MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

(Deemed to be University)

MADANAPALLE

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

Course Structure

&

Detailed Syllabi

For the students admitted to

B. Tech. Regular Four Year Degree Programme during the Academic Year 2026-27

and

B. Tech. Lateral Entry Scheme during the Academic Year 2027-28



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

(Deemed to be University)

MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

Total Credits	160 Credits for 2026 (Regular) & 120 Credits for 2027 (Lateral Entry) Admitted Batch onwards

I. Induction Program and Holistic Development Activities

Sl.No	Title	Duration
1	Induction Program (Mandatory)	Three weeks' duration at the start of First Year

R25 - Curriculum Structure
I Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	25BAMATTC02	Calculus for Computer Science	3	0	0	3	3
2	BSC	25BACHETC03	SMART Chemistry	3	0	0	3	3
3	ESC	25BACIVTC02	Introduction to Environment and Sustainability	2	0	0	2	2
4	ESC	25BAEEETC03	Digital Design	3	0	0	3	3
5	ESC	25BACADTC01	Python Programming for Problem Solving	3	0	0	3	3
6	ESC	25BAMECEC01	Engineering Graphics	2	0	2	4	3
7	BSC	25BACHELC03	Chemistry Laboratory	0	0	2	2	1
8	ESC	25BACADLC01	Python Programming for Problem Solving Laboratory	0	0	2	2	1
9	ESC	25BACOMLC01	Engineering Skills Laboratory	0	0	2	2	1
10	EEC		**NSDC - Certification Course – I** *(Refer ANNEXURE - II)*	0	0	2	2	-
Total				**16**	**0**	**10**	**26**	**20**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	AEC	25BAENGTC01	Professional Communication	2	0	0	2	2
2	HSMC	25BAHUMTC01	Human Values and Professional Ethics	2	0	0	2	2
3	BSC	25BAMATTC05	Linear Algebra	3	0	0	3	3
4	BSC	25BAPHYTC03	Modern Physics for Quantum Technologies	3	0	0	3	3
5	ESC	25BACADTC02	C and Data Structures	3	0	0	3	3
6	PCC	25BACADTC03	Foundations of Intelligence Data Systems	3	0	0	3	3
7	AEC	25BAENGLC01	Professional Communication Laboratory	0	0	2	2	1
8	BSC	25BAPHYLC01	Physics Laboratory	0	0	2	2	1
9	ESC	25BACSELC02	IT Essentials Laboratory	0	0	2	2	1
10	ESC	25BACADLC02	C and Data Structures Laboratory	0	0	2	2	1
11	EEC		**NSDC - Certification Course – II** *(Refer ANNEXURE - II)*	0	0	2	2	-
Total				**16**	**0**	**10**	**26**	**20**

(L = Lecture, T = Tutorial, P = Practical, C = Credit)

ANNEXURE - I

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- ***Proficiency modules***

  - Basic Computer Proficiency
  - Interpersonal skills
  - Computer Graphics
  - Web programming
  - Mobile Apps
  - Vocabulary enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Universal Human Values (UHV – I)
2. Physical and Health
3. Culture
4. Literature and Media
5. Social Service
6. Self-Development
7. Nature and Environment
8. Innovation

ANNEXURE – II

NSDC Certification Courses

Program Track			
Cyber Security Specialization			
S. No.	**Course Code**	**Course Title**	**Certified By**
1	25BACOMCC01	Device Configuration and Management	Pearson VUE-ITS
2	25BACOMCC02	Networking (CISCO - CCST)	CISCO - CCST
3	25BACOMCC03	Network Security	Pearson VUE - ITS
4	25BACOMCC04	Microsoft Azure (AZ-900)	Microsoft
5	25BACOMCC05	Microsoft Security, Compliance, and Identity Fundamentals (SC-900)	Microsoft
6	25BACOMCC06	Cyber Security	CISCO - CCST
AIML Specialization			
7	25BACOMCC07	HTML 5 Application Development	Pearson VUE
8	25BACOMCC08	Python	Pearson VUE
9	25BACOMCC09	Artificial Intelligence (Pearson VUE)	Pearson VUE
10	25BACOMCC10	Artificial Intelligence (Intel)	Intel
11	25BACOMCC11	Machine Learning (Intel)	Intel
12	25BACOMCC12	Machine Learning (IBM)	IBM
13	25BACOMCC13	Deep Learning with Tensor Flow	Intel
14	25BACOMCC14	Azure AI (AI-901)	Microsoft
Generative AI Specialization			
15	25BACOMCC08	Python	Pearson VUE
16	25BACOMCC15	Data Visualization with Python	IBM
17	25BACOMCC10	Artificial Intelligence (Intel)	Intel
18	25BACOMCC11	Machine Learning (Intel)	Intel
19	25BACOMCC14	Azure AI (AI-901)	Microsoft
20	25BACOMCC16	Generative AI	CCS

Data Science			
S. No.	**Course Code**	**Course Title**	**Certified By**
21	25BACOMCC08	Python	Pearson VUE
22	25BACOMCC17	Statistics 101	IBM
23	25BACOMCC18	Data Analysis with Python	IBM
24	25BACOMCC15	Data Visualization with Python	IBM
25	25BACOMCC11	Machine Learning (Intel)	Intel
26	25BACOMCC14	Azure AI (AI-901)	Microsoft
Cloud Computing & Cybersecurity Specialization			
27	25BACOMCC02	Networking (CISCO-CCST)	CISCO-CCST
28	25BACOMCC01	Device Configuration and Management	Pearson VUE
29	25BACOMCC19	Cloud Computing	Pearson VUE
30	25BACOMCC14	Azure AI (AI-901)	Microsoft
31	25BACOMCC05	Microsoft security, compliance, and identity-(SC-900)	Microsoft
32	25BACOMCC20	Introduction to Containers, Kubernetes, and OpenShift	IBM
IOS Mobile Application Development Specialization			
33	25BACOMCC21	HTML and CSS	Pearson VUE
34	25BACOMCC22	JavaScript	Pearson VUE
35	25BACOMCC23	App Development with Swift Certified User	Apple-SWIFT
36	25BACOMCC24	App Development with Swift Associate	Apple-SWIFT
37	25BACOMCC25	Microsoft Power Platform Fundamentals (PL-900)	Microsoft
38	25BACOMCC26	DevOps	IBM

Data Analytics with Python Specialization			
S. No.	**Course Code**	**Course Title**	**Certified By**
39	25BACOMCC07	HTML5 Application Development	Pearson VUE
40	25BACOMCC08	Python	Pearson VUE
41	25BACOMCC17	Statistics 101	IBM
42	25BACOMCC27	Data Analytics	Pearson VUE
43	25BACOMCC25	Microsoft Power Platform Fundamentals (PL-900)	Microsoft
44	25BACOMCC28	Azure Data Fundamentals (DP-900)	Microsoft
Data Analytics with R Specialization			
45	25BACOMCC07	HTML5 Application Development	Pearson VUE
46	25BACOMCC29	R for Data Science	IBM
47	25BACOMCC30	Data Visualization with R	IBM
48	25BACOMCC31	Machine Learning with R	IBM
49	25BACOMCC10	Artificial Intelligence (Intel)	Intel
50	25BACOMCC28	Azure Data Fundamentals (DP-900)	Microsoft
Creative Design & Multimedia Specialization			
51	25BACOMCC07	HTML5 Application Development	Pearson VUE
52	25BACOMCC32	Adobe Photoshop	Adobe
53	25BACOMCC33	Adobe Illustrator	Adobe
54	25BACOMCC34	Adobe Animate	Adobe
55	25BACOMCC35	Autodesk Maya	Autodesk
56	25BACOMCC36	Adobe Premiere Pro	Adobe

IoT			
S. No.	**Course Code**	**Course Title**	**Certified By**
57	25BACOMCC07	HTML5 Application Development	Pearson VUE
58	25BACOMCC08	Python	Pearson VUE
59	25BACOMCC02	Networking (CISCO-CCST)	CISCO-CCST
60	25BACOMCC37	Internet of Things	IBM
61	25BACOMCC38	Azure Fundamentals (AZ-900)	Microsoft
62	25BACOMCC09	Artificial Intelligence (Pearson VUE)	Pearson VUE
63	25BACOMCC10	Artificial Intelligence (Intel)	Intel
Java Full Stack Development Specialization			
64	25BACOMCC07	HTML5 Application Development	Pearson VUE
65	25BACOMCC39	JAVA	Pearson VUE
66	25BACOMCC40	NoSQL MongoDB	IBM
67	25BACOMCC41	Advanced Java (Servlets & JSP)	Ethnotech
68	25BACOMCC42	Spring Framework	IBM
69	25BACOMCC38	Azure Fundamentals (AZ-900)	Microsoft
Python Full Stack Development Specialization			
70	25BACOMCC07	HTML5 Application Development	Pearson VUE
71	25BACOMCC43	Software Development	Pearson VUE
72	25BACOMCC08	Python	Pearson VUE
73	25BACOMCC40	NoSQL MongoDB	IBM
74	25BACOMCC44	Advance Python (Django / Flask)	Ethnotech
75	25BACOMCC38	Azure Fundamentals (AZ-900)	Microsoft

I Year I Semester

B. Tech I Year I Semester

25BAMATTC02 CALCULUS FOR COMPUTER SCIENCE

L	T	P	C
3	0	0	3

Pre Requisites: Mathematics at Intermediate or Equivalent Level

Course Description:

The course introduces the concepts of single variable and multivariable calculus with the view of its applications in various engineering fields. It prepares the students to develop various methods of finding derivatives and integrals; understanding of concepts related to continuous functions and enrich their experience in critical analysis.

Course Objectives:

1. To illustrate various techniques of testing the convergence of infinite series.
2. To introduces the Fourier Series expansions and beta, gamma functions.
3. To acquire knowledge on fundamental principles of differential calculus and polar graphing.
4. To familiarize the knowledge of limit, continuity, partial derivatives, extreme values in multivariable functions.
5. To emphasize the role of double and triple integrals in dealing with area and volume of the regions.

