01	PCC	Data Structures Lab	0	0	3	1.5
8	231ES2L04	ESC	IT Workshop	0	0	2	1
9	231BS2L02	BSC	Chemistry Lab	0	0	2	1
10	231HS2L01	HSMC	NSS/NCC/Scouts & Guides/ Community Service	0	0	1	0.5
Total				**13**	**0**	**15**	**20.5**

ENGINEERING PHYSICS

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231BS1T01	3	0	0	3

Course Objectives:

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Analyze the intensity variation of light due to interference and diffraction.
CO2:	Familiarize with the basics of crystals and their structures.
CO3:	Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4:	Explain fundamentals of quantum mechanics and apply it to one dimensional motion ofparticles.
CO5:	Identify the type of semiconductor using Hall effect.

UNIT I Wave Optics **12 Hrs**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of radius of curvature, wavelength and refractive index of liquids.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

UNIT II Crystallography and X-ray diffraction **8 Hrs**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials **12 Hrs**

Dielectric Materials: Introduction - polarization - polarizability, Dielectrics in a.c fields, Complex Dielectric constant, Dielectric loss and - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation

Polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - - Frequency dependence of polarization – ferroelectric memory device.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials-applications.

UNIT IV Quantum Mechanics and Free electron Theory **12 Hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependentwave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Fermi energy -Fermi-Dirac distribution - Density of states - Quantum free electron theory - electrical conductivity based on quantum free electron theory

UNIT V Semiconductors **10 Hrs**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Text Books:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Engineering Physics – P.K Palanisamy, Scitech Publishers. (2013)
2. Engineering Physics – Dr. M. Armugam, Anuradha Publications.(2015)
3. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources:

1. https://www.loc.gov/rr/scitech/selected-internet/physics.html

LINEAR ALGEBRA & CALCULUS

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231BS1T02	3	0	0	3

Course Objectives:

- 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.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Develop and use of matrix algebra techniques that are needed by engineers for practical applications and solve system of linear equations.
CO2:	Find the inverse and power of a matrix by using Cayley-Hamilton theorem and reduce the Quadratic form.
CO3:	Utilize mean value theorems to real life problems.
CO4:	Familiarize with functions of several variables which is useful in optimization.
CO5:	Familiarize with double and triple integrals of functions of several variables in two dimensions and three dimensions using Cartesian and polar coordinates.

UNIT – I

Matrices (10 Periods):

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of non- singular matrices by Gauss-Jordan method. System of linear equations: Solving system of homogeneous and non-homogeneous linear equations by Gauss elimination method, Gauss - Jacobi and Gauss - Seidel iteration methods.

UNIT – II

Eigenvalues, Eigenvectors and Orthogonal Transformation (10 Periods):

Eigenvalues, Eigenvectors and their properties, Cayley-Hamilton theorem (without proof), Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalization of a matrix, Quadratic forms: Rank, Index, Signature and Nature of the quadratic forms. Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT – III

Calculus (10 periods):

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT – IV

Partial differentiation and its applications (Multi variable calculus) (10 periods):

Functions of several variables: Limit, Continuity and Differentiability, Partial derivatives, Total derivatives, Chain rule, Taylor's and Maclaurin's series expansion of function of two variables.

Jacobians, Functional dependence, Maxima and Minima of functions of two variables, Method of Lagrange multipliers.

UNIT – V

Multiple Integrals (Multi variable calculus) (10 periods):

Double integrals, Change of order of integration, Change of variables to polar coordinates, Triple integrals, Change of variables to cylindrical and spherical coordinates, Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Higher Engineering Mathematics, B.V. Ramana, Mc Graw Hill Education (India) Private Limited. Nineteenth edition.

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).
6. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.

Web Links:

1. https://archive.nptel.ac.in/courses/111/105/111105121/
2. https:// archive.nptel.ac.in/courses/111/105/111105167/

BASIC CIVIL & MECHANICAL ENGINEERING

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231ES1T03	3	0	0	3

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation'seconomy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.
- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Explain various sub-divisions of Civil Engineering and basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
CO2:	Illustrate the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
CO3:	Describe the significance and Engineering aspects of transportation, water storage and water conveyance structures.
CO4:	Understand the different manufacturing processes.
CO5:	Explain the basics of thermal engineering applications with power transmission and powerplants.
CO6:	Describe the basics of robotics and its applications.

PART A: BASIC CIVIL ENGINEERING

UNIT – I

Introduction to Basics of Civil Engineering: Role of Civil Engineers in sustainable development- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering-Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning-Construction Materials-Cement - Aggregate – Bricks - Cement concrete- Steel. Introduction to Prefabricated construction technology.

UNIT – II

Introduction to Surveying: Objectives of Surveying- Linear and Angular Measurements-Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT – III

Introduction to Transportation Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements – Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Introduction to Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Water storage and conveyance structures).

Text Books:

1. Basic Civil and Mechanical Engineering, Ommi Srikanth, M. Sreenivasa Reddy, S. Chand Publications.
2. Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016.
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_ce42/preview
2. https://www.youtube.com/watch?v=chhuq_t40rY&list=PL20A0651466E8A776
3. https://www.youtube.com/results?search_query=Transportation+engineering+NPTEL
4. https://www.mcgill.ca/civil/undergrad/areas/water

PART B: BASIC MECHANICAL ENGINEERING

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and

air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants, Wind power plants, Solar power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications.
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.

