

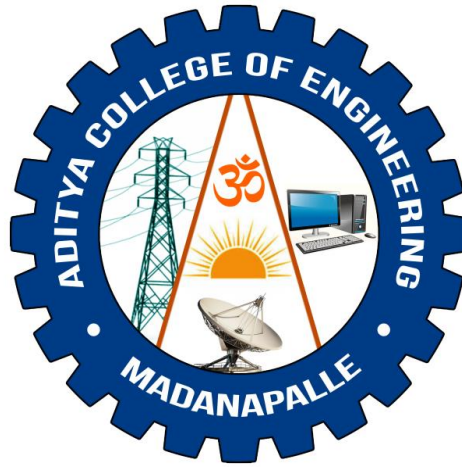
ADITYA COLLEGE OF ENGINEERING, MADANAPALLE

(UGC-AUTONOMOUS INSTITUTION & ACCREDITED WITH NAAC A+ GRADE)

Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapuramu

MADANAPALLE -517325, ANNAMAYYA Dist., A.P.

www.acem.ac.in



ACEM- R24 REGULATION

CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

I YEAR COURSE STRUCTURE AND SYLLABUS

for

B.Tech (Regular – Full Time)

(Effective for the students admitted into I Year from the
Academic Year 2025-26 onwards)

and

B.Tech (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through
Later Entry Scheme from the Academic Year 2026-27 onwards)

**ADITYA COLLEGE OF ENGINEERING :: MADANAPALLE**

Punganur Road, Valasapalle (Post), Madanapalle, Annamayya (Dist.) – 517325.

(An Autonomous Institution)

Department of CSE (Artificial Intelligence and Machine Learning)**Institute Vision:**

To impart quality in engineering education to meet the technological advances and industrial requirements with global standards.

Institute Mission:

- ❖ Provide quality technical education through skill-based trainings and promote research and development, and consultancy services.
- ❖ Offer state-of-the-art-infrastructure for supporting technological advances.
- ❖ Develop disciplined, creative and globally competent engineers.
- ❖ Equip and empower the faculty at all levels to promote innovations and technical advancements in various domains of engineering.

Department Vision:

To emerge as a center of excellence in Artificial Intelligence and Machine Learning education and research, producing competent and socially responsible professionals who contribute to technological advancement and societal development.

Department Mission:

- ❖ Impart quality education in the domain of Artificial Intelligence and Machine Learning through a well-structured curriculum, innovative pedagogy, and hands-on learning.
- ❖ Foster a research-driven environment that promotes critical thinking, innovation, and problem-solving skills.
- ❖ Inculcate ethical values, professional responsibility, and leadership qualities among students through value-based education
- ❖ Encourage industry-academia collaboration for real-world exposure and lifelong learning.

Programme Outcomes (POs):

On Successful completion, the graduate 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, 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 modelling 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.

Program Specific Outcomes (PSOs):

On Successful completion, the graduate (Artificial Intelligence and Data Science) will be able to,

- ❖ Design and develop intelligent systems using Artificial Intelligence, Machine Learning, and Deep Learning techniques to solve domain-specific problems.
- ❖ Apply data-driven techniques, including data preprocessing, visualization, and predictive modeling, to support decision-making and innovation.

Programme Educational Objectives (PEOs):

After few years of graduation, the graduates of Artificial Intelligence and Data Science are expected to

- ❖ Demonstrate technical expertise in AI, Machine Learning, and computational technologies to solve complex engineering problems.
- ❖ Pursue successful careers in industry, academia, or entrepreneurship, and engage in lifelong learning through higher studies or professional development.
- ❖ Exhibit ethical behavior, effective communication, and teamwork in multidisciplinary environments while addressing societal challenges.
- ❖ Contribute to the development of innovative, sustainable, and inclusive AI solutions that address real-world problems in various sectors.

**B.Tech. – CSE (Artificial Intelligence and Machine Learning)
Course Structure & Syllabus – ACEM R24 Regulations
(Applicable from the academic year 2025-26 onwards)**

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 -- corresponding labs, tools and platforms	EC	2-0-3-0
5.	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6.	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7.	Remedial Training in Foundation Courses	MC	2-1-2-0
8.	Human Values & Professional Ethics	MC	3-0-0-0
9.	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10.	Concepts of Programming	ES	2-0-2-0