UNIT I SEQUENCES AND SERIES 9 hours

Sequences and Infinite Series, Convergence and tests for convergence (Comparison test, Ratio test, Root test, Leibniz's Test); Power series and convergence.

UNIT II FOURIER SERIES AND BETA-GAMMA FUNCTIONS 9 hours

Fourier Series, Euler's Formulae, Even and Odd functions, Cosine and Sine Series, Beta and Gamma functions.

UNIT III DIFFERENTIAL CALCULUS & POLAR GRAPHING 9 hours

Rolle's Theorem, Mean value theorems, Indeterminate forms of Limits, Taylor and Maclaurin series, Polar coordinates, Polar Graphing.

UNIT IV MULTIVARIABLE DIFFERENTIAL CALCULUS 9 hours

Functions of severable variables, Limits, Continuity, Partial derivatives, Chain rule, Directional derivative and gradient vectors, Extreme values and Saddle points, Constrained maxima and minima, Lagrange multipliers.

UNIT V MULTIVARIABLE INTEGRAL CALCULUS 9 hours

Multiple Integrals: Double integrals (Cartesian and polar), Reversing the order of integration (Cartesian), Change of integrals (Cartesian to polar), triple integrals, cylindrical and spherical coordinates, Jacobian, Substitutions in Multiple Integrals.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Use the Power series for ascertaining the stability and convergence of various techniques.

CO2: Apply Fourier series to represent periodic functions and evaluate integrals using Beta and Gamma functions.

CO3: Apply the mean value theorems, series expansions and tracing the polar curves in engineering.

CO4: Evaluate the rates of change in time and space variables through the analysis of multivariable functions in engineering.

CO5: Compute multiple integrals in various coordinate systems for engineering applications.

Text Books:

1. George B. Thomas, Maurice D. Weir, Joel R. Hass, Thomas' Calculus, Pearson Education 12th Edition, 2014.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition, 2006.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd. 4th Edition, 2014.
4. Michael D. Greenberg, Advanced Engineering Mathematics, Prentice Hall, 2nd Edition, 1998.
5. Stanley J. Miklavcic, An Illustrative Guide to Multivariable and Vector Calculus, Springer, 2019.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

25BACHETC03 SMART CHEMISTRY

L	T	P	C
3	0	0	3

Pre Requisites: Intermediate Chemistry

Course Description:

SMART Chemistry explores the intersection of modern chemistry, materials science, and computation. The course covers quantum chemistry, group theory, spectroscopy, nanomaterials, molecular logic gates, and bio-inspired computing, emphasizing their applications in molecular electronics and AI-driven chemical systems. Students gain a foundational understanding of advanced chemical principles and futuristic computing paradigms.

Course Objectives:

1. **To develop** an understanding of the principles of quantum chemistry, materials science, group theory, and spectroscopy relevant to computing and molecular technologies.
2. **To enable** students to apply concepts of materials for computing, molecular logic gates, and bio-inspired systems to solve problems in next-generation computing and electronics.
3. **To cultivate** analytical skills for interpreting chemical, spectroscopic, and computational data, and relating them to emerging scientific and technological applications.

UNIT I QUANTUM CHEMISTRY 9 hours

Fundamentals of Quantum mechanics:- Wave-particle duality, Uncertainty principle, Postulates of quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo-diatomic molecules – energy level diagrams of N_2, and O_2, calculation of bond order, π-molecular orbitals of butadiene.

UNIT II GROUP THEORY & SPECTROSCOPY 9 hours

Introduction to group theory, definitions of group, subgroup, Class, Properties of a group, Symmetry elements and symmetry operations, Symmetry point groups, Matrix representation of groups, C_{2V} & C_{2h} point groups. Integration with Quantum Chemistry: Symmetry-informed AI models for molecular structure prediction.

Introduction to spectroscopy, UV-Visible spectroscopy – electronic transitions in MOs, Beer-Lambert's Law - Instrumentation – Applications.

UNIT III MATERIALS FOR COMPUTING 9 hours

Semiconductors – Introduction, basic concept, role of doping agents, applications

Super conductors-Introduction, basic concept, applications.

Conducting polymers – Introduction, mechanism of conduction & applications

Memristors: Concept, working principle, and applications

Nano materials: Introduction, classification, properties and applications (including computing) of Fullerenes, carbon nano tubes and Graphene.

UNIT IV MOLECULAR LOGIC GATES 9 hours

Introduction to Boolean logic, Basic logic gates: AND, OR, NOT, Truth tables and binary language, Transition from silicon to molecules: molecular electronics (VS) molecular logic, Simple chemical input–output systems (e.g., pH, metal ions), Fluorescent and colorimetric logic gates.
Basic examples: (AND gate using acid–base, OR gate using metal ions, NOT gate using quenching), Applications of Molecular Logic, Future of Molecular computing (Limitations and challenges of molecular logic, Comparison with traditional electronics.

Future of Molecular Computing: AI/ML-driven design of molecular circuits, hybrid silicon-molecular architectures.

UNIT V BIO-INSPIRED COMPUTING 9 hours

Introduction to biomolecules, structure & functions of carbohydrates, amino acids, protein, DNA, RNA, neurons, synapses, neuro-muscular junctions (NMJ).
Genes, codons, DNA computing, protein computing, biohybrid robots-Xenobots, Belousov–Zhabotinsky (BZ) reaction and applications.
Introduction to post-CMOS computing, Link to brain-inspired AI (neuromorphic computing)
AI in Bio-computing: ML for genome analysis, protein folding (AlphaFold).

Course Outcomes:

At the end of the course, the students would be able to

CO1: Explain the fundamental postulates of quantum mechanics and the significance of the wave function
CO2: Explain the concepts, properties, and applications of semiconductors, superconductors, conducting polymers, and memristors. Analyze semiconductors, superconductors, polymers, memristors, and nanomaterials for computing, with emphasis on AI-enabled materials discovery.
CO3: Explain Boolean logic, basic logic gates, and the transition from silicon to molecular electronics
CO4: Explain the structure and functions of biomolecules and their roles in biological computing systems
CO5: Explain the basic concepts of group theory, symmetry operations, and point groups, integrating AI/ML approaches for chemical and spectroscopic data interpretation.

Text Books:

1. Quantum Chemistry – Ira N. Levine, 8th Ed., Pearson Education, 2020.

2. Nanostructures and Nanomaterials: Synthesis, Properties and Applications – Guozhong Cao & Ying Wang, 2nd Ed., World Scientific, 2011.

Group Theory and Chemistry – David M. Bishop, Dover Publications, 1993.

3. Artificial Intelligence in Chemistry: Machine Learning and Deep Learning in Chemical and Materials Science – Edited by Hugh Cartwright, Royal Society of Chemistry, 2020.

4 Symmetry and Spectroscopy: An Introduction to Vibrational and Electronic Spectroscopy – Daniel C. Harris & Michael D. Bertolucci, Illustrated Reprint (Dover Publications), November 1, 1989.

5 Recent Developments in Biologically Inspired Computing – L. N. de Castro & F. J. Von Zuben, Idea Group Publishing, 2004.

6 Molecular Logic-based Computation – A. Prasanna de Silva, Royal Society of Chemistry, 2012

Reference Books:

1. Molecular Electronics: An Introduction to Theory and Experiment – Juan Carlos Cuevas & Elke Scheer, 2nd Ed., World Scientific, 2017.
2. Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies – Dario Floreano & Claudio Mattiussi, MIT Press, 2008.
3. Principles of Instrumental Analysis – Douglas A. Skoog, F. James Holler, and Stanley R. Crouch, 7th Ed., Cengage Learning, 2018.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B.Tech I Year I Semester

25BACIVTC02 INTRODUCTION TO ENVIRONMENT AND SUSTAINABILITY

	L	T	P	C
Pre-Requisites: None	**2**	**0**	**0**	**2**

Course Description:

This course provides foundational knowledge of environmental systems, biodiversity, and sustainability. It addresses major environmental challenges like pollution and climate change, and introduces students to key policies, global sustainability frameworks, and sustainable engineering practices.

Course Objectives:

1. Understand the interdependence between environmental system and human well-being.
2. Analyze key environmental issues including pollution, climate change, and resource degradation.
3. Interpret environmental laws, standards, and global sustainability agreements.
4. Evaluate sustainability frameworks and the role of engineering in achieving development goals.
5. Apply sustainable engineering principles to address real-world environmental challenges.

UNIT I ENVIRONMENTAL SYSTEMS 6 hours

Definition, scope, and importance of environment - Components of ecosystem: biotic and abiotic - Energy flow in ecosystems (food chains, food webs) - Biogeochemical cycles: Water, Carbon, Nitrogen - Biodiversity: definition, values, and threats - Overview of natural resources: renewable vs. non-renewable

UNIT II ENVIRONMENTAL CHALLENGES 6 hours

Pollution: definition, types (Air, Water, Soil, Noise) - Causes, effects, and basic control measures - Urbanization – Land degradation - Solid and E-waste management –- Climate change, global warming, greenhouse effect - Ozone depletion and carbon footprint

UNIT III ENVIRONMENTAL POLICIES 6 hours

Overview of ISO 14001:2015 - Roles of CPCB, SPCBs, and NGT - Key environmental acts (Air, Water, Forest, Wildlife) - International agreements: Montreal, Kyoto, Paris Agreement - Basics of Environmental Impact Assessment (EIA) - Introduction to carbon credit and energy auditing

UNIT IV SUSTAINABILITY GOALS 6 hours

Foundations of Sustainability- Definition, Concept, needs and challenges- principles of sustainability - Evolution of Global Sustainability Frameworks - Agenda 21, millennium development goals, and protocols - Sustainable Development Goals - targets, indicators – Role of engineering and technology in achieving SDGs

UNIT V SUSTAINABLE ENGINEERING APPROACHES 6 hours

Introduction to Sustainability in Engineering - Guiding principles and Frameworks for sustainable engineering – Sustainability approaches - Triple bottom Line, Cradle to Cradle concept - Life cycle assessment - Zero waste and R concept - Circular economy - ISO 14000 Series

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Recommend ecofriendly solution to protect ecosystem.
CO2: Identify appropriate pollution control methods for specific situations.
CO3: Demonstrate the use of renewable energy for sustainable development.
CO4: Apply techniques to reduce environmental impact from climate change.
CO5: Utilize environmental laws and policies to promote sustainable practices.