INTRODUCTION TO PROGRAMMING

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231ES1T04	3	0	0	3

Course Objectives:

- To introduce fundamentals of computer programming.
- To foster logical thinking and problem – solving skills.
- To familiarize students with data types, control structures, functions, arrays, pointers and structures.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Develop optimal problem-solving skills by understanding the computer basics, algorithms and flowcharts.
CO2:	Make use of an appropriate control statement to optimize a program.
CO3:	Develop modular programming using functions and dynamic memory allocation using pointers.
CO4:	Solve complex problems using Arrays and Strings.
CO5:	Utilize structure, union and file operations to handle heterogeneous data and files.

UNIT – I Introduction to Programming and Problem Solving

Introduction to Programming: History of Computers, Basic organization of a computer, ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program – Algorithms, Flowcharts (Using Dia Tool), Pseudocode Program Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output Operations, Type Conversion, and Casting.

Problem Solving Techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT – II Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT – III Functions & Pointers

Functions: Introduction to Functions, Built-in Functions, User defined Function - Declaration and Definition, Function call Return Types and Arguments, Scope and Lifetime of Variables, Recursive functions.

Pointers: Introduction to Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, modifying parameters inside functions using pointers, Command line Arguments.

UNIT – IV Arrays and Strings

Arrays: Arrays indexing, memory model, programs with array of integers, two dimensional arrays, arrays as parameters to function, malloc( ), calloc( ), realloc( ), free( )

Strings: Introduction to Strings, String handling functions.

UNIT – V User Defined Data types & File Handling

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type – enum variables, Using Typedef keyword, Bit Fields.

Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Text Books:

1. Programming for problem solving using C Behrouz A.Forouzan. Richard F.Gilberg. Cengage Learning India.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition.

Reference Books:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988.
2. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
3. Let Us C Yashwanth Kanetkar, Eighth edition, BPB Publications.
4. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
5. Head First C: A Brain-Friendly Guide (Greyscale Indian Edition), David Griffiths, Dawn Griffiths.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

COMMUNICATIVE ENGLISH

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231HS1T01	2	0	0	2

Course Objectives:

- The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes (COs): At the end of the course, the student will be able to

CO1:	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2:	Create a coherent paragraph, essays and correct word forms.
CO3:	Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4:	Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5:	Apply grammatical structures to formulate sentences and resume writing.

UNIT I – HUMAN VALUES

Gift of Magi (Short Story)

Listening:	Identifying the topic, the context and specific pieces of information by listeningto 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 ofinformation.
Writing:	Summary Writing
Grammar:	Parts of Speech, Basic Sentence Structures-forming questions.
Vocabulary:	Synonyms, Antonyms, root words

UNIT II – NATURE

The Brook by Alfred Tennyson (Poem)

Listening:	Answering a series of questions about main ideas and supporting ideas afterlistening to audio texts. (Audio files)
Speaking:	Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading:	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing:	Creative Writing - Paragraph writing, Paraphrasing
Grammar:	Cohesive devices - linkers, use of articles and zero article; prepositions

Vocabulary:	Homonyms, Homophones, Homographs.

UNIT III – BIOGRAPHY
(Elon Musk)

Listening:	Listening for global comprehension and summarizing what is listened to. Ted talks/Ted-ed
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:	Essay writing, Introduction to Descriptive Writing, Description of a Place/Person/Process
Grammar:	Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary:	Compound words, Collocations

UNIT IV – INSPIRATION
(The Toys of Peace by Saki)

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:	Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing:	Note making and Note Taking
Grammar:	Reporting verbs, Direct & Indirect speech, Active & Passive Voice.
Vocabulary:	Words often confused, Jargons

UNIT V – MOTIVATION
(The Power of Intrapersonal Communication (An Essay)

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
Reading:	Reading comprehension.
Writing:	Informal, formal Letter writing, Cover letters, Resume Writing
Grammar:	Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary:	Technical Jargons

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3).
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5).

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020.
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY:

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

ENGINEERING WORKSHOP

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231ES1L03	0	0	3	1.5

Course Objectives:

- To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Identify workshop tools and their operational capabilities.
CO2:	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3:	Apply fitting operations in various applications.
CO4:	Apply basic electrical engineering knowledge for House Wiring Practice.

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
   a. Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metalworking, Developments of following sheet metal job from GI sheets.
   a. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the followingfitting exercises.
   a. V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire punctureand change of two-wheeler tyre.
5. **Electrical Wiring**: Familiarity 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
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes,Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding.Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe jointswith coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheelervehicle and its repairs.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
2. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn.

2015.
3. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition.
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

COMPUTER PROGRAMMING LAB

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231ES1L04	0	0	3	1.5

Course Objectives:

- To provide hands on experience with coding and debugging.
- To encourage collaborative learning and teamwork in coding.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Develop the basic C programs in different environments.
CO2:	Utilize appropriate control structures, arrays and strings for problem solving.
CO3:	Develop modular programming skill.
CO4:	Apply pointers for dynamic memory allocation and file operations for file handling.
CO5:	Make use of structures and unions to handle heterogeneous data.

1. **Exercise – 1 : Explore different platforms**
   a. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
   b. Exposure to Turbo C, gcc
   c. Explore to Hacker Rank or any other Online coding platform and compiler environment.
   d. "Hello World" in C
   Objective: Learn about the syntax of reading from stdin and writing to stdout.
   https://www.hackerrank.com/challenges/hello-world-c/problem?isFullScreen=true
   e Write a simple program to read int, float, char and string using scanf() and display using printf() in all the above given platforms.