Group - B**B.Tech. – I Year I Semester**

S. No.	Category	Course code	Name of the Course	L	T	P	Credits
1.	BS	24BSHB101T	Linear Algebra & Calculus	2	1	0	3
2.	BS	24BSHB104T	Chemistry	3	0	0	3
3.	HM	24HMHS101T	Communicative English	2	0	0	2
4.	ES	24ES01101T	Basic Civil & Mechanical Engineering	3	0	0	3
5.	ES	24ES05101T	Introduction to Programming	2	1	0	3
6.	BS	24BSHB104P	Chemistry Lab	0	0	2	1
7.	HM	24HMHS101P	Communicative English Lab	0	0	2	1
8.	ES	24ES03102P	Engineering Workshop	0	0	3	1.5
9.	ES	24ES05101P	Computer Programming Lab	0	0	3	1.5
10.	HM	24HMHS102L	Health and Wellness, Yoga and Sports	0	0	1	0.5
Total				12	2	11	19.5

B.Tech. – I Year II Semester

S. No.	Category	Course code	Name of the Course	L/D	T	P	Credits
1.	BS	24BSHB102T	Differential Equations & Vector Calculus	2	1	0	3
2.	BS	24BSHB103T	Engineering Physics	2	1	0	3
3.	ES	24ES02101T	Basic Electrical & Electronics Engineering	3	0	0	3
4.	ES	24ES03101T	Engineering Graphics	1	0	4	3
5.	PC	24PC05101T	Data Structures	2	1	0	3
6.	BS	24BSHB103P	Engineering Physics Lab	0	0	2	1
7.	ES	24ES02101P	Electrical & Electronics Engineering Workshop	0	0	3	1.5
8.	PC	24PC05101P	Data Structures Lab	0	0	3	1.5
9.	ES	24ES05102P	IT Workshop	0	0	2	1
10.	HM	24HMHS103L	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
Total				10	3	15	20.5

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB101T	BS	Linear Algebra & Calculus (Common for all branches of Engineering)	2	1	0	3

Pre Requisites: Basic Knowledge of Mathematics

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):

On successful completion of the course, Student will be able to

CO1: Analyze the consistency and solution of systems of linear equations using matrix methods including echelon forms, normal forms, Gauss-Jordan method, and iterative techniques. (L4)

CO2: Apply the concepts of Eigenvalues, Eigenvectors, and orthogonal transformation to solve real-life problems. (L3)

CO3: Interpret the implications of Mean Value Theorems and apply Taylor's and Maclaurin's series to approximate and analyze the behavior of functions in single-variable calculus. (L4)

CO4: Examine functions of several variables using partial derivatives, Jacobians, and series expansions, and determine critical points using methods like Lagrange multipliers. (L4)

CO5: Evaluate double and triple integrals in various coordinate systems and apply them to determine areas and volumes in multivariable contexts. (L4)

Unit I: Matrices:

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 equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

Unit II: Eigen values, Eigenvectors and Orthogonal Transformation:

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit III: Calculus:

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 Applications (Multi variable calculus):

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions 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):

Double integrals, triple integrals, change of order of integration, change of variables to polar, 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. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th 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, Michael Greenberg, Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB104T	BS	Chemistry (Common to EEE, ECE, CSE, AI&DS & CSE(AI))	3	0	0	3

Pre-Requisites: Fundamentals of Chemistry

Course Objectives:

1. To understand the concepts of Schrodinger wave equation and molecular orbital theory
2. To understand and apply the concepts of semiconductors, super conductors and nano materials
3. To understand and apply the concepts of electrochemistry effectively.
4. To train the students on the fundamentals and applications of polymers.
5. To introduce basic principles of spectroscopy and chromatography

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the Fundamentals of Quantum mechanics, Apply Schrodinger wave equation to illustrate the molecular orbital energy level diagram for different di- atomic molecules (L3)

CO2: Apply the principle of Band diagrams and classify the Semiconductors, Super conductors, Supercapacitors & Nano materials and demonstrate their applications (L3)

CO3: Analyze electrochemical principles to calculate cell potentials and interpret titration curves, and evaluate the working mechanisms of batteries, fuel cells, and electrochemical sensors. (L4)

CO4: Differentiate between types of polymerization mechanisms and polymer classes, and examine the structure–property relationships and applications of thermoplastics, elastomers, conducting, and biodegradable polymers. (L4)

CO5: Interpret spectroscopic and chromatographic data using principles like Beer-Lambert's law, and analyze the instrumentation and applications of UV-Vis, IR spectroscopy, and HPLC techniques. (L4)

Unit I: Structure and Bonding Models:

Fundamentals of Quantum mechanics- Planck's quantum theory, Dual nature of matter, Schrodinger wave equation, significance of ψ and ψ^2 , particle in one-dimensional box, molecular orbital theory- Bonding in homo and heteronuclear di-atomic molecules, Energy level diagrams of N_2 , O_2 and CO, NO. π - molecular orbital diagrams for butadiene and benzene, calculation of bond order.

