24UGCBESC101-Discrete Mathematics

Teaching Scheme			Credits: 03	Evaluation Scheme		
Lectures	:	3 Hrs/Week		ISE	:	40 Marks
Tutorials	:	--		ESE	:	60 Marks

Course Description:

This course explores discrete mathematics, including logic, combinatorics, graph theory, and algebra. It develops skills in logical reasoning, problem-solving, and mathematical proofs. Students will apply these concepts to real-world computing challenges

Prerequisites	Basic knowledge of algebra and introductory mathematics is required.

Course Objective: The objectives of this course are

1	To build a strong mathematical foundation for advanced Computer Science studies.
2	To cover discrete mathematics, including discrete objects and countable sets.
3	To develop logical thinking and reasoning skills for computer science.
4	To apply discrete math concepts to real-world computing problems.
5	To enhance problem-solving abilities through mathematical reasoning.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain the principles of Boolean algebra and its significance in digital logic design.	Understand
CO2	Describe mathematical logic, truth table and their applications to programming and hardware design	Understand
CO3	Apply concepts from abstract algebra to analyze and demonstrate the properties of algebraic structures	Apply
CO4	Analyze existing concepts and techniques in graph theory and tree to solve the network problem.	Analyse
CO5	To Examine different counting principles to determine and solve various combinatorial configurations	Understand

Section – I		
Unit-1	**Boolean algebra:** Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.	06 Hours
Unit-2	**Mathematical Logic:** Propositional calculus - propositions and connectives, syntax; Semantics - truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness	08 Hours
Unit-3	**Abstract Algebra:** Set, Relation, Groups, Semi group, Monoids, Subgroups, Abelian groups, cyclic group,Rings, Integral domain, Fields	04 Hours
Section – II		
Unit-4	**Graph theory :** Graphs and digraphs, complement, isomorphism, adjacency matrix, Connectedness and reachability, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments.	06 Hours

Unit-5	**Trees:** Trees, Planar graphs, Euler's formula, dual of a planar graph, Independence number and Clique number, Chromatic number, Graph colouring, Rooted tree, Prefix code and Huffman coding method	06 Hours
Unit-6	**Combinatorics:** Introduction to Basic Counting Principles, Formulae behind nPr, nCr - Balls and Pins problems, Pigeonhole Principle, Recurrence relations, Generating Functions, Introduction to Proof Techniques-Mathematical Induction	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Discrete Mathematics and its applications - Keneth H.Rosen - Khanna Publishers
2	Modern Algebra - A.R.Vashistha - Krishna Prakashan
3	Applied Combinatorics - Alan Tucker – Wiley
4	A text book on discrete Mathematics - C.V.Sastry, Rakesh Nai –Wiley
Reference Books :	
1	Introduction to linear algebra. Gilbert Strang.
2	Introductory Combinatorics, R. A. Brualdi, North-Holland, New York.
3	Graph Theory with Applications to Engineering and Computer Science, N. Deo, Prentice Hall, Englewood Cliffs.
4	Introduction to Mathematical Logic, (Second Edition), E. Mendelsohn, Van-Nostrand, London.

24UGCBBSC102 - Introductory Topics in Statistics, Probability and Calculus

Teaching Scheme			Credits: 04	Evaluation Scheme		
Lectures	:	3 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	:	1		**ESE**	**:**	60 Marks

Course Description:

This course covers key statistical concepts, including data types, probability distributions, and sampling techniques. It focuses on measures of central tendency, dispersion, and the analysis of random variables. Students will apply these methods to solve real-world problems

Prerequisites	Knowledge of basic mathematics and algebra

Course Objective: The objectives of this course are

1	To understand key concepts and techniques in statistics.
2	To develop skills in data analysis and interpretation.
3	To apply statistical methods to solve real-world problems.
4	To provide an overview of partial derivatives and double and triple integral and its applications.