2. **Exercise – 2 : Basics and Operators**
   a. Sum and Difference of 2 numbers
   Objective: Understand int and float data types.
   https://www.hackerrank.com/challenges/sum-numbers-c/problem?isFullScreen=true
   b. Playing with Characters
   Objective: Learn how to take a character, a string and a sentence as input in C.
   https://www.hackerrank.com/challenges/playing-with-characters/problem?isFullScreen=true
   c. Bitwise Operators
   Objective: Learn how to work with bits (0,1) and bitwise operators.
   https://www.hackerrank.com/challenges/bitwise-operators-in-c/problem?isFullScreen=true
   d. Conversion of Fahrenheit to Celsius and vice versa.
   e. Distance travelled by an object.
   f. Calculate Simple interest and compound interest.

3. **Exercise – 3 : Operators and Expressions, Variables and Type conversions**
   a. Evaluate the following expressions a, b integers, c float, d double, i, j intergers
      i. a/b*c-b+a*d/3
      ii. j = (i++) + (++i)
   b. Square root of a given number.
   c. Find the area of circle, square, rectangle and triangle.
   d. Find the maximum of three numbers using conditional operator.
   e. Take marks of 5 subjects in integers, find the total in integer and average in float.

4. **Exercise – 4 : Conditional Statements**
   a. Conditional statements in C.
      Objective: Understand *if* and *else*.
      https://www.hackerrank.com/challenges/conditional-statements-in-c/problem?isFullScreen=true
   b. Roots of a Quadratic Equation.
   c. Generate electricity bill.
   d. Simulate a calculator using switch case.
   e. Find the given year is a leap year or not, year should be YYYY.

5. **Exercise – 5 : Loops**
   a. "for" Loop in C.
      Objective: Learn the usage of the *for* loop.
      https://www.hackerrank.com/challenges/for-loop-in-c/problem?isFullScreen=true
   b. Sum of the digits of a 5-digit number.
      Objective: Learn the usage of while loop and usage of operators - % and /.
      https://www.hackerrank.com/challenges/sum-of-digits-of-a-five-digit-number/problem?isFullScreen=true
   c. Given number is a prime or not. (Also Prime numbers between a given range.)
   d. Armstrong Number or not.
   e. Palindrome or not.
   f. Printing patterns using Loops.
      Objective: Print a pattern of numbers.
      https://www.hackerrank.com/challenges/printing-pattern-2/problem?isFullScreen=true
   g. Construct a Pascal triangle

6. **Exercise – 6 : Arrays**
   a. One dimensional Arrays in C
      Objective: Print the sum and free the memory where the array is stored.
      https://www.hackerrank.com/challenges/1d-arrays-in-c/problem?isFullScreen=true
   b. Array reversal
      Objective: Working with indices in array
      https://www.hackerrank.com/challenges/reverse-array-c/problem?isFullScreen=true
   c. Search an element in array (Linear Search)
   d. Find min and max elements in array

e. Replace an element into array at a given index
f. Identify duplicate elements from array
g. Sorting of elements in an array using Bubble sort

7. Exercise – 7 : 2-D Arrays

a. Addition of two matrices
b. Multiplication of two matrices
c. Transpose of a Matrix
d. Trace of a Matrix
e. Lower Triangular in a Matrix

8. Exercise – 8 : Strings

a. Printing Tokens
Objective: print each word of the sentence in a new line
https://www.hackerrank.com/challenges/printing-tokens-/problem?isFullScreen=true
b. Count number of alphabets (lowercase, uppercase, consonants, vowels) and digits
c. Lowercase to Uppercase, Uppercase to Lowercase, Toggle case, Sentential case
d. Digit Frequency
Objective: find the frequency of each digit in the given string.
https://www.hackerrank.com/challenges/frequency-of-digits-1/problem?isFullScreen=true
e. Find string length, concatenate two strings, reverse a string using built-in and without built-in string functions.

9. Exercise – 9 : Functions and Recursion

a. Functions in C
Objective: Learn simple usage of functions.
https://www.hackerrank.com/challenges/functions-in-c/problem?isFullScreen=true
b. Fibonacci Numbers using recursion
Objective: Complete the recursive function.
https://www.hackerrank.com/challenges/ctci-fibonacci-numbers/problem
c. Factorial
Objective: N! (N factorial) using recursion.
https://www.hackerrank.com/contests/ccc-veltech-practice-set-ende/challenges/factorial-using-recursion-1
d. Digit Sum
Objective: find the *super digit* of the integer.
https://www.hackerrank.com/challenges/recursive-digit-sum/problem
e. LCM
f. Calculate the Nth term

$$S(n) \begin{cases} a & n=1, \\ b & n=2, \\ c & n=3, \\ S(n-1)-S(n-2)-S(n-3) & otherwise \end{cases}$$

Objective: Find the Nth term.
https://www.hackerrank.com/challenges/recursion-in-c/problem?isFullScreen=true