Unit II: Modern Engineering materials:

Semiconductor materials: Introduction, Types of semiconductors, P- type and N- type semiconductors, Band diagrams for conductors, semiconductors and insulators, role of doping on band structures, Applications. **Super conductors** - Introduction, Classification, Properties and Applications. **Supercapacitors:** Introduction, Construction and working, Classification – Applications. **Nano chemistry:** Introduction, classification of nano materials, properties and applications of Fullerenes, carbon nano tubes and Graphene's nanoparticles

Unit III: Electrochemistry and Applications:

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems. **Potentiometry-** potentiometric titrations (redox titration), 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, polymer electrolyte membrane fuel cells – working of the cells.

Unit IV: Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation. **Plastics** - Thermoplastics and Thermosettings, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibers. Elastomers–Buna-S, Buna-N - preparation, properties and applications. Conducting polymers–polyacetylene, polyaniline, mechanism of conduction and applications. Biodegradable polymers- PGA & PLA.

Unit V: Instrumental Methods and Applications:

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law, UV-Visible, Electronic transition, Instrumentation, IR Spectroscopies fundamental modes and selection rules- Instrumentation, Chromatography- Basic principle, classification – HPLC - principle, instrumentation and applications.

Text Books:

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

Reference Books:

1. G.V. Subba Reddy, K.N. Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

Reference Website:

1. <https://youtu.be/Oal2zQ84je4?si=d67NlidzOTfrfEon>
2. <https://youtu.be/qbxRHHnmvJk?si=soLaMMqXYV8xswri>
3. <https://youtu.be/CKyo2M1mNqQ?si=xLqBkrqtYm3uyN3G>
4. https://youtu.be/rG1qDXuRRoE?si=O0z5iQg7AUIZ_2Ik
5. https://youtu.be/Mig9b5hra-k?si=A6Q5vUJ--M4Nv31_

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS101T	HM	Communicative English (Common to all branches of Engineering)	2	0	0	2

Pre-Requisites: Basics of LSRW skills

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 make them effective in speaking and writing skills and make them industry ready.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues. (L2)

CO2: Apply grammatical structures to formulate sentences and correct word forms. (L3)

CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions. (L4)

CO4: Evaluate reading / listening texts and to write summaries based on global – Comprehension of these texts. (L5)

CO5: Create a coherent paragraph, essay, and resume. (L6)

Unit I: Human Values: Gift of Magi (Short Story)

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.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

Unit II: Nature: The Brook by Alfred Tennyson (Poem)

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

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

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

Writing: Structure of a paragraph - Paragraph writing (specific topics)

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.

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:** Summarizing, Note-making, paraphrasing
- 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 text to convey information, reveal trends/patterns/ relationships, communicate processes or display complicated data.
- Writing:** Letter Writing: Official Letters, Resumes
- 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:** Writing structured essays on specific topics.
- 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.
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

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES01101T	ES	Basic Civil and Mechanical Engineering (Common to All branches of Engineering)	3	0	0	3

Part – A: Basic Civil Engineering

Pre-Requisites: Basic Knowledge in Physics & Chemistry

Course Objectives:

1. Get familiarized with the scope and importance of Civil Engineering sub-divisions.
2. Introduce the preliminary concepts of surveying
3. Acquire preliminary knowledge on Transportation and its importance in nation's economy and also learn water resource and water quality.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Identify the roles and disciplines within civil engineering and apply basic knowledge of construction materials and building techniques, including prefabricated construction, in practical civil engineering contexts. (L3)

CO2: Analyse the methods of horizontal and angular measurements used in surveying and interpret levelling and bearing data to generate contour maps and elevation profiles. (L4)

CO3: Differentiate types of transportation systems and pavement structures, and examine the basic components of water resources and environmental engineering systems including hydrology and water conveyance structures. (L4)

Unit I: Basics of Civil Engineering: Role of Civil Engineers in Society- 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 Techniques.

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

Unit III: 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. **Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. 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.

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2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016.
3. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.