Course Outcomes:

COs	At the end of successful completion of the course, the students will be able to	**Bloom's Taxonomy**
CO1	Calculate partial derivative & find extreme values of function of two variables.	Apply
CO2	Calculate double and triple integral apply to find area and Mass.	Apply
CO3	Identify data types and interpret graphical representations and calculate mean, median, standard deviation.	Understand
CO4	Analyze random variables and their probability distributions.	Understand
CO5	To Apply probability distributions like binomial and normal.	Apply
CO6	Utilize sampling techniques and evaluate standard error.	Understand

Section – I		
Unit-1	**Differential Calculus:** Introduction, Definition: -Differentiation, Rules for Differentiation, Definition: - Partial Differentiation, Partial Differentiation of first order and higher order, Partial Differentiation of some standard function and composite function, Maxima and Minima of function of two variables	07 Hours
Unit-2	**Integral Calculus:** Introduction, Basic Concept of definite and Indefinite integral, Rules for integration, Double integral, Triple integral, Application of double integral: -Area and Mass.	06 Hours
Unit-3	**Introduction to statistics:** Random Variable and types of Random Variable. Two - dimensional random Definition, Data, various types of data, Graphical Representation of data. Measures of central tendency: Mean, Median, Mode and simple properties Measures of Dispersion: Variance, Standard Deviation, Coefficient of Variation. Bivariate data, Marginal and Conditional frequency distribution.	06 Hours
Section – II		
Unit-4	**Probability & Random variable:** Definition of probability, sample space, random variable, Probability mass function, probability density function, mathematical expectation and its properties.	05 Hours

Unit-5	Probability Distributions: Discrete Probability Distribution: -Binomial Distribution & Poisson Distribution, Continuous Probability Distribution: -Geometric Distribution & Normal Distribution	06 Hours
Unit-6	Sampling Techniques: Random sampling. Random Sampling from Finite and Infinite populations. Standard Error. Simple random sampling with and without replacement. Chi-square Distribution test, t – Distribution test, F- Distribution test	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Introduction of Probability Models– S. M. Ross - Academic Press, N.Y
2	Fundamentals of Statistics - I & II - A. Goon, M. Gupta and B. Dasgupta - World Press
3	Higher Engineering Mathematics - B. S. Grewal - Khanna Publication, Delhi
Reference Books :	
1	A first course in Probability– S. M. Ross - Prentice Hall.
2	Probability and Statistics for Engineers– 4th edition – I. R. Miller, J.E. Freund and R – PHI
3	Introductions to the Theory of Statistics- A. M. Mood, F.A. Graybill ,D.C. Boes - McGrawHill Edu
4	Advanced Engineering Mathematics – 7th edition - Peter V. O'Neil- Pearson
5	Applied Mathematics – 1st & 2nd edition - P. N. Wartikar and J. N. Wartikar- Vidyarthi Prakashan.
6	Advanced Engineering Mathematics – 2nd edition - M. D. Greenberg- Tata McGraw.

24UGCBESC103 – Fundamentals of Computer Science

Teaching Scheme			Credits: 03	Evaluation Scheme		
Lectures	**:**	3 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:**			**ESE**	**:**	60 Marks

Course Description: This course introduces essential programming concepts, including data types, operators, control flow, functions, pointers, and arrays. It covers file handling, structures, and Unix system interfaces, equipping students with practical skills for effective software development.

Prerequisites	Fundamentals of Computer

Course Objective: The objectives of this course are

1	To understand fundamental programming concepts and structures.
2	To develop skills in writing and managing functions and data structures.
3	To apply programming techniques to solve real-world problems and work with system interfaces.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Identify and use fundamental programming concepts and data types.	Understand
CO2	Apply control flow statements like loops and conditionals in programs.	Apply
CO3	Understand the use and management of functions, including recursion and scope.	Understand
CO4	Utilize pointers and arrays for efficient data handling and memory management.	Understand
CO5	Apply file I/O operations and interact with Unix system interfaces.	Apply

	Section – I	
Unit-1	**General problem-Solving concepts and Imperative languages**: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops. Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C).Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation	07 Hours
Unit-2	**Control Flow with discussion on structured and unstructured programming:** Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming	06 Hours
Unit-3	**Functions and Program Structure with discussion on standard library**: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Pre-processor, Standard Library Functions and return types	06 Hours
	Section – II	
Unit-4	**Pointers and Arrays:** Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initializations of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated	05 Hours

Unit-5	**Structures:** **Basic Structures :** Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields **Input and Output:** Standard I/O, Formatted Output – printf, Formatted Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions	06 Hours
Unit-6	**Unix system Interface:** File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, make file utility	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-
CO5	2	-	2	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	B. W. Kernighan and D. M. Ritchi, "The C Programming Language", Second Edition, PHI.
2	B. Gottfried, "Programming in C", Second Edition, Schaum Outline Series.
Reference Books:	
1	Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
2	YashavantKanetkar, "Let Us C", BPB Publications.