10. **Exercise – 10 : Pointers**
    a. Pointers in C
       Objective: learn to implement the basic functionalities of pointers in C.
       https://www.hackerrank.com/challenges/pointer-in-c/problem?isFullScreen=true
    b. Students Marks Sum
       Objective: Learn using Pointers with Arrays and Functions
       https://www.hackerrank.com/challenges/students-marks-sum/problem?isFullScreen=true
    c. Sorting Array of Strings
       Objective: sort a given array of strings into lexicographically increasing order or into an order in which the string with the lowest length appears first.
       https://www.hackerrank.com/challenges/sorting-array-of-strings/problem?isFullScreen=true
    d. Find the sum of a 1D array using malloc()
    e. Swap two numbers using functions and pointers - call by value and reference.
    f. Dynamic Array in C
       Objective: Handling requests by a Librarian to place the books in the shelves.
       https://www.hackerrank.com/challenges/dynamic-array-in-c/problem?isFullScreen=true

11. **Exercise – 11 : Structure, Union, typedef, bit-fields and enum**
    a. Write a C program to find the total, average of n students using structures
    b. Boxes through a Tunnel
       Objective: Using a structure for transporting some boxes through a tunnel
       https://www.hackerrank.com/challenges/too-high-boxes/problem?isFullScreen=true
    c. Post Transition
       Objective: Storing and transferring packages using pointers in structures.
       https://www.hackerrank.com/challenges/post-transition/problem?isFullScreen=true
    d. Copy one structure variable to another structure of the same type.
    e. Read student name and marks from the command line and display the student details along with the total.
    f. Shift/rotate using bitfields.

12. **Exercise – 12 : Files**
    a. Write text into and read text from a file
    b. Write into text and read text from a binary file using fread( ) and fwrite( )
    c. Copy the contents of one file to another file.
    d. Merge two files into the third file using command-line arguments.

13. **Exercise – 13 – 16 : Logic Building – Augmented Experiments (Complete any 2)**
    a. Variadic functions in C
       Objective: Understanding variable number of arguments
       https://www.hackerrank.com/challenges/variadic-functions-in-c/problem?isFullScreen=true
    b. Querying the Document

Objective: representing the words, sentences, paragraphs, and documents using pointers.
https://www.hackerrank.com/challenges/querying-the-document/problem?isFullScreen=true

c. Structuring the Document
Objective: Using structure with pointers
https://www.hackerrank.com/challenges/structuring-the-document/problem?isFullScreen=true

d. Small Triangles, Large Triangles
Objective: Print sorted by their areas
https://www.hackerrank.com/challenges/small-triangles-large-triangles/problem?isFullScreen=true

e. Permutations of Strings
Objective: print all strings permutations in strict lexicographical order
https://www.hackerrank.com/challenges/permutations-of-strings/problem?isFullScreen=true

Text Books:

1. Programming for problem solving using C Behrouz A.Forouzan. Richard F.Gilberg.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition.
3. Unix Shell Programming, Kanetkar Yeshvant P, BPB Publications.

ENGINEERING PHYSICS LAB

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231BS1L01	0	0	2	1

Course Objectives:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Operate optical instruments like travelling microscope and spectrometer.
CO2:	Estimate the wavelengths of different colours using diffraction grating.
CO3:	Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4:	Determine the Frequency of electrically maintained tuning fork.
CO5:	Calculate the band gap of a given semiconductor.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using acompound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

Reference Book:

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

Web Resources:

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/ilter?subjects=physics&type=htl,prototype

COMMUNICATIVE ENGLISH LAB

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231HS1L01	0	0	2	1

Course Objectives:

- The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes (COs): After completion of the course the student will be able to

CO1:	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2:	Apply communication skills through various language learning activities.
CO3:	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4:	Evaluate and exhibit professionalism in participating in debates and group discussions.
CO5:	Create effective Course Objectives.

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed).Kindle, 2013.

Web Resources:
Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common for all branches of Engineering)

Semester: I	L	T	P	C
Course code: 231HS1L02	0	0	1	0.5

Course Objectives:

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes (COs): After completion of the course the student will be able to

CO1:	Understand the importance of yoga and sports for Physical fitness and sound health.
CO2:	Demonstrate an understanding of health-related fitness components.
CO3:	Compare and contrast various activities that help enhance their health.
CO4:	Assess current personal fitness levels.
CO5:	Develop Positive Personality.

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022

2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice.
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere, Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.

CHEMISTRY

(Common for EEE, ECE, CSE, IT, CSE (AI&ML) & CSE (DS))

Semester: II	L	T	P	C
Course code: 231BS2T03	3	0	0	3

Course Objectives:

- To familiarize concepts of chemistry and its applications.
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods, non-conventional sources of energy.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Analyze different types of Polymers and understand the mechanism of conduction in polymers.
CO2:	Utilize the theory of construction of electrodes, batteries, and fuel cells in redesigning engineering products.
CO3:	Analyze principles of instrumental methods and its applications and design models for non-Conventional energy sources.
CO4:	Summarize the various modern engineering materials and their applications.
CO5:	Apply the concept of bonding in molecules in developing stable structures.

UNIT – I

Polymer Chemistry (10 Periods)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and methods of polymerization (Suspension polymerization and Emulsion Polymerization)

Plastics: Thermoplastics and Thermosetting polymers, Preparation, properties, and applications of PVC, Teflon, Bakelite, Nylon-6,6.

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

Conducting polymers: polyacetylene, polyaniline, – mechanism of conduction and applications.

Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly L-Lactic Acid (PLA).