Part-B : Basic Mechanical Engineering

Pre-Requisites: Basic Knowledge in Physics & Chemistry

Course Objectives:

1. Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2. Explain different engineering materials and different manufacturing processes.
3. Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

- CO1:** Identify the role of mechanical engineering across various industrial sectors and apply basic knowledge of engineering materials—including metals, ceramics, composites, and smart materials—in mechanical applications. (L3)
- CO2:** Differentiate between various manufacturing processes including CNC and smart manufacturing, and analyze the working principles of thermal systems such as engines, refrigeration cycles, and hybrid vehicles. (L4)
- CO3:** Examine the operating principles of different power plants and mechanical transmission systems, and classify types of robotic configurations based on their structure and applications. (L4)

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.

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

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05101T	ES	Introduction to Programming (Common to all branches of Engineering)	2	1	0	3

Pre-Requisites: Nil**Course Objectives:**

1. To introduce students to the fundamentals of computer programming.
2. To provide hands-on experience with coding and debugging.
3. To foster logical thinking and problem-solving skills using programming.
4. To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
5. To encourage collaborative learning and teamwork in coding projects.

Course Outcomes (COs):**On successful completion of the course, Student will be able to**

- CO1:** Demonstrate basics of computers, the concept of algorithm & flow chart and analyse the time & complexities of algorithms. (L4)
- CO2:** Write the algorithms, draw the flow charts and develop the programs using conditional statements of C-Language. (L3)
- CO3:** Write the algorithm, draw the flow chart and develop the programs using arrays & strings of C-Language. (L3)
- CO4:** Apply the Pointers & user defined Data types of C language and Develop solutions to real world problems. (L3)
- CO5:** Develop the programs using Functions for real world problems in C language. (L3)

Unit I: Introduction to Programming and Problem Solving:

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), pseudo code. Introduction to 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: Arrays and Strings:

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

Unit IV: Pointers & User Defined Data types:

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

Unit -5: Functions & File Handling:

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Text Books:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988.
2. "Schaum's Outline of Programming with C", Byron S Gottfried, McGraw-Hill Education, 1996.

Reference Books:

1. "Computing fundamentals and C Programming", Balagurusamy, E., McGraw-Hill Education, 2008.
2. "Programming in C", Rema Theraja, Oxford, 2016, 2nd Edition.
3. "C Programming, A Problem-Solving Approach", Forouzan, Gilberg, Prasad, CENGAGE, 3rd Edition.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB104P	BS	Chemistry Lab (Common to EEE, ECE, CSE, AI&DS & CSE(AI))	0	0	2	1

Pre-Requisites: Fundamentals of Chemistry

Course Objectives:

1. To provide solid foundation in chemistry laboratory to solve engineering problems.
2. To Illustrate the applications of conductometry and potentiometry
3. To Illustrates the properties of analytical equipment's like UV-VIS and IR.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Prepare advanced polymer Bakelite materials. (L2)

CO2: Measure the strength of an acid present in secondary batteries. (L3)

CO3: Determine the cell constant and conductance of solutions (L3)

CO4: Analyze some simple organic compounds by IR. (L3)

CO5: Prepare advanced Nano materials. (L2)

List of Chemistry Experiments

1. Estimation of Ferrous Iron by Dichrometry
2. Preparation of a Bakelite
3. Conductometric titration of strong acid vs. strong base
4. Conductometric titration of weak acid vs. strong base
5. Determination of Strength of an acid in Pb-Acid battery
6. Potentiometry - determination of redox potentials and emfs
7. Verify Lambert-Beer's law
8. Determination of cell constant and conductance of solutions
9. Identification of simple organic compounds by IR
10. Preparation of nanomaterials by precipitation
11. Measurement of 10Dq by spectrophotometric method
12. Wavelength measurement of sample through UV-Visible Spectroscopy

Note: Minimum Ten experiments to be performed.

Reference Books:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.
3. Chemistry Laboratory Manual, Sri Krishna Hitech Publishing Company Pvt.Ltd, 2nd Edition, A Ravi Krishanan, B Tirumala Rao, 2020-2021.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS101P	HS	Communicative English Lab (Common to all branches of Engineering)	0	0	2	1

Pre-Requisites: Basics of LSRW skills

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):

On successful completion of the course, Student will be able to

CO1 : Understand the different aspects of the English language proficiency with emphasis on LSRW skills.(L2)

CO2 : Apply communication skills through various language learning activities(L3)

CO3 : Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.(L4)

CO4 : Evaluate and exhibit professionalism in participating in debates and group discussions.(L5)

CO5 : Create effective Course Objectives. (L6)

List of Topics:

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

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*, (2ndEd), Kindle, 2013
5. T. Balasubramanyam, *A Textbook of English Phonetics for Indian Students*, (3rd Ed) Trinity Press.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES03102P	ES	Engineering Workshop (Common to all branches of Engineering)	0	0	3	1.5

Pre-Requisites: Nil

Course Objectives:

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

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Identify workshop tools and their operational capabilities. (L3)

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. (L3)

CO3: Apply fitting operations in various applications. (L3)

CO4: Apply basic electrical engineering knowledge for House Wiring Practice (L3)

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
 - a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
 - a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
 - a) V-fit b) Dovetail fit c) Semi-circular fit
 - d) Bicycle tire puncture and change of two-wheeler tyre
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 joints with coupling for same diameter and with reducer for different diameters.