24UGCBESC104 - Principles of Electrical Engineering

Teaching Scheme			Credits: 02	Evaluation Scheme		
Lectures	**:**	2 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:**	--		**ESE**	**:**	60 Marks

Course Description:

This course covers fundamental concepts in electrical engineering, including DC and AC circuits, electrostatics, capacitors, and batteries. It explores the principles of electro mechanics, sensors, and measurement systems. Students will gain practical knowledge of electrical networks, power analysis, and wiring systems

Prerequisites :	Basic knowledge of mathematics and physics

Course Objective: The objectives of this course are

1	To understand fundamental electrical concepts and circuit analysis techniques.
2	To apply principles of electrostatics, capacitors, and batteries in practical scenarios.
3	To analyze AC circuits and electromechanical systems, including sensors and measurement techniques.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Apply knowledge of basic concepts of work, power, energy for energy conversion and calculate current in electrical network using Kirchhoff's laws.	Apply
CO2	Calculate response of electrical circuit using network theorems	Calculate
CO3	Define basic terms of single phase and three phase ac circuits and supply systems.	Describe
CO4	Describe construction, principle of operation, specifications and applications of capacitors and batteries	Describe
CO5	Apply fundamental concepts of magnetic and electro-mechanics for operation of single-phase transformer, illumination and describe types of wiring and earthling system.	Apply

Section – I

Unit-1	**Introduction:** Concept of EMF, Potential difference, voltage, current, resistance, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis (Numerical Treatment: KCL, KVL-Two Loops)	04 Hours
Unit-2	**DC Circuits:** Ohm Law, Difference between AC and DC Circuit, Thevenin's theorem, Norton's Theorem, Simplifications of networks using series-parallel, Star/Delta transformation. (Numerical Treatment: Simplifications of networks using series-parallel, Star/Delta transformation))	04 Hours
Unit-3	**AC Circuits:** Faradays law, AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, concept of impedance, admittance, active, reactive, apparent power, definition of power factor, Three-phase balanced AC circuits (Y-Δ and Δ-Y): (Numerical Treatment: RL, RC, RLC Series)	05 Hours

Section – II

Unit-4	**Electrostatics:** Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitors in series and parallel, energy stored in capacitors, Principle of batteries, types, construction and working, application. (Numerical Treatment: capacitors in series and parallel)	05 Hours

Unit-5	**Electro-Mechanics:** Self and mutual inductance, Ampere's law, Comparison between magnetic and electric circuits and B-H Curve, Single phase transformer, principle of operation, EMF equation, KVA rating, losses in transformer, efficiency and regulation. (Numerical Treatment: Single phase transformer)	04 Hours
Unit-6	**Measurements and Sensors:** Measuring devices/sensors: Piezoelectric and thermo-couple related to electrical signals, Basic concept of indicating and integrating instruments, Electrical Wiring Different types of lamps like Fluorescent Lamp, Compact Fluorescent Lamp, Sodium Vapor Lamp, Mercury Vapor Lamp., Necessity of earthing, Types of earthing.	05 Hours

Mapping of POs & COs:

PO COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		-		-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	2	-	1	1	2	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	2	2	2	-	-	-	-	-	-	-

References	
Text Books :	
1	Electric Machinery,(Sixth Edition) A.E. Fitzgerald, KingselyJr Charles, D. Umans Stephen, Tata McGraw Hill.
2	A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and Company Ltd. Delhi.
3	Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4	Theory and problems of Basic Electrical Engineering, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.
Reference Books :	
1	Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011
2	Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3	Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book
4	Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

24UGCBBSC105 - Physics for Computing Science

Teaching Scheme			Credits: 02	Evaluation Scheme		
Lectures	**:**	2 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:**	--		**ESE**	**:**	60 Marks

Course Description:

This course explores advanced topics in physics, including oscillations, interference, diffraction, and polarization. It covers lasers, fiber optics, crystallography, semiconductor physics, quantum mechanics, electromagnetism, and thermodynamics. Students will gain an understanding of both theoretical concepts and practical applications in these areas