UNIT – II

Electrochemistry and Applications (10 Periods)

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT – III

Spectroscopic Methods and Non-Conventional sources of energy (10 Periods)

Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation and Applications, IR spectroscopies, fundamental modes and selection rules, Instrumentation and Applications.

Non- Conventional Sources of Energy: Hydro power, Solar energy – Introduction to PV cell / solar cell- Construction and Working of Photovoltaic Cells -applications of solar energy. Geothermal energy

UNIT – IV

Modern Engineering materials (8 Periods)

Semiconductors, band diagram in solids, Semiconductor devices (p-n junction diode as rectifier and transistors)

Super conductors-Introduction, types, and applications.

Supercapacitors: Introduction, Basic Concept- Classification and applications.

Nano materials: Introduction, Preparation of nano materials by Sol-Gel method, Applications of Fullerenes, carbon nano tubes and Graphene nanoparticles.

UNIT – V

Structure, Bonding and Chemi-informatics (10 Periods)

Valence bond theory, Hybridisation - types of hybridizations - molecular orbital theory - bonding in homo nuclear di atomic molecules - energy level diagrams of O_2 and N_2 and calculation of bond order.

Chemi- Informatics: Docking - Approaches and types, factors affecting docking, and applications.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.M. Lehn, Supra Molecular Chemistry, VCH Publications International Ltd., 2021 5th Edition (9th reprint).

Web Links:

1. https://youtu.be/mwog2IxDFso?si=X1G5CS6HovnI4VkY
2. https://youtu.be/h6FYs_AUCsQ?si=S4n8hemFrhVv9GFu
3. https://youtu.be/1dG0PmKFsQA?si=UsBp44VBHh0YpTvu

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common for all branches of Engineering)

Semester: II	L	T	P	C
Course code: 231BS2T02	3	0	0	3

Course Objectives:

- 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

Course Outcomes (COs): At the end of the course, student will be able to:

CO1:	Solve the linear differential equations and model various situations involving differential equations of first order.
CO2:	Solve linear differential equations of higher order and model various situations involving second order differential equations.
CO3:	Identify the techniques for solving partial differential equations
CO4:	Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO5:	Estimate the work done against a field, circulation and flux using vector calculus.

UNIT – I

Differential equations of first order and first degree (10 Periods):

Basic definitions, Variables separable method, Exact equations, Equations reducible to Exact form, Linear differential equations, Bernoulli's equations. Applications: Newton's law of cooling, Law of natural growth and decay, Electrical circuits.

UNIT – II

Linear differential equations of higher order with constant coefficients (10 Periods):

Definitions: Wronskian, Homogenous and Non-homogenous differential equations, Complimentary function, Particular integral, General solution, Particular solution, Method of variation of parameters, Solutions to simultaneous equations. Applications to L-C-R Circuits and Simple harmonic motion.

UNIT – III

Partial Differential Equations (10 Periods):

Introduction and Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solutions of first order linear equations using Lagrange's method. Higher order homogeneous linear partial differential equations with constant coefficients-RHS terms of the type e^{ax+}, $\sin(ax + by)$, $\cos(ax + by)$ and $x^m y^n$ ..

UNIT – IV

Vector differentiation (10 Periods):

Scalar and vector point functions, Level surfaces, Gradient of a scalar point function and its applications, Divergence and Curl of a vector point function, Laplacian operator, Vector identities.

UNIT – V

Vector integration (10 Periods):

Line integral-circulation-work done, Surface integral-flux, Volume integral, Green's theorem in the plane, Stoke's theorem, Divergence theorem and related problems (All theorems without proofs).

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Higher Engineering Mathematics, B.V. Ramana, Mc Graw Hill Education (India) Private Limited. Nineteenth edition.

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.
2. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
3. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
4. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
5. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).

Web Links:

1. https://youtu.be/4QFsiXfgbzM
2. https://youtu.be/Unh8HTvPoso

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common for all branches of Engineering)

Semester: II	L	T	P	C
Course code: 231ES2T03	3	0	0	3

Course Objectives:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical / electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes (COs): At the end of the Course, Student will be able to:

CO1:	Analyze the concepts associated with AC and DC circuits.
CO2:	Explain the operating principles of motors, generators and measuring instruments.
CO3:	Analyze the Different Energy Resources and Equipment Safety Measures.
CO4:	Explain the concept and the applications of semiconductor Diodes.
CO5:	Analyze the Basic Electronic Circuits and Instrumentation.
CO6:	Interpret numeric information in different code formats.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT-1 DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, source transformation technique, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor series RLC circuit only (Simple Numerical problems).

UNIT-II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of digital multimeter, Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone Bridge. Tong tester and megger.

UNIT-III Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker(MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety

Precautions to avoid shock.

Text Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

UNIT I SEMICONDUCTOR DEVICES

Introduction – Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of P N Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator.
Amplifiers: Block diagram of Public Address System.
Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XORand XNOR. Simple combinational circuits–Half and Full Adders

Text Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009.

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

DATA STRUCTURES

(Common for CSE, IT, CSE(AI & ML) & CSE(DS))

	L	T	P	C
Semester: II				
Course code: 231CS2T01	**3**	**0**	**0**	**3**

Course Objectives:

- To provide knowledge of basic data structures and implementation.
- To develop skills of applying data structures in problem solving.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Illustrate Time and Space complexities for different searching and sorting algorithms.
CO2:	Demonstrate various operations on Linked Lists.
CO3:	Explain different operations on Stack and its applications.
CO4:	Illustrate different operations on queue and its applications
CO5:	Demonstrate the importance and various operation on non-linear data structures and hashing.