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. Raghuvanshi, 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.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05101P	ES	Computer Programming Lab (Common to all branches of Engineering)	0	0	3	1.5

Pre Requisites: Nil

Course Objectives:

The course aims at providing students with hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes(COs):

On successful completion of the course, Student will be able to

CO1: Read, understand, and trace the execution of programs written in C language. (L2)

CO2: Select the right control structure for solving the problem. (L3)

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers. (L3)

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C. (L3)

Unit I: Week 1:

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Exposure to Turbo C, gcc
- iii) Writing simple programs using printf(), scanf()

Week 2:

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- i) Sum and average of 3 numbers
- ii) Conversion of Fahrenheit to Celsius and vice versa
- iii) Simple interest calculation

Week 3:

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- i) Finding the square root of a given number
- ii) Finding compound interest
- iii) Area of a triangle using heron's formulae
- iv) Distance travelled by an object

UNIT – II : Week 4:

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.

a. $A+B*C+(D*E) + F*G$ b. $A/B*C-B+A*D/3$

c. $A+++B---A$ d. $J= (i++) + (++i)$

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

Week 5:

Objective: Explore the full scope of different variants of “if construct” namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

Week 6:

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.

ii) Find if the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers.

Unit III: Week 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on 1D array.

iii) The reverse of a 1D integer array

- B. Tech. - CSE (Artificial Intelligence and Machine Learning)
- iv) Find 2's complement of the given binary number.
 - v) Eliminate duplicate elements in an array.

Week 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

Unit – IV : Week 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc () and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc ()

Week 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10: Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

Unit – V: Week 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

- i) Write a C function to calculate NCR value.
- ii) Write a C function to find the length of a string.
- iii) Write a C function to transpose of a matrix.
- iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

Week 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

Week 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using

pointers.

Week14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print the last n characters of a given file.

Text Books:

1. Ajay Mittal, Programming in C: A practical approach, Pearson 1st Edition 2010.
2. Byron Gottfried, Schaum's Outline of Programming with C, Mc Graw Hill; 2nd edition 1996.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India, 1988.
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition, 2011.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS102L	HM	Health and Wellness, Yoga and Sports (Common to all branches of Engineering)	0	0	1	0.5

Pre-Requisites: Nil**Course Objectives:**

1. To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject.

Course Outcomes(COs):**On successful completion of the course, student will be able to****CO1:** Be Physical fit to perform daily routine without undue fatigue.(L2)**CO2:** Be Mentally alert and Socially Cohesive(L2)**CO3:** Consider success and failure equally.**CO4:** Develop Positive Personality. (L3)**CO5:** Improve Leadership qualities. (L3)**Unit I: Health and Fitness:**

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: Yoga:

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: Sports and Fitness:**

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 and running.

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.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB102T	BS	Differential Equations & Vector Calculus (Common for all branches of Engineering)	2	1	0	3

Pre Requisites: Basic Knowledge of Mathematics

Course Objectives:

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

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Solve the differential equations of first order and first degree and apply in Newton's law of cooling and Electrical Circuits applications. (L3)

CO2: Solve the linear constant coefficient differential equations of higher order and apply in L-C-R Electrical Circuits and Simple Harmonic motion applications. (L3)

CO3: Find the solution to Partial Differential Equations and Homogeneous Linear Partial differential equations with constant coefficients and solve real time related problems. (L3)

CO4: Examine the physical meaning of different operators such as gradient, curl and divergence. (L4)

CO5: Determine the Line, Surface and Volume integrals using Vector Calculus and solve related engineering problems. (L4)

Unit I: Differential Equations of First Order and First Degree:

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

Unit II: Linear Differential Equations of Higher Order (Constant Coefficients):

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

Unit III: Partial Differential Equations:

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. Homogeneous Linear Partial differential equations with constant coefficients.