Prerequisites	Basic understanding of physics and mathematics

Course Objective: The objectives of this course are

1	To understand the principles of quantum mechanics.
2	To discuss various advanced engineering materials and their properties
3	To understand the periodic motion, oscillation and its characteristics.
4	To discuss various properties of material for engineering applications.
5	To familiarize with the phenomenon of light and their engineering applications.
6	To explain various characteristics of LASER and types of Optical Fiber with applications.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Summarize the knowledge of basic quantum mechanics to understand Dualism and their phenomenon.	Understand
CO2	Demonstrate the different crystal structure understanding crystal physics.	Understand
CO3	Apply the theory and phenomenon oscillations to produce various motion by using oscillators	Apply
CO4	Define the fundamental concepts of Electromagnetism, Thermodynamics and Band theory for engineering applications.	Remember
CO5	Illustrate the different phenomena of light.	Understand
CO6	Explain the concepts with applications of LASER and Fiber Optics	Understand

Section – I

Unit-1	**Quantum Mechanics:** Introduction, Plank's quantum theory, Matter waves, de Broglie wavelength, Heisenberg uncertainty principle, time-independent and time-dependent Schrodinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box.	03 Hours
Unit-2	**Crystallography:** Basic terms, Types of crystal systems, Bravais Lattices, Miller Indice d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures, X-ray diffraction	07 Hours
Unit-3	**Oscillation**: Periodic motion, simple harmonic motion, characteristics of simple harmonic motion, the vibration of the simple spring-mass system, Resonance - definition, damped harmonic oscillator, heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.	04 Hours

Section – II		
Unit-4	**Electromagnetism, Thermodynamics and Semiconductor Physics::** **Electromagnetism:** Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium. **Thermodynamics:** Zeroth law of thermodynamics, First law of thermodynamics, Application of First law, Second law of thermodynamics, concept of Engine, Entropy, Change in entropy in reversible and irreversible processes. **Semiconductor:** Conductor, Semiconductor and Insulator, Origin of Band theory, Basic Concept of the Band theory.	05 Hours
Unit-5	**Interference, Diffraction and Polarization of Light**: **Interference:** Theory of Interference fringes, types of interference, Fresnel's prism, Newton's rings, **Diffraction**: Types of diffraction, the difference between interference and diffraction, Fraunhofer diffraction at single slit plane diffraction grating, Temporal and spatial coherence.**Polarization:** Concepts of production of a polarized beam of light from two SHM acting at a right angle, plane, elliptical and circularly polarized light, Brewster's law, Double Refraction.	04 Hours
Unit-6	**LASER and Fiber Optics:** **LASER** Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, Different types of lasers, Ruby Laser, CO2 and Neodymium YAG (Neodymium doped Yirtium Aluminum Garnet); Properties of LASER beams (Monochromaticity, Coherence, Directionality and brightness, LASER speckles), and Applications of LASER in Engineering. **Fiber Optics** Fiber optics, Principle, Advantages, and application, types of optical fibers.	04 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Concepts Of Physics (Fifth edition)ABeiser McGraw Hill International.
2	Fundamentals Optics (Fifth edition) AjoyGhatak, Tata McGraw Hill Sears &Zemansky University Physics, Addison –Wesley Fundamentals of Optics ,(Third Edition)Jenkins

	&White, McGraw-Hill
Reference Books :	
1	R. K. Gaur & Gupta S. L, Engineering Physics –DhanapatRai Publication
2	B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi
3	Subramanyam&BrijLal, A Text Book of Optics –S. Chand & Company (P.) Ltd.
4	M. N. Avadhanulu& P. G. Kshirsagar - A Text Book of Engineering Physics -S. Chand Publication.
5	B. K. Pandey and S. Chaturvedi- Engineering Physics, Cengage Learning

24UGCBHSM106 - Business Communication and Values –I

Teaching Scheme		Credits: 01	Evaluation Scheme		
Lectures	**:** 1 Hrs/Week		**ISE**	**:** --- Marks	
Tutorials	**:** --		**ESE**	**:** 50 Marks	

Course Description: This course help students develop life skills for a balanced life, encourage self-improvement, and introduce key concepts like values and business communication. Enhancing their English grammar and communication skills will boost their performance in assessments and professional interactions.