Text Books:

1. R. L. Rag and Lekshmi Dinachandran Remesh. Introduction to Sustainable Engineering. 2nd Edition,PHI Learning Pvt. Ltd., 2016.
2. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Scienceand Conservation. S. Chand Publishing, New Delhi.
3. **Masters, Gilbert M. & Ela, Wendell P.** – *Introduction to Environmental Engineering and Science*, Pearson Education, 3rd Edition, 2013
4. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development,Cengage learning
5. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies,Prentice Hall
6. Richard T. Wright, Dorothy F. Boorse (2017) Environmental Science: Toward A Sustainable Future,Pearson, 13th Edition

Reference Books:

1. R.C. Sohal & S.K. Agrawal – *Environmental Studies*, University Science Press, 2018.
2. Erach Bharucha – *Textbook of Environmental Studies for Undergraduate Courses*, University Grants Commission, 2nd Edition, 2013.
3. Peavy, H.S., Rowe, D.R. & Tchobanoglous, G. – *Environmental Engineering*, McGraw Hill Education, 2017.
4. R.K. Trivedi & P.K. Goel – *An Introduction to Air Pollution*, B.S. Publications, 2015.
5. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley-Blackwel
6. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.
7. Leelakrishnan, P. (2022). *Environmental law in India* (Vol. 1). LexisNexis.
8. Ghosh, S. (Ed.). (2019). *Indian environmental law: Key concepts and principles*. Orient BlackSwan.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

25BAEEETC03 DIGITAL DESIGN

L	T	P	C
3	0	0	3

Pre Requisites: NIL

Course Description:

This course provides a modern introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic, and also the course deals with sequential circuits, State machines, Different representations including truth table; logic gate, timing diagram, switch representation, and state diagram will be discussed.

Course Objectives:

1. To introduce number systems, logic gates, and Boolean algebra.
2. To provide methods for simplifying logical expressions and designing combinational circuits.
3. To develop understanding of sequential circuits and their applications.
4. To explain standard programmable logic devices and memory elements.
5. To familiarize students with digital system design practices.

UNIT I NUMBER SYSTEMS AND LOGIC GATES 9 hours

Number systems and conversions: binary, decimal, octal, hexadecimal. Signed and unsigned numbers. Binary arithmetic: addition, subtraction, multiplication. Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR – truth tables and logic symbols. NAND and NOR Implementation

UNIT II BOOLEAN ALGEBRA AND MINIMIZATION 9 hours

Boolean postulates and laws. DeMorgan's theorems. Standard SOP and POS forms. Boolean Algebra, Minimization of Logic expressions, Quine–McCluskey Method/Tabulation Method, K-Map Simplification (Upto 4-Variable). Realization using logic gates.

UNIT III COMBINATIONAL LOGIC CIRCUITS 9 hours

Design and implementation of combinational circuits: half adder, full adder, subtractor, comparator, multiplexer, demultiplexer, encoder, decoder. Code Converters like Binary to Gray, Gray to Binary conversion.

UNIT IV SEQUENTIAL LOGIC CIRCUITS 9 hours

Latches and flip-flops: SR, JK, D, T – truth tables and excitation tables. Conversion between flip-flops. Counters: asynchronous and synchronous. Shift registers and basic timing diagrams.

UNIT V MEMORY AND PROGRAMMABLE LOGIC DEVICES 9 hours

Memory Hierarchy and classification of memories - RAM, ROM, PROM, EPROM different types. Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Convert and perform arithmetic operations on different number systems.
CO2: Simplify Boolean expressions and implement logic functions.
CO3: Design combinational circuits using standard building blocks.
CO4: Analyze and implement sequential circuits using flip-flops and counters.
CO5: Explain the working of memory devices and programmable logic components.

Text Books:

1. Digital Design, M. Morris Mano, Micheal D. Ciletti, 5th Edition, 2013, Pearson.
2. Digital Logic Design, Leach, Malvino, Saha,TMH

Reference Books:

1. Donald D. Givonne, "Digital Principles and Design" TMH, 2003. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
2. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier
3. Computer System Architecture , M. Morris Mano, 3th Edition, pearson.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

25BACADTC01 PYTHON PROGRAMMING FOR PROBLEM SOLVING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course introduces the fundamentals of programming using Python. It focuses on algorithmic thinking, Python syntax, control structures, functions, built-in data structures, file handling, modules, and packages. The course enables students to develop problem-solving skills and implement efficient Python programs for real-world applications.

Course Objectives:

This course enables students to

1. Understand the fundamentals of algorithms, Python programming environment, data types, operators, and expressions.
2. Develop Python programs using decision-making, iterative, and control statements.
3. Apply string processing techniques and implement modular programs using functions.
4. Utilize Python data structures such as lists, tuples, sets, and dictionaries for data organization and manipulation.
5. Implement file handling operations and develop reusable programs using modules and packages.

UNIT I PYTHON PROGRAMMING FUNDAMENTALS 9 hours

Problem Solving Concepts: Algorithms, Characteristics of Algorithms, Building Blocks of Algorithms, Flow of Program Execution.

Introduction to Python: History of Python, Features of Python Programming, Python Interpreter, Running Python Programs, Python Scripts, Variables, Keywords, Identifiers, Input and Output Statements, Indentation, Comments.

Data Types and Operators: Numeric Data Types, Strings, Boolean Data Type, Type Conversion, Arithmetic Operators, Relational Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and Operator Precedence.

UNIT II PYTHON PROGRAM FLOW AND CONTROL STATEMENTS 9 hours

Decision Making Statements: Introduction to Control Structures, if Statement, if-else Statement, if-elif-else Statement, Nested Conditional Statements.

Iterative Statements: range() Function, for Loop, while Loop, Nested Loops.

Loop Control Statements: break Statement, continue Statement, pass Statement.

UNIT III STRINGS AND FUNCTIONS 9 hours

String Processing: Introduction to Strings, String Operations, String Indexing and Slicing, String Traversal, String Handling Functions, String Methods, String Immutability.

Functions: Introduction to Functions, Defining Functions, Calling Functions, Passing Arguments, Function Parameters, Return Values, Built-in Functions, User-defined Functions, Recursive Functions, Scope of Variables,Global and Local Variables.

UNIT IV PYTHON COLLECTIONS AND DATA STRUCTURES 9 hours

Lists: Introduction to Lists, List Creation, Indexing and Slicing, List Operations, List Traversal, List Methods.

Tuples and Sets: Introduction to Tuples, Tuple Operations and Methods, Introduction to Sets, Set Operations, Set Methods.

Dictionaries and Comprehensions: Introduction to Dictionaries, Creating Dictionaries, Accessing and Updating Dictionary Elements, Dictionary Operations, Dictionary Methods, Sequences, List and Dictionary Comprehensions.

UNIT V FILE HANDLING, MODULES AND PACKAGES 9 hours

File Handling: Introduction to Files, Types of Files, File Handling Modes, Opening and Closing Files, Reading Data from Files, Writing Data into Files, Appending Data to Files, Exception Handling in File Operations.

Modules and Packages: Need for Modular Programming, Creating Modules, Import Statement, From Import Statement, Namespace, Standard Python Modules, User-defined Modules, Creating and Using Packages.

Course Outcomes:

After successful completion of the course, students will be able to:

1. CO1: Explain Python programming fundamentals, data types, operators, expressions, and basic problem-solving techniques.
2. CO2: Develop Python programs using conditional statements, loops, and control statements.
3. CO3: Implement string manipulation techniques and design modular programs using functions and recursion.
4. CO4: Apply Python data structures including lists, tuples, sets, and dictionaries to solve computational problems.
5. CO5: Develop Python applications using file handling concepts, modules, and packages.

Text Books

1. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press, 2017.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2015.

Reference Books

1. Mark Lutz, Learning Python, 5th Edition, O'Reilly Media, 2013.
2. Wesley J. Chun, Core Python Applications Programming, 3rd Edition, Pearson Education, 2012.
3. John V. Guttag, Introduction to Computation and Programming Using Python, 2nd Edition, MIT Press, 2016.
4. Paul Barry, Head First Python, 2nd Edition, O'Reilly Media, 2016.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech I Year I Semester

25BAMECEC01 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Pre-requisite: None

Course Description:
This course introduces the fundamentals of Engineering Graphics and its applications, with hands-on practice using AutoCAD and Autodesk Fusion 360. It covers orthographic projection of points, lines, planes, and solids, including sectional views and surface developments. Students will learn to interpret and convert between isometric and orthographic views, as well as perform simple 2D drawings and 3D modelling. The course emphasizes visualization skills and technical drawing practices essential for engineering design and communication.

Course Objectives:
This course is designed to:

1. Provide fundamental knowledge of engineering graphics and its applications in design and communication.
2. Develop skills in orthographic projections of points, lines, planes, and solids.
3. Enable students to visualize and represent sections and development of engineering solids.
4. Familiarize students with isometric and orthographic views and their interconversion.
5. Introduce computer-aided design (AutoCAD and Autodesk Fusion 360) for 2D drafting and simple 3D modelling.