Unit IV: Vector Differentiation:

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

Unit V: Vector Integration:

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 related problems.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education, 2017.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB103T	BS	Engineering Physics (Common for all branches of Engineering)	2	1	0	3

Pre-Requisites: Fundamentals of Physics

Course Objectives:

To bridge the gap between Physics in school at 10+2 level and UG level engineering courses by identifying the importance of 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):

On successful completion of the course, Student will be able to

CO1: Analyze the intensity variation of light due to Interference Diffraction and Polarization. (L4)

CO2: Analyze the properties of crystals and determine the type of structure using the X-ray Diffraction technique. (L4)

CO3: Summarize various types of Polarization of dielectric materials & Classify Magnetic materials. (L4)

CO4: Apply the fundamentals of quantum mechanics & free electron theory to the dimensional motion of particles. (L3)

CO5: Explain the basics concepts in semiconductors and identify the type of semiconductor using Hall effect. (L3)

Unit I: Wave Optics:

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

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).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol’s Prism -Half wave and Quarter wave plates.

Unit II: Crystallography and X-ray Diffraction :

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:

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

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.

Unit IV: Quantum Mechanics and Free electron Theory:

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

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

Unit V: Semiconductors :

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 -- Direct and Indirect Band gap of semiconductors – Hall effect and its applications.

Text Books:

1. Palanisamy ,”Engineering Physics”, Palanisamy, Scitech Publications.
2. K.Thyagarajan ,”Engineering Physics”, McGraw Hill Publications.
3. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.K.shirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019
- 4 Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

- 1.Introduction to solid state physics , Charles kittel 7th Edition , John Wiley and Sons.
2. Gaur and Gupta, “Engineering Physics”, Dhanpatrai Publications.
3. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).
4. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010

Reference Website:

1. <https://www.youtube.com/watch?v=PEXSH8dB-Uk>
2. <https://www.youtube.com/watch?v=YvrwVK9ZqQY>
3. <https://www.digimat.in/nptel/courses/video/115107095/L01.html>
4. <https://www.youtube.com/watch?v=6QUFuZpCgGw>
5. <https://nptel.ac.in/courses/115/105/115105122/>

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES02101T	ES	Basic Electrical and Electronics Engineering (Common to all branches of Engineering)	3	0	0	3

Part - A: Basic Electrical Engineering

Pre-requisites: Fundamentals of Physics

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):

On successful completion of the course, Student will be able to

CO1: Apply KVL & KCL to AC & DC Circuits to determine the various electrical parameters. (L3)

CO2: Explain the construction and working principles of electrical machines and measuring instruments, and compare their functions and applications in practical scenarios. (L4)

CO3: Distinguish between various power generation systems and evaluate domestic energy consumption to calculate electricity bills and implement appropriate electrical safety measures. (L4)

Unit I: 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, 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 (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 Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

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, two-part electricity tariff, calculation of electricity bill for domestic consumers.

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

- B. Tech. - CSE (Artificial Intelligence and Machine Learning) ACEM R24 Regulations
2. Basic Electrical Engineering, [T. K. Nagsarkar](#) and [M. S. Sukhija](#), Oxford University Press, 2017.
 3. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Pearson Publications, 2018, Second Edition.
 4. E. Hughes, Electrical and Electronic Technology, PEARSON , 2010
 5. 5. G. Rizzoni, Principles and Applications of Electrical Engineering, TMH , 2017

Web Resources:

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>
3. <https://archive.nptel.ac.in/courses/108/105/108105053>

Part-B: Basic Electronics Engineering

Pre-Requisites: Fundamentals of Physics and Boolean Algebra

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

Course Outcomes (COs):

On successful completion of the course, Students will be able to

- CO1:** Apply the concept of science and mathematics to understand the working of diodes, transistors with characteristics. (L3)
- CO2:** Describe the operation of rectifiers, regulators, and amplifiers, and analyse the functional blocks of power supplies and electronic instrumentation systems for signal processing applications. (L4)
- CO3:** Interpret number systems and coding schemes, and construct basic combinational and sequential circuits using logic gates and Boolean algebra for digital system design. (L4)

Unit I: Semiconductor Devices:

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode - Zener Effect -Zener Diode and its Characteristics. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics- Elementary Treatment of Small Signal CE Amplifier.

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, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. **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. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

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.