Prerequisites : Basic English HSC level

Course Objective: The objectives of this course are

1. To develop communication skills and overcome barriers.
2. To enhance verbal aptitude and grammar.
3. To improve listening, speaking, and business correspondence.

Course Outcomes:

COs	At the end of successful completion of the course, the students will be able to	Bloom's Taxonomy
CO1	Recognize the importance of life skills and values in personal and professional growth.	Understand
CO2	Identify personal strengths and areas for improvement to foster self-development.	Understand
CO3	Apply life skills effectively in various real-world situations.	Apply
CO4	Understand and implement key communication practices across different types of interactions.	Understand

	Section – I	
Unit-1	**Communication and Values :** Introduction to Values: Understanding their importance and necessity. Communication Fundamentals: Exploring the significance, process, and levels of communication. Methods of Communication: Distinguishing between verbal and non-verbal forms. Communication Barriers: Identifying obstacles and discovering solutions.	03 Hours
Unit-2	**Communication in Business Context :** Overview of Business Communication: Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions	02 Hours
Unit-3	**Verbal Aptitude :** Grammar: parts of speech-using articles, conjunctions and prepositions; using appropriate tenses, degree, voice Vocabulary: Affixation, synonyms and antonyms, idioms, confusables-homophones and homonyms. Syntax: types of sentences, spotting errors in sentences with justification	03 Hours
	Section – II	
Unit-4	**Enhancing Listening, Speaking, and Thinking Skills** Effective listening: Law of nature- Importance of listening skills, Difference between listening and hearing, process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers Effective speaking: Importance, various oral business contexts/situations, preparing effective public speeches, expressing oneself clearly •Thinking as a learning skill.	03 Hours
Unit-5	**Formal Business Correspondence-1** Principles, structure (elements) Layout (complete block, modified block, semi-block)	02 Hours
Unit-6	**Formal Business Correspondence-2** Types of letters (leave application, enquiry and replies, claim and adjustment	02 Hours

Mapping of POs & COs:

PO COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-		-	-	-	2	2	3	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
CO4	-	-	-	-	-	-	-	1	-	2	-	-
CO5	-	-	-	-	-	-	-	1	2	2	-	-

References	
Text Books :	
1	Communication Skills– 3rd edition - Meenakshi Raman and Sangeeta Sharma – Oxford University Press (OUP)
2	Communication Skills – 2nd edition - Sanjay Kumar and Pushpa Lata- Oxford University Press (OUP)
Reference Books :	
1	Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011

24UGCBESC103LP – Fundamentals of Computer Science Lab

Teaching Scheme		Credits: 01	Evaluation Scheme	
Lectures	: --		**ISE**	: 25 Marks
Practical	: 2 Hrs/Week		**POE**	: 50 Marks

Course Objective: The objectives of this course are	
1	To Develop proficiency in fundamental C programming constructs and techniques.
2	To Implement robust input validation and error handling in C programs.
3	To Enhance problem-solving skills through practical programming challenges.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able**	**Bloom's Taxonomy**
CO1	To Apply various C programming constructs to write and debug programs that effectively solve specified problems.	Apply
CO2	To Analyze and manipulate data through string and file handling, demonstrating an understanding of data processing techniques..	Analyze
CO3	To Create modular and error-resistant C programs using user-defined libraries, showcasing their ability to design and implement complex solutions.	Create

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-

List of Experiments:

01	Write a C program to display a specified pattern using nested loops.
02	Create a C program that prints its own source code as output.
03	Develop a C program that demonstrates the use of arrays with both simple and recursive functions.
04	Implement a C program to count the number of lines, words, and characters in a given text file.
05	Write a C program that utilizes structures and pointers to manage and manipulate complex data.
06	Create a multi-file C program that employs user-defined libraries to enhance code organization.
07	Develop a C program that accepts single alphabetical characters, sorting them and terminating on a non-alphabetical input.
08	Write a C program that checks another C program for common syntax errors, including unbalanced parentheses and quotes.
09	Implement a C program that performs prime factorization of an integer from command-line input, outputting results to both the console and a text file.
10	Create a C program that functions as a basic calculator, using functions to perform arithmetic operations based on user input.