UNIT I INTRODUCTION **12 hours**

Introduction to Engineering Graphics and its Applications. Introduction to AutoCAD commands. Types of Lines, Dimensioning and Geometrical Constructions, Simple 2D drawings using AutoCAD.

UNIT II PROJECTIONS OF POINTS & LINES **12 hours**

Projection of points: Orthographic projections, notation system, positions and projection of points in four quadrants.
Projection of lines: Positions and projection of lines (inclined to one plane, HP/VP).

UNIT III PROJECTIONS OF PLANES & SOLIDS **12 hours**

Projection of planes: Positions and projection of planes (inclined to two planes, HP and VP).
Projection of solids: Projections of regular solids. (resting on HP and axis inclined to HP only).

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **12 hours**

Section of solids: Sectional view of regular solids (cutting plane inclined to HP) and its true shapes.
Development of Surfaces: Development of surfaces of regular solids (Prism and Pyramid only).

UNIT V ISOMETRIC, ORTHOGRAPHIC VIEWS AND SIMPLE 3D MODELLING **12 hours**

Conversion of isometric views into orthographic views and vice-versa.
3D Modelling: Introduction to 3D modelling. Simple 3D modelling using Autodesk Fusion 360. (Software practice only. Not for examination)

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Interpret and apply AutoCAD commands to create simple 2D engineering drawings.
CO2: Construct orthographic projections of points, lines, and planes in different quadrants.
CO3: Generate projections of solids, sectional views, and true shapes.
CO4: Develop surface diagrams of prisms and pyramids and apply them to practical applications.
CO5: Convert between isometric and orthographic views and create simple 3D CAD models using Fusion 360.

Text Books:

1. K.L. Narayana & P. Kannaiah, *Engineering Graphics*, 4th Edition, Scitech Publications, 2021.
2. K. Venugopal & V. Prabhu Raja, *Engineering Drawing + AutoCAD*, 7th Edition, New Age International, 2022.
3. Dhananjay A. Jolhe, *Engineering Drawing with an Introduction to AutoCAD*, 5th Edition, McGraw Hill Education, 2023.

Reference Books:

1. N.D. Bhatt & V.M. Panchal, *Engineering Drawing: Plane and Solid Geometry*, 56th Edition, Charotar Publishing House, 2023.
2. Shah, P.J., *Engineering Drawing*, 3rd Edition, Pearson Education, 2021.
3. Agrawal B. & Agrawal C.M., *Engineering Graphics*, 2nd Edition, Tata McGraw Hill, 2020.

Online Learning Resources:

1. National Programme on Technology Enhanced Learning (NPTEL), Engineering Graphics – IIT Kharagpur. Available at: https://nptel.ac.in/courses/11210560
2. Autodesk Education, AutoCAD & Fusion 360 Learning Resources. Available at: https://www.autodesk.com/education/edu-software/overview
3. Coursera, Engineering Drawing and Visualization – Georgia Tech. Available at: https://www.coursera.org/learn/engineering-drawing

Mode of Evaluation: Continuous Assessment, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

25BACHELC03 CHEMISTRY LABORATORY

L	T	P	C
0	0	2	1

Pre Requisites: NIL

Course Description:

This laboratory course provides practical training in classical volumetric and instrumental analytical techniques, alongside modern experimental approaches including nanomaterials synthesis, conducting and biodegradable polymers, spectroscopy, and molecular logic gates. Emphasis is placed on sustainable methodologies, quantitative data analysis, and applications of bio-inspired computing in chemical systems.

Course Objectives:

- To verify the fundamental concepts with experiments

List of Experiments:

From the following 17 experiments, students are required to perform any 10 using volumetric and/or instrumental methods of analysis. Wherever applicable, modeling software may also be used.

1. Preparation of a nanomaterial.
2. Demonstration of a two-input molecular AND logic gate based on two chemical inputs using spectroscopy
3. Demonstration of a three-input molecular AND logic gate based on three chemical inputs
4. using spectroscopy
5. Determination of λmax for molecules using UV-VISIBLE spectroscopy
6. Synthesis of polyaniline conducting polymer
7. Demonstration of a two-input molecular OR logic gate based on two chemical inputs
8. Estimation of ferrous ion by colorimetry
9. Demonstration of a two-input molecular AND logic gate based on two chemical inputs using titrimetry
10. Green synthesis of PVA/Starch biopolymer (biodegradable materials for sustainable tech)
11. Synthesis of PVA biopolymer
12. Estimation of Ascorbic acid
13. Demonstration of a two-input molecular NOT logic gate based on two chemical inputs
14. Verification of Beer-Lambert's Law

15. Determine reaction order and rate constant using MS-excel regression model
16. Conductometric titration of strong acid vs strong base
17. Conductometric titration of weak acid vs strong base
18. Determination of amino-acid sequence and ID of a protein from a DNA/protein input.

Course Outcomes:

CO1: Apply volumetric, colorimetric, conductometric, and spectroscopic techniques to determine physicochemical properties and composition of chemical systems.

CO2: Demonstrate the principles of molecular logic gates and their applications in bio-inspired computing through chemical and spectroscopic experiments.

CO3: Design and synthesize nanomaterials, conducting polymers, and biodegradable polymers, highlighting sustainable and green chemistry approaches.

CO4: Analyze kinetic parameters and quantitative data using modern computational tools such as regression models and molecular modeling software.

CO5: Integrate experimental chemistry with interdisciplinary applications in materials science, biopolymers, and biomolecular identification for real-world problem solving.

Text / Reference Books:

1. Vogel's Textbook of Quantitative Chemical Analysis – J. Mendham, R.C. Denney, J.D. Barnes & M.J.K. Thomas, 6th Ed., Pearson Education, 2000.
2. Instrumental Methods of Chemical Analysis – B.K. Sharma, 23rd Ed., Goel Publishing House, 2007.
3. Molecular and Supramolecular Information Processing: From Molecular Switches to Logic Systems – Evgeny Katz (Ed.), Wiley-VCH, 2012.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

25BACADLC01 PYTHON PROGRAMMING FOR PROBLEM SOLVING LABORATORY

L	T	P	C
0	0	2	1

Pre-requisite: NIL

Course Objectives:

1. Understand Python fundamentals, algorithms, data types, operators, and expressions.
2. Develop Python programs using decision-making, looping, and control statements.
3. Apply string handling concepts and implement modular programs using functions.
4. Utilize Python data structures such as lists, tuples, sets, and dictionaries for problem-solving.
5. Implement file handling, modules, and packages to develop reusable applications.

Programs:

1. Develop a Python program to create a personal expense calculator that accepts a user's monthly income and expenses such as food, transport, education, and other expenses. Calculate the total expenditure and remaining savings. Display the monthly expense summary.
2. An electricity department wants to automate the billing process. Write a Python program that accepts customer details and number of units consumed. Calculate and display the total electricity bill amount based on the given charges.
3. A weather monitoring application requires conversion of temperature values. Develop a Python program to accept temperature in Celsius and convert it into Fahrenheit and Kelvin.
4. An online examination system evaluates student performance automatically. Write a Python program to accept student marks, calculate percentage, determine pass/fail status, and assign grades based on the percentage obtained.
5. A banking organization wants to simulate basic ATM operations. Develop a Python program to perform balance enquiry, deposit, and withdrawal operations repeatedly using menu-driven options until the user chooses to exit.
6. An organization maintains employee attendance records. Write a Python program to calculate attendance percentage by accepting the number of working days and attended days. Display eligibility status based on attendance percentage.
7. An online application requires a password verification system for secure user registration. Write a Python program using functions to check password strength based on length, uppercase letters, lowercase letters, digits, and special characters.
8. A university stores student information digitally. Develop a Python program to perform string operations such as extracting student initials, converting names into required formats, and displaying formatted student details.
9. Design a Python-based calculator application using user-defined functions to perform arithmetic operations. Implement a recursive function to calculate the factorial of a given number.
10. A university wants to analyze student marks in a course. Develop a Python program using list operations to store marks of students and perform the following operations:
    a. Add new student marks to the list.
    b. Remove incorrect entries.
    c. Find highest and lowest marks.
    d. Calculate average marks.
    e. Sort the marks in ascending and descending order.
    f. Display the final marks list.
11. An organization maintains fixed employee information. Develop a Python program using tuples to:

a. Store employee details.

b. Access employee information.
c. Perform tuple operations.

12. A social media platform wants to analyze user connections. Develop a Python program using sets to:
a. Find common friends.
b. Find unique friends.
c. Suggest new connections.
13. A supermarket wants to manage product information. Create a Python program using dictionaries to:
a. Store product ID, name, and price.
b. Search products.
c. Update product information.
d. Display inventory details.
14. An organization wants to maintain employee payroll records permanently. Develop a Python program using file handling concepts to store employee details, retrieve employee records, and display salary information.
15. A college examination cell wants to maintain student results electronically. Write a Python program to store student marks into a file, read the stored information, calculate results, and generate a student performance report.
16. A banking system requires reusable program components. Develop a Python application by creating user-defined modules for account creation, deposit, withdrawal, and balance enquiry. Store transaction details using files.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1: Develop Python programs using basic syntax, data types, operators, and input/output operations.

CO2: Implement programming solutions using conditional statements, loops, and control statements.

CO3: Apply strings and functions to design modular Python programs.

CO4: Analyze and solve problems using Python data structures and their operations.

CO5: Create application-based Python programs using file handling, modules, and packages.

Text Books:

1. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press, 2017.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2015.