Reference Website:

1. <https://youtu.be/n9ZytPvXi7w>
2. <https://youtu.be/ngznoF6z0aw>
3. <https://youtu.be/S845RG7X70s>
4. <https://youtu.be/1OM3Bd8GXUo>

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES03101T	ES	Engineering Graphics (Common to all branches of Engineering)	1	0	4	3

Pre-Requisites: Basics of Geometry & Mathematics

Course Objectives:

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

Course Outcomes (COs):

On successful completion of the course, Student will be able to

- CO1:** Construct geometrical shapes, regular polygons, and engineering curves using standard drawing instruments and apply appropriate methods to draw plain, diagonal, and vernier scales. (L3)
- CO2:** Draw the orthographic projections of points, lines, and planes in various positions using reference planes and apply projection principles to solve related engineering problems. (L3)
- CO3:** Represent the projections of polyhedral and solids of revolution in different positions, including those inclined to reference planes. (L4)
- CO4:** Determine sectional views and true shapes of solids and develop their surfaces using appropriate geometric methods. (L4)
- CO5:** Convert isometric views to orthographic views and vice versa, and demonstrate basic 2D and 3D object modelling using CAD tools. (L4)

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 method, Cycloids, Involute, Normal and tangent to Curves.

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 Books:

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

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kanniah, 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, Tata McGraw Hill, 2017.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC05101T	PC	Data Structures (Common to CSE, AI&DS and CSE(AI))	2	1	0	3

Pre Requisites: Basic Knowledge in C-Language

Course Objectives:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand the importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

- CO1:** Implement linear data structures using Abstract Data Types (ADTs) and apply basic searching and sorting techniques to solve computational problems with appropriate time and space complexity considerations. (L3)
- CO2:** Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. (L4)
- CO3:** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. (L3)
- CO4:** Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges. (L3)
- CO5:** Design novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems. (L4)

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 Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion 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 etc.

Unit IV: Queues, Deques and Graphs:

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc. **Deques:** Introduction to deques (double-ended queues), Operations on deques and their applications, **Graphs:** Basic Terminology and Representations.

Unit V: Trees & Hashing:

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

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2ndEdition, 2002.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders, 1st edition, 2008.
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft, 1st edition, 2002.
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum, 1st edition, 2006.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, 3rd edition, 2006.
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick, 3rd edition, 2001.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB103P	BS	Engineering Physics Lab (Common for all branches of Engineering)	0	0	3	1

Pre-Requisites: Fundamentals of Physics

Course Objectives:

1. To study the concepts of optical phenomenon like Interference , Diffraction, etc
2. To recognize the importance of energy gap a study of conductivity.
3. To study the parameters and applications of di-electric and magnetic materials by conducting experiments
- 4 .To verify the laws of stretched strings
5. To Plot the intensity of the magnetic field of circular coil carrying current with distance.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

- CO1:** Operate optical instruments like travelling microscope and spectrometer to measure the Various physical quantities. (L2)
- CO2:** Examine the wavelengths of different colors using diffraction grating. (L4)
- CO3:** Plot the intensity of the magnetic field of circular coil carrying current with distance. (L2)
- CO4:** Determine dielectric constant for dielectric materials. (L2)
- CO5:** Calculate the band gap of a given semiconductor and to Identify the type of semiconductor using Hall effect. (L3)
- CO6:** Examine the loss of stretched string using sonometer (L4)

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's Method
11. Determination of Hall voltage , Hall coefficient and type of semiconductor (N-type or P-Type) using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound 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's experiment

Note: Any TEN of the listed experiments are to be conducted and TWO of these TEN experiments may be conducted in virtual mode.

Reference Book:

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/filter?subjects=physics&type=html,prototype>

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES02101P	ES	Electrical and Electronics Engineering Workshop (Common to all branches of Engineering)	0	0	3	1.5

Activities:

- 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.
- 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.
- Components:
 - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
 - 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 instruments

Part A: Electrical Engineering Lab

Pre-requisites: Fundamentals of Physics

Course Objectives:

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

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Verify KVL, KCL & various network theorems and Apply to AC & DC Electrical circuits to measure Electric Circuit parameters (R, L & C), Power, Power factor etc. (L3)

CO2: Conduct Experiments on AC&DC Machines, plot characteristics and measure the various electrical parameters or quantities. (L3)

CO3: Design suitable circuits and methodologies for the measurement of various electrical parameters; House hold and commercial wiring. (L3)

List of experiments:

- Verification of KCL and KVL
- Verification of Superposition theorem
- Measurement of Resistance using Wheat stone bridge
- Magnetization Characteristics of DC shunt Generator
- Measurement of Power and Power factor using Single-phase wattmeter
- Measurement of Earth Resistance using Megger
- Calculation of Electrical Energy for Domestic Premises

Note: Minimum Six Experiments are to be performed.

Reference 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.