24UGCBBSC104LP - Physics for Computing Science Lab

Teaching Scheme		Credits: 01	Evaluation Scheme	
Lectures	: --		**ISE**	: 25 Marks
Practical	: 2 Hrs/Week		**POE**	: ----

Course Objective: The objectives of this course are

1	To introduce fundamental concepts of oscillations, wave phenomena, and quantum mechanics.
2	To provide an understanding of semiconductor physics, electromagnetism, and thermodynamics with engineering applications.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand basic principles of oscillations, interference, and diffraction, and their applications.	Understand
CO2	Apply concepts of lasers, fiber optics, and crystallography in practical and engineering contexts.	Apply
CO3	Analyze quantum mechanics, electromagnetism, and thermodynamics to solve real-world physics problems.	Analyze

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-

List of Experiments:

01	Determine gravitational acceleration by measuring the oscillation period of a Kater's pendulum.
02	Calculate the torsional constant by analyzing the oscillation period of a torsional pendulum.
03	Verify the inverse square law by measuring light intensity at different distances.
04	Measure the divergence angle of a laser beam
05	Analyze diffraction patterns to determine the wavelength of light using a grating.
06	Assess the resolving power of a diffraction grating with spectral lines.
07	Determine crystal structure and Miller indices using X-ray diffraction.
08	Measure Hall voltage to find the Hall coefficient of a semiconductor.
09	Calculate Planck's constant using the photoelectric effect.
10	Evaluate laser and optical fiber performance by measuring key parameters.

24UGCBBSC104LP - Principles of Electrical Engineering Lab

Teaching Scheme	Credits: 01	Evaluation Scheme
Lectures : --		**ISE** : 25 Marks
Practical : 2 Hrs/Wee		**POE** : 50 Marks

Course Objective: The objectives of this course are	
1	To impart the use of electrical Elements, sources, measuring devices and transducers relatedto electrical circuits experimentally.
2	To verify the network theorems for the electric circuit using hardware.
3	To enable experimental measurement of electrical quantities in DC and AC systems

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand the principles of electrical circuits and measurement techniques.	Understand
CO2	Apply theoretical concepts to validate DC circuit theorems through experiments.	Apply
CO3	Analyze circuit performance and behavior in RL, RC, and AC circuits using practical measurements.	Analyze

Mapping of POs & COs:

PO COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	-	-	-	-

List of Experiments:	
01	Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical.
02	Determination of resistance temperature coefficient.
03	Verification of Superposition Theorem.
04	Verification of Norton Theorem
05	Verification of Maximum Power Transfer Theorem.
06	Simulation of R-L-C series circuits for XL>XC , XL< XC.
07	Simulation of Time response of R-C circuit.
08	Verification of relation in between voltage and current in three phasebalanced.
09	Demonstration of measurement of electrical quantities in DCand AC systems.
10	Measure the time constant of an RC circuit and analyze its impact on charging and discharging rates.

24UGCBHSM106LP Business Communication and Value Science -I Lab			
Teaching Scheme	**Credits: 01**	**Evaluation Scheme**	
Lectures : --		**ISE** : 25 Marks	
Practical : 2 Hrs/Week		**POE** : ----	

Course Objective: The objectives of this course are	
1	To Enhance students' understanding of English sounds for improved pronunciation.
2	To Develop students' listening and speaking skills through practical exercises.
3	To Strengthen grammatical competence to enable effective communication

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Analyze English sounds and grammar to improve professional communication.	Analyze
CO2	Apply effective listening techniques in everyday interactions.	Apply
CO3	Construct and deliver impactful public speeches.	Construct

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-			-	-	-	2	2	3	-	1
CO3	-	-	-	-	-	-	-	2	2	2	-	-

List of Experiments:	
01	**Ice Breaking**: Introduce yourself and others using adjectives and phrases for effective communication.
02	**Life Skills Presentation**: Present on a favorite sports captain, focusing on the skills and values they demonstrate.
03	**Phonetics Practice**: Explore consonants, vowels, and diphthongs in English, practicing pronunciation with audio-visual aids.
04	**Verbal Aptitude - Vocabulary**: Engage in vocabulary-building games and practice using idioms and homonyms.
05	**Verbal Aptitude - Grammar**: Practice grammar skills, including tense usage, articles, and error spotting in sentences.
06	**Listening Comprehension**: Develop effective listening strategies through guided audio and video exercises.
07	**Speaking Practice - Public Speaking**: Analyze effective speeches and practice extemporaneous and prepared speaking.
08	**Speaking Practice - Prepared Speeches**: Deliver prepared speeches for assessment and improvement feedback.
09	**Experiencing Life Skills**: Participate in community service with an NGO and share your experience through roleplay.
10	**Understanding Life Skills**: Analyze "The Pursuit of Happyness" to identify and relate to essential life skills and values.