Reference Books:

1. Mark Lutz, Learning Python, 5th Edition, O'Reilly Media, 2013.

2. Wesley J. Chun, Core Python Applications Programming, 3rd Edition, Pearson Education, 2012.
3. John V. Guttag, Introduction to Computation and Programming Using Python, 2nd Edition, MIT Press, 2016.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

25BACOMLC01 ENGINEERING SKILLS LABORATORY

L	T	P	C
0	0	2	1

Pre-Requisites Nil

Course Description:

This course provides hands-on experience in using basic electrical/electronic instruments and circuit design. and to develop practical skills in microcontroller programming and device interfacing for real-time applications. And provides hands-on training in fundamental manufacturing and fabrication processes used in mechanical engineering. Students will develop practical skills through activities such as sheet metal product development, plastic fabrication, 3D printing, woodwork using carpentry tools, laser engraving, and metal welding. The course also introduces the operation and applications of various mechanical power tools, CNC lathe, and milling machines, enabling learners to gain exposure to modern and traditional manufacturing techniques.

Course Objectives:

By the end of this course, the student will be able to:

1. To provide hands-on experience in using basic electrical/electronic instruments and circuit design.
2. To develop practical skills in microcontroller programming and device interfacing for real-time applications.
3. Provide hands-on experience in basic fabrication processes using sheet metal, plastics, wood, and welding to develop simple utility products.
4. Familiarize students with modern manufacturing technologies such as 3D printing, CNC machining, and laser engraving for product realization.
5. Enable students to understand, identify, and safely operate various mechanical engineering tools and equipment for engineering applications.

PART – A

Study Experiments:

1. Familiarization with Instrumentation and Tools
2. Understanding the microcontroller architecture and Programming

Choose any six from the following list of experiments:

1. Clock Pulse Generation and Signal Analysis using Digital Storage Oscilloscope (DSO).
2. Measurement of Electrical Power, Power Factor, and Energy using Portable Meters.
3. Study, Design and Testing of Full-Wave Bridge Rectifier Circuit.
4. Study, Design and Implementation of a SMPS.
5. Study, Design and Testing of Multiplexer using Logic Gates.
6. Interfacing of 7-Segment Display, Buzzer, Sensor with microcontroller.
7. Speed and Angle Control of Servo Motor using Microcontroller.
8. PCB Soldering Techniques and Testing Using a Multimeter.

Content Beyond the Syllabus (Virtual Laboratory)

9. Familiarisation of ICs.
10. Application of basic logic gates in fire and burglar alarms.
11. Wiring of a simple circuit for controlling

    (1) a lamp/fan point,
    (2) a staircase or corridor winding,
    (3) an electrical appliance (16A socket).

PART – B

List of Experiments:

1. Utility product development using sheet metal.
2. Plastic product fabrication.
3. 3D printing of simple components.
4. Wood product fabrication using carpentry tools.
5. LASER engraving.
6. Metal welding and fabrication.
7. Study of different mechanical engineering power tools.
8. Study of CNC Lathe and Milling machining processes.

Content beyond Syllabus

9. Plumbing
10. Computer Controlled Cutting of wooden object
11. 3D Machining

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

CO1: Demonstrate soldering, measurement, and testing techniques using basic electrical/electronic instruments.

CO2: Design and implement simple circuits and microcontroller-based applications for power and control systems

CO3: Demonstrate the ability to fabricate simple components using sheet metal, wood, and welding processes.

CO4: Analyze and compare traditional and modern manufacturing techniques such as 3D printing, CNC machining, and laser engraving.

CO5: Select and operate appropriate hand tools, power tools, and machine tools for given product development tasks with safety considerations.

Text Books:

1. R. S. Sedha, A Textbook of Applied Electronics, S. Chand & Company Ltd.
2. Muhammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education.

3. V. Ramesh Babu, Engineering Workshop practice for JNTU, VRB Publishers Pvt. Ltd. 2023.
4. A. K. Sarathe, Engineering Workshop Practice, 1st edition, Khanna Book Publishers, 2022
5. Lab manual provided by the departments.

Reference Books:

1. Boylestad & Nashelsky, Electronic Devices and Circuit Theory, Pearson Education.
2. David A. Bell, Electronic Instrumentation and Measurements, Oxford University Press.
3. The Art of Electronics by Paul Horowitz and Winfield Hill, Cambridge University Press.
4. Sanjay Gupta & Santosh Gupta, SMPS: Switch Mode Power Supply, Technical Publications.
5. Boylestad & Nashelsky, Electronic Devices and Circuit Theory, Pearson Education.
6. P.Kannaiah, K.L.Narayana, Workshop Manual, 2nd Edition, SciTech Publishers, 2009.
7. K.C. John, Mechanical Workshop Practice, 2nd edition, Kindle Edition, 2010.
8. https://fab-coep.vlabs.ac.in/

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination.

I Year II Semester

B. Tech I Year II Semester

25BAENGTC01 PROFESSIONAL COMMUNICATION

L	T	P	C
2	0	0	2

Pre Requisites: Universal Human Values (UHV-I) (desirable).

Course Description :

This course aims to develop essential English communication skills required for academic, social, and professional contexts. Students will learn to convey information effectively. The program enhances reading for comprehension, promotes reading for pleasure, and trains students to write various texts including emails, reports, business letters, presentations, and posters, enabling clear and confident communication in diverse settings.

Course Objectives:

This course aims to:

1. Enable students greet, introduce themselves and others, and describe their daily routines, surroundings, and familiar places.
2. Develop the ability to narrate past events or incidents coherently and to express plans and predictions for the future.
3. Foster functional communication skills such as enquiring, requesting, giving directions, instructions, and reporting information accurately.
4. Cultivate reading proficiency by engaging with stories, enhancing comprehension, vocabulary, and critical appreciation.
5. Equip students with skills in professional writing through emails, reports, letters, posters, and visual presentations.

UNIT I EVERYDAY ENGLISH 6 hours

Basics of essential grammar; Functions of communication such as greetings, introductions, leave-taking, polite expressions; describing daily routines and habits using the simple present tense; Describing things related to family, friends, classroom, home, campus, common places, gadgets and other objects.

UNIT II NARRATION AND PLANNING 6 hours

Using past tense forms for narration; sequencing events using connectors; vocabulary related to experiences, festivals, travel, and memorable events; expressing future time; predicting events and making career plans/prospects

UNIT III FUNCTIONAL COMMUNICATION IN DAILY LIFE 6 hours

Making enquiries using wh-questions, polite questions, and indirect requests; requesting and offering help with expressions for permission, obligation, and necessity; giving directions using common roadmap vocabulary; providing and following formal/informal instructions in everyday and academic contexts; reporting information through direct and indirect speech; impersonal passive voice.

UNIT IV READING FOR COMPREHENSION AND PLEASURE 6 hours

Developing extensive reading skills through prescribed short stories: *The Victory* by Rabindranath Tagore and *The Ransom of the Red Chief* by O Henry; applying techniques of reading such as skimming, scanning, and reading for gist and detail; building vocabulary through the texts; engaging in discussions on characters, settings, and themes from the reading; practicing reading comprehension for specific details through formal email samples.

UNIT V PROFESSIONAL AND BUSINESS COMMUNICATION 6 hours

Learning principles of professional communication such as clarity, conciseness, courtesy, correctness, and formats; Email etiquette; Drafting emails/letters critically appreciating the novel/short story read in Unit 4; preparing short reports; drafting business letters such as inquiries, complaints, replies; designing posters with focus on layout, persuasive language, and visuals; delivering short presentations using visual aids.

Course Outcomes:

Students will be able to:
CO1: Greet and introduce themselves and others, describe their routines, places, and things around them.
CO2: Narrate an event or incident, planning and predicting the future
CO3: Enquire, request, give directions/instructions, report and convey information
CO4: Read for pleasure and read for comprehension
CO5: Write formal/informal emails, short reports, presentations, business letters, and make posters.

Text Books:

1. Functional English for Communication by Ujjwala Kakarla, Tanu Gupta, Leena Pundir (SAGE, 2019)
2. Communication Skills by Sanjay Kumar & Pushp Lata (Oxford University Press, 3rd Edition, 2024)
3. Extensive Reading in the Second Language Classroom" by Richard R. Day and Julian Bamford (Cambridge University Press, 2022).

Reference Books:

1. Functional English Grammar (Cambridge University Press, 2024)
2. Essentials of Business Communication by Mary Ellen Guffey & Dana Loewy (Cengage Learning, 10th Edition, 2016)
3. English for Business Communication by Mable Chan (Routledge, 2025)
4. Handbook of Communication Skills edited by Owen Hargie (Routledge)

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination

B.Tech I Year II Semester

25BAHUMTC01 HUMAN VALUES AND PROFESSIONAL ETHICS

L	T	P	C
2	0	0	2

Pre-requisite None. Universal Human Values (UHV-I) (desirable).

Course Description :

1. This course presents a universal approach to value education by developing the right understanding of reality (i.e., a worldview of the reality "as it is") through the process of self-exploration.
2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of reality are presented, and the students are encouraged to self-explore the proposals by verifying them based on their natural acceptance within oneself and validating experientially in living.
3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.
4. While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students to discern the difference on their own right.
5. Thus, this course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Course Objectives :

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a right understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values (UHV) and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4. To aid the students in realising their full human potential and act accordingly.
5. To assist the students to live with a feeling of relationship, harmony and co-existence.