UNIT – I Introduction to Linear Data Structures

Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.

Searching & Sorting Techniques: Linear Search & Binary Search, Sorting, Bubble sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort

UNIT – II Linked Lists

Singly linked lists representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT – III Stacks

Introduction to stacks, properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list.

UNIT – IV Queues

Introduction to queues, properties and operations, implementing queues using arrays and linked lists, Applications of queues, double ended queues.

UNIT – V Trees, Graphs & Hashing

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

Graphs: Introduction to Graph Terminology, Representation of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFS & DFS)

Hashing: Introduction to hashing and hash functions, Collision resolution techniques, chaining and open addressing.

Text Books:

1. Data Structures Using C, Reema Thareja, Oxford University Press, 2nd Edition.
2. "The Algorithm Design Manual", Steven S. Skiena, Second Edition, Springer Publication.

Reference Books:

1. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.
2. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders.
3. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.

Web Links:

1. https://nptel.ac.in/courses/106102064
2. https://archive.nptel.ac.in/courses/106/105/106105225/
3. https://www.udemy.com/topic/data-structures/
4. https://www.coursera.org/specializations/data-structures-algorithms
5. https://www.coursera.org/specializations/boulder-data-structures-algorithms?trk_location=query-summary-list-link

ENGINEERING GRAPHICS

(Common for all branches of Engineering)

	L	T	P	C
Semester: II				
Course code: 231ES2L04	**1**	**0**	**4**	**3**

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions andstandards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solidsand Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometricand Perspective projections.

Course Outcomes (COs): At the end of the Course, Student will be able to:

CO1:	Understand the principles of engineering drawing, including engineering curves, scales,orthographic and isometric projections.
CO2:	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3:	Understand and draw projection of solids in various positions in first quadrant.
CO4:	Explain principles behind development of surfaces.
CO5:	Prepare isometric and perspective sections of simple solids.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Introduction to Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane,Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in

simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Text Book:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common for all branches of Engineering)

Semester: II	L	T	P	C
Course code: 231ES2L03	0	0	3	1.5

Course Objectives:

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes (COs): At the end of the Course, Student will be able to:

CO1:	Understand the concepts of KCL, KVL and apply network theorems to electrical circuits.
CO2:	Determine resistance, power& power factor, and energy.
CO3:	Evaluate critical speed, critical resistance of DC shunt generator.
CO4:	Identify and test various electronic components.
CO5:	Analyze the characteristics of diodes, BJT Rectifiers and amplifier.
CO6:	Explain the operation of logic gates.

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc. Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter. Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components: •Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding package, symbol, cost etc.
4. Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc. with the measured values by using instrument

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Power and Power factor using Single-phase wattmeter
4. Measurement of Resistance using Wheatstone bridge
5. Measurement of insulation Resistance using Megger.
6. Calculation of Electrical Energy for Domestic Premises.

List of Augmented Experiments: (Any one of the fallowing experiment can be performed)

7. Verification of KCL, KVL and ohm's law using simulation.
8. Magnetization Characteristics of DC shunt Generator.

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, 1 st Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, 3rd Edition.

PART B: ELECTRONICS ENGINEERING LAB

List of Experiments:

1. V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. V-I characteristics of Zener Diode and its application as voltage Regulator.
3. Input & Output characteristics of BJT in CE configuration.
4. Implementation of half wave and full wave rectifiers (ripple factor & waveform analysis).
5. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
6. Input & Output characteristics of BJT in CB configuration.

List of Augmented Experiments:

7. Design and verify Half Adder and Full Adder circuits.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009.
   R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

DATA STRUCTURES LAB

(Common for CSE, IT, CSE(AI & ML) & CSE(DS))

	L	T	P	C
Semester: II				
Course code: 231CS2L01	**0**	**0**	**3**	**1.5**

Course Objectives:

- To enable and gain knowledge in practical applications of data structures.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Make use of iterative and recursive procedures for problem solving.
CO2:	Utilize appropriate searching and sorting techniques to search and sort elements.
CO3:	Implement various operations in linear data structures.
CO4:	Implement various operations in non-linear data structures.
CO5:	Apply the appropriate data structure to solve different types of applications.

1. **Exercise – 1 : Array Manipulation and Searching Techniques**
   a. Arrays – DS
      Objective: Reverse array elements
      https://www.hackerrank.com/challenges/arrays-ds/problem?isFullScreen=true
   b. Linear Search
      Objective: Find the position of number K in the given list
      https://www.hackerrank.com/contests/17cs1102/challenges/1-a-linear-search
      Write a simple program to read int, float, char and string using scanf() and display using printf() in all the above given platforms.
   c. Binary Search – Basic
      Objective: find index (0-based) of a given key in a sorted array
      https://www.hackerrank.com/contests/launchpad-1-winter-challenge/challenges/binary-search-basic
   d. Binary Search – Iterative
      Objective: Given queries found in array elements or not.
      https://www.hackerrank.com/contests/17cs1102/challenges/1-b-binary-search-iterative
   e. Binary Search – Recursion
      Objective: Given queries found in array elements or not.
      https://www.hackerrank.com/contests/17cs1102/challenges/1-c-binary-search-recursion