24UGCBVSE107T - Computer Aided Publishing - LAB

Teaching Scheme		Credits: 01	Evaluation Scheme		
Lectures	: --		ISE	:	25 Marks
Practical	: 2 Hrs/Wee		POE	:	---

Course Objective: The objectives of this course are

1	To each students to create professional documents and presentations using software tools.
2	To enable effective use of graphic design tools for visual communication.
3	To develop skills in formatting and designing materials for various purposes.

Course Outcomes:

COs	At the end of successful completion of the course, the students will be able to	Bloom's Taxonomy
CO1	Create professional reports, presentations, and documents using Microsoft Word, PowerPoint, and Excel.	Create
CO2	Utilize Photoshop for graphic design and image editing, and CorelDRAW for logos and print materials.	Utilize
CO3	Develop documents and templates with varied formatting in PageMaker and create effective advertisements and packaging.	Develop

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	1	2	-	-	-	-	-	-	1
CO2	-	-	1	1	2	-	-	-	-	-	-	1
CO3	-	-	2	2	2	-	-	-	-	-	-	1

List of Experiments:

01	Design a professional report in Microsoft Word, incorporating styles, headers, and footers.
02	Create a multimedia presentation in PowerPoint that includes images, charts, and animations.
03	Use Excel to analyze a dataset, applying formulas and creating visual charts to present findings.
04	Edit a photo using Photoshop, applying filters, adjustments, and retouching techniques.
05	Create a logo using CorelDRAW, focusing on shape, color, and typography.
06	Design a tri-fold brochure in CorelDRAW for a fictional business, including text and images.
07	Develop a document template in PageMaker, incorporating different formatting styles for text and paragraphs.
08	Create an infographic using graphic design tools to visually represent data or information on a chosen topic.
09	Design a print advertisement in CorelDRAW, emphasizing layout, typography, and persuasive elements.
10	Create a packaging design for a product using CorelDRAW, considering branding and visual appeal.

Textbooks:

1. Bittu Kumar (2013). Desktop Publishing: Practical Guide To Publish Anything On Your Desktop.
2. Satish Jain, M. Geetha (2018). CorelDRAW Training Guide. BPB

References:

1. Simon Mitchell (1999). Mastering Desktop Publishing. Palgrave Macmillan.

24UGCBCC108T - Co-Curriculum Course-I

Teaching Scheme	Credits: 01	Evaluation Scheme
Lectures : --		**ISE** : 25 Marks
Practical : 2 Hrs/Week		**POE** : ---

Course Description:

This course on Design Thinking and Business Innovation equips students with essential skills to tackle real-world business challenges through stakeholder consultations, process mapping, and user requirements analysis. Participants will learn to create innovative solutions and effectively communicate findings through comprehensive reports

Course Objective: The objectives of this course are

1	To Develop skills in stakeholder consultations to address business challenges.
2	To Equip students with business process mapping and workflow analysis techniques.
3	To Foster innovation by creating practical solutions based on user requirements.

Course Outcomes:

COs	At the end of successful completion of the course, the students will be able to	Bloom's Taxonomy
CO1	Explain stakeholder needs and the principles of business process mapping.	Understand
CO2	Use stakeholder insights to analyze and propose practical business solutions.	Apply
CO3	Develop comprehensive reports with innovative recommendations based on analysis.	Create

Activity

Activity 1: Stakeholder Consultations
Students will conduct interviews with key stakeholders to gather insights about their needs and expectations regarding a specific business challenge.

Activity 2: Business Process Mapping
Students will visualize the current business process, allowing them to understand workflows and identify areas for improvement through mapping techniques.

Activity 3: User Requirements Analysis
Using the data gathered from stakeholders, students will analyze user requirements to identify key issues and needs, ensuring alignment with business goals.