UNIT I INTRODUCTION TO VALUE EDUCATION 6 hours

Lecture 1: Holistic Development and the Role of Education (Right Understanding, Relationship and Physical Facility)
Lecture 2: Understanding Value Education
Lecture 3: Self-Exploration as the Process for Value Education
Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Lecture 5: Happiness and Prosperity – Current Scenario

UNIT II HARMONY IN THE HUMAN BEING 6 hours

Lecture 6: Understanding Human being as the Co-existence of the self and the body
Lecture 7: The body as an Instrument of the self
Lecture 8: Understanding Harmony in the self
Lecture 9: Harmony of the self with the body
Lecture 10: Programme to ensure self-regulation and Health

UNIT III HARMONY IN THE FAMILY AND SOCIETY 6 hours

Lecture 11: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 12: 'Trust' – the Foundational Value in Relationship
Lecture 13: 'Respect' – as the Right Evaluation
Lecture 14: Other Feelings, Justice in Human-to-Human Relationship
Lecture 15: Understanding Harmony in the Society

UNIT IV HARMONY IN THE NATURE/EXISTENCE 6 hours

Lecture 16: Understanding Harmony in Nature
Lecture 17: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Lecture 18: Realizing Existence as Co-existence at All Levels
Lecture 19: The Holistic Perception of Harmony in Existence

UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS 6 hours

Lecture 20: Natural Acceptance of Human Values
Lecture 21: Definitiveness of (Ethical) Human Conduct
Lecture 22: Competence in Professional Ethics
Lecture 23: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 24: Strategies for Transition towards Value-based Life and Profession

Course Outcomes:

After completing this Unit, students will be able to
CO1: Understand the basic human aspiration and Natural Acceptance.
CO2: Aware of themselves and self-regulation.
CO3: Recognize human-human relationship (Justice) and identify human goals in society.
CO4: Appreciate the harmony in nature and existence.
CO5: Develop as socially and ecologically responsible engineers in handling problems with sustainable solutions (user-friendly and eco-friendly).

Text Book(s)

1. R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 3rd Revised Edition, UHV Publications, Sarva Shubha Nyas, Kanpur, 2023. ISBN: 978-81-957703-7-3 (Printed Copy) ISBN: 978-81-957703-6-6 (e-book)
2. R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for a Foundation Course in Human Values and Professional Ethics,* 3rd Revised Edition, UHV Publications, Sarva Shubha Nyas, Kanpur, 2023.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book), Annie Leonard, Free Press, 2010.
4. The Story of My Experiments with Truth, Mohandas Karamchand Gandhi, Fingerprint! Publishing
5. Small is Beautiful - E. F Schumacher, Random House, 2011.
6. Slow is Beautiful - Cecile Andrews, New Society Publishers, 2006.
7. Economy of Permanence - J C Kumarappa
8. Vivekananda - Romain Rolland

Online Resources:

1. https://fdp-si.aicte-india.org/index.php
2. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
3. https://uhv.org.in/
4. https://www.youtube.com/@UniversalHumanValues/playlists
5. https://www.youtube.com/@mitsmadanapalle3058/playlists

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech I Year II Semester

25BAMATTC05 LINEAR ALGEBRA

L	T	P	C
3	0	0	3

Pre Requisites: 25BAMATTC02

Course Description:

The course provides a comprehensive foundation in linear algebra and its applications. The course explores the theory of matrices, vector spaces, linear transformations, and orthogonality, while also developing computational techniques essential for solving real-world problems in science and engineering.

Course Objectives:

1. To understand the types of matrices and techniques to solve the system of linear equations.
2. To interpret the significance of eigenvalues, eigenvectors and quadratic forms in Engineering problems.
3. To learn the fundamental concepts of vector spaces and bases.
4. To acquire skills in change of coordinatization and linear transformations.
5. To develop the techniques of orthogonality and projections.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9 hours

Matrices- Orthogonal matrix, Idempotent matrix, Partition matrix, Permutation and Boolean Matrices, Reduced Row Echelon form, Rank, Inverses of matrices, System of linear equations, Gaussian Elimination, Gauss-Jordan method, Applications.

UNIT II EIGENVALUES AND EIGENVECTORS 9 hours

Eigenvalues and Eigenvectors, Properties, Diagonalization, Quadratic forms, Cayley-Hamilton theorem (without proof) - computing inverse and powers of a matrix.

UNIT III FINITE DIMENSIONAL VECTOR SPACE 9 hours

Vector spaces, subspaces, span, linear independence, basis and dimension, Coordinates with respect to ordered basis.

UNIT IV COORDINATIZATION AND LINEAR TRANSFORMATIONS 9 hours

Transition matrix for change of Coordinates, Introduction to Linear transformations, matrices of linear transformation, Kernel and Range, Dimension theorem, invertible linear transformations, applications to computer graphics.

UNIT V ORTHOGONALITY AND PROJECTIONS 9 hours

Real inner products, length, distance and angles, Gram-Schmidt orthogonalization, orthonormal bases, orthogonal projections, projection matrix, QR Factorization, Singular Value Decomposition.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Solve the systems of linear equations using matrix operations relevant to computational problems.

CO2: Determine eigenvalues and eigenvectors in real world computing tasks.

CO3: Utilize the concepts of vector space and basis in data modelling.

CO4: Construct linear transformations and compute transition matrices for coordinate transformations.

CO5: Apply orthogonal projections, orthonormal bases and SVD in image compression.

Text Books:

1. Elementary linear algebra, Stephen Andrilli & David Hecker, Academic Press (Elsevier), 4th Edition, 2012.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.
2. Linear Algebra with Applications, Gareth Williams, 9th Edition, Jones & Bartlett Learning, 2018.
3. Jin Ho Kwak and Sungpyo Hong, Linear Algebra, Birkhaüser, Second edition, 2004.
4. Ferrante Neri, Linear Algebra for Computational Sciences and Engineering, Springer, 2nd Edition, 2016.
5. Mark J. DeBonis, Introduction to Linear Algebra, CRC Press, 1st Edition, 2022.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

25BAPHYTC03 MODERN PHYSICS FOR QUANTUM TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisites: Plus two physics fundamental knowledge

Course Description:

This course offers an accessible and engaging introduction to the fundamental concepts of modern physics and their applications in quantum computing. specifically designed for computer science and engineering students. It explores key quantum concepts such as superposition, entanglement, and quantum gates, and explains how these ideas form the foundation of quantum information processing. Students will also explore the hardware side of quantum computing, including optics and photonics-based systems, linear optical components, semiconductor technologies, magnetism, and superconducting qubits used in modern quantum processors. The course combines theoretical understanding with practical insights into the tools, frameworks, and emerging technologies driving real-world quantum computation.

Course Objectives:

1. Understand and apply principles of interference, diffraction, and polarization in advanced optical systems for quantum technologies.
2. Interpret Schrödinger's equation to simple quantum systems and apply quantum tunneling phenomena.
3. Explain quantum superposition, entanglement, and quantum gates for computation.
4. Understand semiconductor physics, quantum Hall effect, and quantum dots in computing hardware.
5. Apply magnetism and superconductivity for superconducting qubits and quantum circuits.

UNIT I WAVE OPTICS 9 hours

Principles of interference, Young's double slit experiment, Newton's rings experiment, Michaelson interferometer, Quantum interference, Principles of Diffraction, Single Slit, double slit, diffraction grating (Qualitative). Polarization and Types, methods of Polarization, Nicol Prism, Beam splitters (Intensity & polarization), phase shifters (Half wave and Quarter wave).

UNIT II QUANTUM MECHANICS 9 hours

De Broglie's hypothesis, Uncertainty principle, Postulates of quantum mechanics - Wave function, Operators, Quantum states and measurement, Hilbert space, Schrodinger wave equations: Time dependent and independent, Applications of Schrodinger wave equation: free particle, particle in a box, and tunnelling.

UNIT III FOUNDATIONS OF QUANTUM COMPUTING 9 hours

Qubit, single and multi-qubit systems, Bloch sphere visualization, Quantum vs classical computers, Principles of superposition, Quantum Parallelism. Measurement of Quantum states and observation, Quantum Entanglement: introduction, EPR pairs and importance in quantum information, Unitary transformations, Elementary quantum gates.

UNIT IV FREE ELECTRON THEORY & SEMICONDUCTORS 9 hours

Quantum free electron theory, origin of energy bands, band structure, classification of materials, density of states, Fermi energy level.

Semiconductor types, intrinsic and extrinsic, Drift and Diffusion Current, Hall effect, 0-, 1-, 2-dimensional quantum materials, Quantum dots, Quantum Dots as Qubits, Quantum Hall Effect (QHE) and Sensors.

UNIT V MAGNETISM AND SUPERCONDUCTIVITY FOR QUANTUM TECHNOLOGIES 9 hours

Magnetism: Atomic origin and classification of magnetic materials, hysteresis, magnons. Superconductors: Type I & II, BCS theory, Josephson junctions, superconducting qubits, Quantum circuits, SQUIDs, superconductors in quantum computers.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Apply optical interference, diffraction, and polarization principles in designing quantum optical systems.

CO2: Solve simple quantum systems using Schrödinger's equation and interpret tunnelling phenomena.

CO3: Represent and manipulate qubit states, superposition, and entanglement using basic quantum gates.

CO4: Understanding semiconductor properties and quantum effects for their role in quantum hardware.

CO5: Apply the magnetic and superconducting principles relevant to superconducting qubits and Quantum circuits.

Text Books:

1. Engineering Physics –Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar & TVS Arun Murthy, 11th editions 2018, S. Chand and Company.
2. Quantum Mechanics, Concepts and Applications (An Indian Adaptation) - **Nouredine Zettili,** 2ed: by Wiley.
3. Quantum Computing: A Beginner's Introduction, - Parag K. Lala, 1st Edition, 2019 McGraw-Hill Education.
4. Quantum Computing for Everyone – Bernhardt, 2020, The MIT Press
5. Engineering Physics - H.K. Malik & A.K. Singh, 2nd Edition, 2018, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Concepts of Modern Physics, - Arthur Beiser, 7th Edition, 2017, TATA Mc Graw Hill
2. Engineering Physics –K. Thyagarajan, 2018, McGraw Hill Publisher
3. Physics Vol I & II, - Halliday/Resnick/Krane 5th Edition, 2007, John Wiley.
4. Quantum Computation and Quantum Information - Nielsen & Chuang, 10th Anniversary Edition, 2010, CAMBRIDGE UNIVERSITY PRESS
5. Solid State Electronic Devices- B.G. Streetman, Sanjay Kumar Banerjee, 7th ed. 2018, Pearson,
6. Superconductivity: Basics and Applications to Magnets - P. N. Barnes, 2015, Springer

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

25BACADTC02 C AND DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite Programming for Problem Solving

Course Description:

This course introduces C programming concepts and fundamental data structures for effective problem-solving. It covers C programming constructs, arrays, functions, structures, pointers, dynamic memory allocation, linked lists, stacks, queues, searching, and sorting techniques. The course enables students to develop structured programs and apply appropriate data structures for efficient data organization and processing.