2. **Exercise – 2 : Sorting Techniques**
   a. Bubble Sort
      Objective: Sort the array in ascending order
      https://www.hackerrank.com/challenges/ctci-bubble-sort/problem
   b. Insertion Sort
      Objective: Implement insertion sort on array

https://www.hackerrank.com/contests/17cs1102/challenges/3-a-implement-insertion-sort

c. Selection Sort
Objective: Implement insertion sort on array.
https://www.hackerrank.com/contests/17cs1102/challenges/3c-implement-selection-sort

3. **Exercise – 3 : Sorting Techniques – Divide and Conquer**
   a. Merge Sort
   Objective: Implement merge sort using array.
   https://www.hackerrank.com/contests/17cs1102/challenges/merge-sort-6
   b. Quick Sort
   Objective: Implement quick sort using array.
   https://www.hackerrank.com/contests/17cs1102/challenges/4a-quick-sort

4. **Exercise – 4 : Linked List**
   a. Single Linked List
   Objective: Perform different operations in single linked list.
   https://www.hackerrank.com/contests/17cs1102/challenges/5a-single-linked-list
   b. Double Linked List
   Objective: Perform different operations in double linked list.
   https://www.hackerrank.com/contests/17cs1102/challenges/5b-doubly-linked-list

5. **Exercise – 5 : Linked List Continued**
   a. Circular Linked List
   Objective: Perform different operations in circular linked list.
   https://www.hackerrank.com/contests/17cs1102/challenges/5c-circular-linked-list
   b. Reverse a linked list
   Objective: Reversing a single linked list
   https://www.hackerrank.com/challenges/reverse-a-linked-list/problem?isFullScreen=true
   c. Compare two linked list
   Objective: Compare the data in the nodes of the linked lists to check if they are equal.
   https://www.hackerrank.com/challenges/compare-two-linked-lists/problem?isFullScreen=true

6. **Exercise – 6 : Linked List - Applications**
   a. Implement a linked list to represent polynomials and perform addition.
   b. Delete duplicate-value nodes from a sorted linked list.
   Objective: Delete nodes and return a sorted list with each distinct value in the original list.
   https://www.hackerrank.com/challenges/delete-duplicate-value-nodes-from-a-sorted-linked-list/problem?isFullScreen=true

7. **Exercise – 7 : Stack**

a. Stack and its operations using arrays
b. Stack Using Linked List
   Objective: Implement Stack using Linked List
   https://www.hackerrank.com/contests/17cs1102/challenges/6a-stack-using-linked-list
c. Stack using two Queues
   Objective: Implement Stack using two Queues
   https://www.hackerrank.com/contests/17cs1102/challenges/6b-implement-stack-using-two-queues-

8. Exercise – 8 : Queue

a. Queue and its operations using arrays
b. Queue Using Linked List
   Objective: Implement a queue using Linked List
   https://www.hackerrank.com/contests/17cs1102/challenges/7b-implement-a-queue-using-linked-list
c. Queue using two Stacks
   Objective: Implement Queue using two Stacks
   https://www.hackerrank.com/contests/17cs1102/challenges/queue-using-two-stacks
d. Circular Queues
   Objective: Implement Circular Queue using Arrays
   https://www.hackerrank.com/contests/17cs1102/challenges/7a-circular-queue-using-arrays

9. Exercise – 9 : Stacks - Applications

a. Towers of Hanoi
   Objective: Implement Towers of Hanoi using Stack
   https://www.hackerrank.com/contests/17cs1102/challenges/6c-towers-of-hanoi-using-stack
b. Balanced Brackets
   Objective: Given strings of brackets, determine whether each sequence of brackets is balanced.
   https://www.hackerrank.com/contests/17cs1102/challenges/balanced-brackets

10. Week 10: Stacks - Applications

c. Infix to Postfix
   Objective: Convert an infix expression into postfix expression.
   https://www.hackerrank.com/contests/17cs1102/challenges/8b-infix-to-posttfix
d. Postfix Expression Evaluation
   Objective: Implement a program to evaluate a postfix expression.
   https://www.hackerrank.com/contests/17cs1102/challenges/8-c-postfix-expression-evaluation

11. Exercise – 11 : Tree

a. Binary Search Tree (BST)
   Objective: Implement Binary search tree (BST).

https://www.hackerrank.com/contests/17cs1102/challenges/9a-implement-binary-search-tree

b. Binary Search Tree (BST) Traversals
Objective: Implement Binary search Tree (BST) Traversals.
https://www.hackerrank.com/contests/17cs1102/challenges/9b-implement-binary-search-tree

12. Exercise – 12 : Graphs and Hashing – Collision Resolution

a. BFS
Objective: Graph Traversal using BFS
https://www.hackerrank.com/contests/17cs1102/challenges/13-a-breadth-first-search
b. DFS
c. Open Hashing - Separate Chaining
d. Closed Hashing - Open Addressing – Linear Probing

13. Exercise – 13 – 16 : List of Augmented Experiments (Complete any 2)

a. DeQueue Implementation
b. Fibonacci Search
c. Radix Sort
d. Quadratic Probing

Text Books:

1. Data Structures Using C,Reema Thareja, Oxford University Press,2nd Edition.
2. "The Algorithm Design Manual", Steven S. Skiena, Second Edition, Springer Publication.