Part-B: Electronics Engineering Lab

Pre-requisites: Fundamentals of Physics

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the usage of electronic measuring instruments and Analyze the V-I characteristics of various electronic devices. (L4)

CO2: Develop various Analog Electronic Circuits such as Rectifier, Regulators and Amplifiers (L3)

CO3: Develop Digital Electronic Circuits such as Combinational and Sequential Circuits. (L3)

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Tables of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Reference 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
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: Minimum Six Experiments are to be performed. All the experiments shall be performed using both Hardware and Software

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC05101P	PC	Data Structures Lab (Common to CSE, AI&DS and CSE(AI))	0	0	3	1.5

Pre Requisites: Basic Knowledge in C-Language

Course Objectives:

The course aims at strengthening the ability of the students to identify and apply suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing & accessing data efficiently in algorithms. (L2)

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. (L4)

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. (L3)

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges. (L3)

CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems. (L3)

List of Experiments:**Exercise 1: Array Manipulation**

- i) Write a program to reverse an array.
- ii) C Programs to implement the Searching Techniques –Linear & Binary Search
- iii) C Programs to implement Sorting Techniques –Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

- i) Implement a singly linked list and perform insertion and deletion operations.
- ii) Develop a program to reverse a linked list iteratively and recursively.
- iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

- i) Create a program to detect and remove duplicates from a linked list.
- ii) Implement a linked list to represent polynomials and perform addition.
- iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand its properties and applications.

- ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

- i) Implement a stack using arrays and linked lists.
- ii) Write a program to evaluate a postfix expression using a stack.
- iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

- i) Implement a queue using arrays and linked lists.
- ii) Develop a program to simulate a simple printer queue system.
- iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

- i) Use a stack to evaluate an infix expression and convert it to postfix.
- ii) Create a program to determine whether a given string is a palindrome or not.
- iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

- i) Implementing a BST using Linked List.
- ii) Traversing of BST.

Exercise 9: Hashing

- i) Implement a hash table with collision resolution techniques.
- ii) Write a program to implement a simple cache using hashing.

Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2ndEdition, 2002.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders, 1st edition, 2002.
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft, 1st edition, 2008.
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum, 1st edition, 2006.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, 3rd edition 2006.
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick, 3rd edition, 2001.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05102P	ES	IT Workshop (Common to all branches of Engineering)	0	0	2	1

Pre Requisites: Nil

Course Objectives:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Perform Hardware troubleshooting. (L3)

CO2: Demonstrate the Hardware components and inter dependencies. (L2)

CO3: Safeguard computer systems from viruses/worms. (L3)

CO4: Prepare Document/ Presentation by utilizing computer tools. (L3)

CO5: Perform calculations using spreadsheets. (L3)

PC Hardware & Software Installation:

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit it to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web:

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate to the instructor how to access websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: 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.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: 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 x downloads to avoid viruses and/or worms.

LaTeX and Word:

Task 1: Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word –Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered: -Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: -Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel:

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler -Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: -Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

Lookup/Vlookup

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power Point

Task 1: 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.

Task 2: Interactive presentations -Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting –Background, textures, Design Templates, Hidden slides.

AI Tools –ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: 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."

Task 3: 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?'"

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), 1st Edition, 2004.
5. LaTeX Companion, Leslie Lamport, PHI/Pearson, 1st edition, 1994.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition, 2008.
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rd edition, 2008.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS103L	HM	NSS/NCC/Scouts & Guides/Community Service (Common to all branches of Engineering)	0	0	1	0.5

Pre-Requisites: Nil

Course Objectives:

1. To impart discipline, character, and fraternity amongst young citizens
2. To train them to work in teams/groups to enhance their team spirit.
3. To enable the students to acquire leadership qualities.
4. To induce social consciousness among students through various activities.
5. To instill self-confidence and the ideals of selfless service
6. To engage students in responsible and challenging actions for the common good.

Course Outcomes (COs):

On successful completion of the course, the students will be able to

CO1: Explain the importance of discipline, character and service motto. (L2)

CO2: Outline the needs and problems of the commUnity. (L2)

CO3: Solve some societal issues by applying acquired knowledge, facts, and techniques. (L3)

CO4: Explore human relationships by analyzing social problems. (L4)

CO5: Determine to extend their help for the fellow beings and downtrodden people and Develop leadership skills and civic responsibilities. (L3)

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 societal issues 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
- ii. in the village, identification of problems- helping them to solve via media- authorities experts etc.
 - a. Conducting awareness programs on Health-related issues such as General Health,

iii. Mental health, Spiritual Health, HIV/AIDS,

- a. Conducting consumer Awareness. Explaining various legal provisions etc.
- b. Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population

iv. Education.

- a. 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.