Course Objectives:

This course enables students to

1. Understand C programming constructs, arrays, functions, and structured programming concepts.
2. Apply pointers, structures, and dynamic memory allocation techniques for efficient programming.
3. Understand fundamental data structures and their organization methods.
4. Implement linked lists, stacks, and queues to solve computational problems.
5. Apply searching and sorting techniques for effective data processing.

UNIT I C PROGRAMMING ESSENTIALS 9 hours

C Fundamentals: Structure of C Program, Data Types, Variables, Constants, Input and Output Statements, Control Statements, Looping Statements.

UNIT II ARRAYS, FUNCTIONS AND STRUCTURES

Arrays and Strings: One-dimensional Arrays, Two-dimensional Arrays, Array Operations, String Declaration, String Handling Functions.

Functions: Function Declaration, Function Definition, Function Call, Parameter Passing, Recursion

Structures: Structure Definition, Structure Variables, Array of Structures, Introduction to Unions

UNIT III POINTERS AND DATA STRUCTURES 9 hours

Pointers: Introduction to Pointers, Pointer Declaration, Pointer Arithmetic, Pointers with Arrays, Pointers with Structures

Data Structures: Need for Data Structures, Types of Data Structures, Abstract Data Types (ADT).

Dynamic Memory Allocation: malloc(), calloc(), free().

UNIT IV LISTS, STACKS AND QUEUES 9 hours

Lists: Introduction, List Operations, Implementation using Singly Linked List

Stacks: Introduction, Stack Operations, Implementation using Arrays, Applications of Stack.

Queues: Introduction, Queue Operations, Linear Queue, Circular Queue, Applications of Queue.

UNIT V SEARCHING AND SORTING 9 hours

Searching Techniques: Linear Search, Binary Search.

Sorting Techniques: Bubble Sort, Selection Sort, Insertion Sort.

Course Outcomes:

After completing this Unit, students will be able to

CO1: Develop C programs using programming constructs, arrays, and functions.

CO2: Implement solutions using structures, pointers, and dynamic memory management concepts.

CO3: Apply fundamental data structure concepts for organizing and managing data.

CO4: Develop applications using linked lists, stacks, and queues.

CO5: Analyze and implement searching and sorting algorithms for problem-solving.

Text Book(s)

1. Seymour Lipschutz, Data Structures with C, Schaum's Outline Series, McGraw Hill Education, 2017.
2. Reema Thareja, Data Structures Using C, 2nd Edition, Oxford University Press, 2014.

Reference Books

1. Yashavant Kanetkar, Let Us C, 18th Edition, BPB Publications, 2021.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2002.
3. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill Education, 2019.

Mode of Evaluation: Assignments, Mid Term Tests, Semester End Examination.

B. Tech I Year II Semester

25BACADTC03 FOUNDATIONS OF INTELLIGENT DATA SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The course introduces the fundamentals of intelligent data systems, Artificial Intelligence, and Data Science for first-year students. It covers data concepts, intelligent systems, machine learning basics, data handling, emerging technologies, and responsible AI applications. The course provides awareness of modern intelligent technologies and their real-world applications.

Course Objectives:

This course enables students to

1. To understand the fundamentals of intelligent data systems and data concepts.
2. To learn the basic concepts of Artificial Intelligence and Machine Learning.
3. To study data collection, organization, storage, and visualization techniques.
4. To explore emerging technologies in AI and Data Science.
5. To understand intelligent applications, ethical issues, and career opportunities in AI & DS.

UNIT I INTRODUCTION TO INTELLIGENT DATA SYSTEMS 9 hours

Data and Information, Types of Data, Structured and Unstructured Data, Characteristics of Intelligent Systems, Introduction to Artificial Intelligence, Introduction to Data Science, AI in Daily Life, Applications of Intelligent Data Systems.

UNIT II FOUNDATIONS OF ARTIFICIAL INTELLIGENCE 9 hours

History of Artificial Intelligence, AI vs Machine Learning vs Deep Learning, Basics of Machine Learning, Types of Machine Learning, Intelligent Agents and Smart Systems, Problem Solving in AI, Applications of Artificial Intelligence.

UNIT III DATA COLLECTION AND DATA HANDLING 9 hours

Sources of Data, Methods of Data Collection, Data Storage Concepts, Data Cleaning and Preparation, Organizing Data using Tables and Charts, Introduction to Databases, Basics of Data Visualization, Role of Data in Decision Making.

UNIT IV EMERGING TECHNOLOGIES IN AI & DS 9 hours

Introduction to Big Data and its Applications, Introduction to Cloud Computing and Types of Cloud Services, Basics of Internet of Things (IoT) and Smart Devices, Introduction to Social Media Analytics, Introduction to Generative AI, Future Trends in Intelligent Technologies.

UNIT V INTELLIGENT APPLICATIONS AND RESPONSIBLE AI 9 hours

Intelligent Personal Assistants, Recommendation Systems Basics, AI Applications in Healthcare, Education and Agriculture, Data Privacy and Security, Ethical Issues in Artificial Intelligence, Responsible AI, Career Opportunities in AI & Data Science.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1: Explain the fundamentals of intelligent data systems and data concepts.

CO2: Describe the basic concepts of Artificial Intelligence and Machine Learning.

CO3: Identify methods of data collection, storage, and visualization.

CO4: Explain emerging technologies and intelligent applications in AI & DS.

CO5: Analyze ethical issues and career opportunities in Artificial Intelligence and Data Science.

Text Books

1. Tom Taulli, *Artificial Intelligence Basics: A Non-Technical Introduction*, Wiley Publications, First Edition, 2019.
2. Joel Grus, *Data Science from Scratch: First Principles with Python*, O'Reilly Media, Second Edition, 2019.
3. D.P. Nagpal, *Computer Fundamentals*, S. Chand Publishing, First Edition, 2010.

Reference Books

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, Fourth Edition, 2021.
2. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press, Fourth Edition, 2020.
3. Foster Provost and Tom Fawcett, *Data Science for Business*, O'Reilly Media, First Edition, 2013.
4. Margaret H. Dunham, *Data Mining: Introductory and Advanced Topics*, Pearson Education, First Edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech I Year II Semester

25BAENGLC01 PROFESSIONAL COMMUNICATION LABORATORY

L	T	P	C
0	0	2	1

Course Description:

This course enhances proficiency in English communication with emphasis on fluency, accurate pronunciation, and confidence. It develops speaking, listening, reading, and writing skills through structured activities. Learners will also develop competence in composing formal correspondence, reports, presentations and designing effective posters.

Course Objectives:

This course aims to:

1. Enable students to confidently greet others, introduce themselves and others in professional and cross-cultural contexts, and describe their everyday routines, roles, environments, and familiar locations with clarity.
2. Build the skill to narrate past experiences, achievements or memorable events clearly and to articulate professional goals, plans and predictions for the future.
3. Enhance practical communication skills such as making enquiries, requesting, giving directions or offering clarifications, and drafting accurate reports in academic and workplace settings.
4. Strengthening reading and listening skills by engaging with stories to improve comprehension, vocabulary, and critical appreciation.
5. Prepare students to compose formal emails, reports, letters, and to make posters, and deliver presentations using effective English expressions, structures, and style.

Lab Activities

Activities shall include listening tasks and a revisit of grammar, vocabulary, pronunciation, and intonation (wherever required)

1. Introduction to sounds of English, stress and intonation for apt pronunciation
2. Greetings; Introducing oneself and others; conversations
3. Describing a person, place, object, etc.
4. Narrating a personal incident/events
5. Planning/predicting a future event/prospects
6. Skit on enquiring and requesting
7. Roleplays on giving formal/informal instructions and reporting what has been done so far in the lab / general scenario
8. Listening to select video/audio and discussing a favorite part of the story/ documentary in groups.
9. Reading comprehension and reading business emails
10. Writing email, letters/reports
11. Presentations and making posters (online and offline)

Course Outcomes:

Students will be able to:

CO1: Speak English fluently with a good pronunciation in an Indian accent, and confidently handle greetings, introductions, and provide descriptions of their routines, locations, and surrounding objects.

CO2: Narrate stories, incidents, or personal experiences, as well as engage in planning and predicting future possibilities using appropriate English structures.

CO3: Demonstrate effective English communication by asking questions, making polite requests, giving instructions, and presenting reports or information clearly.

CO4: Apply listening and reading skills for comprehension, interpretation, and language development in both academic and professional contexts.

CO5: Compose grammatically correct and well-structured formal emails, reports, presentations, and business letters, and design posters with clear English expressions.

Text Books:

1. Communicative English – A Workbook by Shobha K.N. & Rayen J. Lourdes (Cambridge University Press, 2019)

Reference Books:

1. Communication Skills: A Workbook by Sanjay Kumar & Pushp Lata (Oxford University Press, 2019)
2. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities (Board of Editors, Orient Black Swan Pvt. Ltd., 2016)
3. English Language Skills: A Practical Approach by Veerendra Mishra et al. (Cambridge University Press, 2020)

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

25BAPHYLC01 PHYSICS LABORATORY

L	T	P	C
0	0	2	1

Pre-requisites: Plus two physics knowledge

Course Description:

This course offers a comprehensive exploration of fundamental physics principles through a series of well-designed experiments, emphasizing both conceptual understanding and hands-on measurement techniques.