Web Links:

1. https://nptel.ac.in/courses/106102064
2. https://archive.nptel.ac.in/courses/106/105/106105225/
3. https://www.udemy.com/topic/data-structures/
4. https://www.coursera.org/specializations/data-structures-algorithms
5. https://www.coursera.org/specializations/boulder-data-structures-algorithms?trk_location=query-summary-list-link
6. https://www.hackerrank.com/contests/17cs1102/challenges

IT WORKSHOP

(Common for all branches of Engineering)

Semester: II	L	T	P	C
Course code: 231ES2L04	0	0	2	1

Course Objectives:

- To introduce the internal parts of a computer.
- To demonstrate configuring the system as dual boot.
- To teach the usage of internet for productivity and self-paced learning.
- To introduce office tools.

Course Outcomes (COs): At the end of the course, the student will be able to:

CO1:	Experiment with assembling, disassembling hardware components of a computer.
CO2:	Explain the process of safeguarding a computer system or network from virus/worm.
CO3:	Demonstrate virtual machine and software installation.
CO4:	Develop a Document, Spreadsheet and Presentation using MS-Office and AI Tools.
CO5:	Make use of GIT for version control and LaTeX for document preparation.

1. **Exercise – 1 : Identification of peripherals of a computer**
   a. Block diagram of the CPU along with the configuration of the each peripheral and its functions.

2. **Exercise – 2 : System Assembling and Disassembling**
   a. Disassembling the components of a PC.
   b. Assembling the components back to working condition.

3. **Exercise – 3 : Virtual Machine setup**
   a. Setting up and configuring a new virtual machine.

4. **Exercise – 4 : Installation of Software**
   a. Install LINUX in the personal computer.
   b. Install Microsoft Windows in the personal computer.

5. **Exercise – 5 : Networking and Internet**
   a. Networking commands.
   b. Exploring Internet and World Wide Web.
   c. Exploring Search Engines, Cyber hygiene.

6. **Exercise – 6 : Text Editors**
   a. Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, VS Code

7. **Exercise – 7 : Word**

a. Demonstration and practice on Microsoft Word- Formatting, Page Borders, Reviewing, Equations, symbols.

8. **Exercise – 8 : Excel**
   a. Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
   b. Calculating GPA - Features to be covered: Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

9. **Exercise – 9 : Powerpoint**
   a. Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.
   b. Interactive presentations – Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts.

10. **Exercise – 10 : AI TOOLS – Chat GPT and Version Control – GITHUB**
    a. Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas • Ex: Prompt: In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality.
    b. Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. • Ex: Prompt: Translate the following English sentence to French: 'Hello, how are you doing today?'
    c. GIT Commands and GITHUB: config, init, clone, status, add, commit, push, branch, checkout, merge, pull, log

11. **Exercise – 11 : LaTeX**
    a. Installation of LaTeX and related Software's.
    b. Basic formatting using LaTeX.
    c. Handling the equations in LaTeX.
    d. Inserting the Tables in LaTeX.

12. **Exercise – 12 : Internet & World Wide Web (WWW)**
    a. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
    b. Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active downloads to avoid viruses and/or worms.

13. **Exercise – 13 : List of Augmented Experiments: (Complete any 2)**
    a. Prepare a power point presentation for college information (Include 10 slides).
    b. List the common computer hardware problem and write down the solutions.
    c. Prepare your resume using MS-Word and LaTeX.
    d. Upload all your documents into GIT and work with access permissions.

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003.
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft).
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Vekateswarlu, S.Chand.

Web Links:

1. https://assembleyourpc.net/
2. https://www.latex-tutorial.com/tutorials
3. http://www.teachmsoffice.com/
4. https://www.geeksforgeeks.org/top-12-most-used-git-commands-for-developers/

CHEMISTRY LAB

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

Semester: II	L	T	P	C
Course code: 231BS2L02	0	0	2	1

Course Objectives:

- To verify the fundamental concepts with experiments.

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

CO1	Analyze the water quality parameters.
CO2	Determine the quality of ore and Vitamin-C.
CO3	Utilize basic instruments for analysis.
CO4	Synthesize polymer and nano materials.
CO5	Analyze the strength of acid in battery.

List of Experiments:

1. Determination of Hardness of a ground water sample
2. Determination of Chloride content in given water sample
3. Estimation of dissolved oxygen in given water sample
4. Estimation of Vitamin-C in ascorbic acid
5. Analysis of Mn in Pyrolusite
6. Determination of Strength of an acid in Pb-Acid battery
7. Conductometric titration of strong acid vs strong base
8. Potentiometric determination of strong acid -strong base
9. Preparation of a polymer (Bakelite)
10. Preparation of nanomaterials

Additional Experiments (Demonstration)

1. Wavelength measurement of sample through UV-Visible Spectroscopy
2. Identification of simple organic compounds by IR

Reference Books:

1. "Vogel's Quantitative Chemical Analysis 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes, and B. Sivasankar

Web Links:

1. http://pcv-au.vlabs.ac.in/physical-chemistry/EMF_Measurement/

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common for all branches of Engineering)

Semester: II	**L**	**T**	**P**	**C**
Course code: 231HS2L01	**0**	**0**	**1**	**0.5**

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

CO1	Understand the importance of discipline, character and service motto.
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3	Explore human relationships by analyzing social problems.
CO4	Determine to extend their help for the fellow beings and downtrodden people.
CO5	Develop leadership skills and civic responsibilities.

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6).
2. Red Book – National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi.
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008.
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007.
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.