Course Objectives:

1. To experimentally analyze and quantify optical phenomena such as interference, diffraction, and polarization, using techniques like Newton's rings, single slit, and diffraction grating.
2. To determine and understand essential material and electronic properties, including energy gap in semiconductors and the mechanical strength of materials using specialized methods.
3. To measure and interpret magnetic and electromagnetic characteristics by studying B-H curves, magnetic fields, and resonance phenomena in electrical circuits.
4. To estimate fundamental physical constants such as Planck's constant and the charge-to-mass ratio of an electron using classical experimental setups.
5. To develop skills in conducting precise experimental investigations, analyzing data, and deriving key physical quantities relevant to modern physics and engineering applications.

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. To determine the slit width (d) using the diffraction pattern produced by a single slit.
4. To determine the Brewster's angle and refractive index of a glass.
5. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of wavelength of Laser light using diffraction grating.
8. Determination of energy gap of a semiconductor using p-n junction diode.
9. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
10. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
11. Estimation of Planck's constant using photoelectric effect.
12. Determination of numerical aperture and acceptance angle of an optical fiber.
13. To study the frequency response of series LCR circuit-resonance frequency, band width and quality factor.
14. To find the charge to mass ratio of an electron using Thomson's method.

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

Course Outcomes:

CO1: Know the various phenomena of light practically and gain knowledge about various optical technique methods.

CO2: Verify the theoretical concepts of optics, magnetism, waves and oscillations by hands on experiment.

CO3: Apply the scientific process in the conducting of experiments and report the experimental findings.

CO4: Understand mechanical phenomena by instruments and apply them in real time applications.

CO5: Acquire and interpret experimental data to examine the physical laws.

Text / Reference Books:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.
2. Engineering Physics Laboratory Manual, Jayaraman, 2013, Pearson Education.
3. A Course of Experiments with He-Ne Lasers, R.S. Sirohi, New Age International (P) limited, Publishers, 1985.

Web Resources: www.vlab.co.in
https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

25BACSELC02 IT ESSENTIALS LABORATORY

L	T	P	C
0	0	2	1

Pre-requisite: NIL

Course Description:

This course equips students with foundational computing skills, including computer hardware assembly, safe internet usage, professional document creation, cloud collaboration, and responsible use of AI tools for productivity and creativity.

Course Objectives:

1. Understand computer components, assembly, and OS installation.
2. Create documents, spreadsheets, and presentations using productivity tools.
3. Utilize cloud tools for storage, scheduling, and data collection.
4. Explore AI tools for prompts, creative tasks, and translation.
5. Build foundational computing skills with safe internet practices and responsible AI use.

List of Experiments:

1. PC Hardware:

Task 1: Hardware Identification

- Identify common computer peripherals (input, output, storage) and list Central Processing Unit (CPU) components with their functions.

2. Internet & Email:

Task 1: Networking Concepts and Safe Practices

- LAN, MAN, WAN, Wi-Fi, and the Internet.
- Web browsers, web navigation, search engines, web surfing best practices, netiquette, and cyber hygiene (Passwords, Updates, Phishing Awareness, Safe Downloads, Backups).
- Bookmark webpages and configure or showcase a pop-up blocker in a modern browser.

Task 2: Email Operations

- Create an email account, compose and send an email, and demonstrate unsubscribing from unwanted mailing lists using standard unsubscribe mechanisms or settings.

3. Office Productivity Tools (MS-Office/Libre Office):

Word Processor

Task 1: Event Certificate Creation

- Design a professional event certificate:
  - Font formatting (typeface, size, style), Drop Cap for emphasis, Text effects and character spacing adjustments, Borders and color schemes, Header and footer for branding/institutional details, Insert → Date and Time field for event date and Export final certificate to PDF.

Task 2: Newsletter Development

- Create a newsletter:
  - Automatic Table of Contents, Multi-column (newspaper) layouts, Images from local files and LibreOffice Clipart Gallery, Drawing tools and Fontwork for decorative headings, Textboxes for flexible content placement, Paragraph styles for consistent formatting, Built-in Mail Merge Wizard with spreadsheet data.

Spread Sheet

Task 1: Scheduler Creation

- Build a scheduler
    - Gridlines and cell formatting (dates, times, custom formats).
    - AutoFill for repeated patterns, Text formatting for emphasis.

Task 2: GPA Calculator & Visualization

- Create a GPA calculator:
    - Mathematical functions (sum, average, etc.)
    - Charts to visualize data, Hyperlinks for navigation between sheets or to online resources.

Task 3: LOOKUP/VLOOKUP

- Boolean and logical operators, Conditional formatting.

Presentation

Task 1: Interactive Presentation

- Develop an interactive presentation:
    - Insert Hyperlinks, Images, Audio, Video, and Clip Art.
    - Insert tables, and charts.
    - Custom animations, slide transitions, and action buttons.

Task 2: Student Project Presentation using CANVA .

4. Cloud Storage and Calendar:

Task 1: Data Management and Scheduling

- Store, organize, share, and retrieve files using a cloud storage service (e.g., Google Drive), including restoring items from Trash when applicable.
- Schedule activities using a calendar application (e.g., Google Calendar), including creating events, setting recurring schedules, inviting guests, attaching Drive files, and configuring notifications.

Task 2: Event Form Creation (Microsoft/Google/Any online platform)

5. AI Tools & Ethical Usage:

Task 1: Prompt Engineering and Response Evaluation

- Formulate clear, precise prompts or questions for an AI-based tool (e.g., ChatGPT, Gemini).

Task 2: AI-Assisted Creative Writing

- Provide an introductory sentence, paragraph, or descriptive scene to an AI text-generation tool.
- Allow the AI to continue the narrative, ensuring coherence in tone, style, and plot progression.
- Assess the creativity, originality, and narrative flow of the generated content.

Task 3: AI-Powered Language Translation and Plagiarism Check

- Input a sentence or passage in a source language into an AI translation tool.
- Translate it into a target language and review the results for grammar, fluency, and contextual meaning.
- Plagiarism Check for the AI-generated translation to human or reference translations.

Course Outcomes:

After completion of the course, Students will be able to,

CO1: Identify computer hardware, networking basics, and safe internet/email use.

CO2: Create documents, spreadsheets, and presentations using productivity tools.

CO3: Use advanced spreadsheet functions for data analysis and visualization.

CO4: Manage files, schedules, and forms with cloud applications.

CO5: Assess AI tool outputs for accuracy, creativity, and ethical use.

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003.
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft).
5. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme– CISCO Press, Pearson Education, 3rd edition.
6. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and Semester End Examination

B. Tech I Year II Semester

25BACADLC02 C AND DATA STRUCTURES LABORATORY

L	T	P	C
0	0	2	1

Pre-requisite Programming for Problem Solving Laboratory

Course Description:

This laboratory course provides hands-on experience in C programming and fundamental data structures. It focuses on developing programs using control structures, arrays, strings, functions, structures, pointers, dynamic memory allocation, linked lists, stacks, queues, searching, and sorting techniques. The course enables students to apply programming concepts for solving real-world computational problems.

Course Objectives:

The objectives of this laboratory course are to enable students to:

1. Develop C programs using control structures, arrays, and string handling concepts.
2. Implement modular programming concepts using functions, structures, and pointers.
3. Apply dynamic memory allocation and fundamental data structure concepts for efficient data management.
4. Implement linear data structures such as linked lists, stacks, and queues.
5. Apply searching and sorting techniques to solve computational problems.

List of Experiments:

1. Develop a C program for a smart traffic system that determines actions based on traffic signal conditions and vehicle status using decision-making statements.
2. Develop a C program to analyze a given number by checking whether it is prime, palindrome, or Armstrong number using iterative statements.
3. Develop a C program to calculate electricity charges based on units consumed using different tariff conditions and generate the final bill.
4. A weather monitoring system stores daily temperature readings. Write a C program using arrays to find the highest temperature, lowest temperature, and average temperature.
5. Develop a C program for a text processing application to perform string operations such as:
   - Find length of a string
   - Copy one string to another
   - Compare two strings
   - Concatenate two strings

6. Develop a menu-driven C program using functions to perform mathematical operations and calculate factorial using recursion.
7. Develop a C program using structures to maintain book details such as book ID, title, author name, and availability status.
8. An IoT system collects sensor readings. Develop a C program using pointers to access and process sensor data stored in an array.
9. Develop a C program to allocate memory dynamically for storing and processing a collection of values during program execution.
10. Implement a singly linked list to manage songs in a music playlist. Perform:
    - Insert a song
    - Delete a song
    - Display playlist
11. A text editor stores previous actions for undo functionality. Implement stack operations to:
    - Insert new actions
    - Remove recent actions
    - Display history
12. A printer processes multiple printing requests. Implement a queue system to:
    - Add printing requests
    - Process requests
    - Display pending jobs
13. A digital contact directory stores contact numbers randomly. Develop a C program to search for a specific contact number using the linear search technique.
14. A library maintains book IDs in sorted order. Develop a C program to search for a required book ID efficiently using the binary search technique.
15. A gaming platform needs to arrange player scores based on ranking. Develop a C program to sort player scores using bubble sort, selection sort, and insertion sort techniques.

Course Outcomes:

After successful completion of the laboratory course, students will be able to:

CO1: Develop C programs using decision-making statements, loops, arrays, and strings.

CO2: Design modular applications using functions, structures, pointers, and dynamic memory concepts.

CO3: Implement linked list operations for dynamic data organization.

CO4: Develop applications using stack and queue data structures.

CO5: Analyze and implement searching and sorting algorithms for efficient problem-solving.

Text Books:

1. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill Education, 2019.
2. Reema Thareja, Data Structures Using C, 2nd Edition, Oxford University Press, 2014.

References Books:

1. Yashavant Kanetkar, Let Us C, 18th Edition, BPB Publications, 2021.
2. Seymour Lipschutz, *Data Structures with C*, Schaum's Outline Series, McGraw Hill Education, 2017.
3. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, 2nd Edition, Pearson Education, 2002.

Mode of Evaluation: Continuous Internal Evaluation and Semester End Examination.