Activity 4: Solution Prototyping
Based on user needs and business process insights, students will create innovative solutions to address identified challenges, emphasizing practicality and impact.

Activity 5: Report Generation
Students will compile findings into a comprehensive report, including an executive summary, methodology, key findings, analysis, recommendations, and conclusions to support informed decision-making.

24UGCBBSC201 - Linear Algebra

Teaching Scheme			Credits: 04	Evaluation Scheme		
Lectures	**:**	3 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:**	1		**ESE**	**:**	60 Marks

Course Description:

This course covers fundamental topics in linear algebra, including systems of linear equations, vector spaces, and linear transformations. It delves into eigenvalues and eigenvectors, quadratic forms, and their applications in machine learning and image processing. Additionally, the course explores inner product spaces and orthogonalization techniques

Prerequisites	Basic knowledge of algebra and introductory linear algebra concepts

Course Objective: The objectives of this course are

1	To understand and apply fundamental concepts of linear algebra
2	To analyze and compute properties of linear transformations
3	To utilize advanced techniques such as quadratic forms singular value decomposition (SVD), and principal component analysis (PCA) in practical applications

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain systems of linear equations and perform matrix decomposition techniques.	Understand
CO2	Understand and apply concepts related to vector spaces and their properties.	Understand
CO3	Analyze and implement linear transformations and related theorems effectively.	Analyze
CO4	Understand eigen values and eigenvectors and apply diagonalization methods.	Understand
CO5	Utilize quadratic forms, SVD, and PCA for applications in image processing and machine learning.	Utilize
	Section – I	
Unit-1	**System of Linear Equations:** Rank of a Matrix, System of Linear Equations, Gauss Elimination, LU Decomposition method	06 Hours
Unit-2	**Vector Space:** Vectors , n-Vectors , linear combination, Linear Dependence & Independence of vectors, Vector space, Subspace, Spanning Set, Basis & Dimension	06 Hours
Unit-3	**Linear Transformations:** Linear Transformations, Matrix of Linear transformation, Range and Kernel, Non-singular lineartransformation, Rank-Nullity Theorem, Orthogonal transformation	06 Hours
	Section – II	
Unit-4	**EigenValues and EigenVectors:** EigenValues and EigenVectors, Cayley-Hamilton theorem and its Applications, Diagonalization,Inverse and power of matrix by modal matrix.	06 Hours
Unit-5	**Quadratic Forms and Applications:** Quadratic forms, Symmetric Matrices, Reduction of Quadratic forms to canonical form, Definite &Semi- definite forms, Linear and Orthogonal transformation, Singular value decomposition (SVD) and Principal Component Analysis(PCA), Applications to Image Processing and Machine Learning	06 Hours
Unit-6	**Inner Product Space:**Inner Product Space, Norm of a Vector, Orthogonality, Orthogonal Projection, Gram-Schmidt ortho normalization, QR decomposition	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Elementary Linear Algebra – Larson, Edwards, Falvo and - Houghton Mifflin
2	Introduction to linear algebra – Gilbert Strang and – Wellesley
3	Linear Algebra – Kenneth Hoffman, Ray Kunze and – Pearson
Reference Books :	
1	Linear Algebra – Seymour and – McGraw Hill.
2	Linear Algebra and its Applications – David C Lay and – Pearson
3	Linear Algebra – Kenneth M Hoffman and – Prentice Hall

24UGCBBSC202 - Statistical Methods

Teaching Scheme	**Credits: 03**	**Evaluation Scheme**
Lectures : 3 Hrs/Week		**ISE : 40 Marks**
Tutorials : --		**ESE : 60 Marks**

Course Description:

In this course, students will learn Regression, Statistical Inference, and **Time Series Analysis** to model relationships, make predictions, and analyze time-based data. These skills will help them apply statistical techniques for data-driven decision-making

Prerequisites	Basic statistics and Probability.

Course Objective: The objectives of this course are

1	To Explain the role of regression and data analysis in business decision-making.
2	To Impart knowledge on data collection, analysis, and presentation for informed decisions.
3	To Apply estimation, testing, and modeling techniques to analyze real-time data and relationships.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain systems of linear equations and perform matrix decomposition techniques**.**	Understand
CO2	Understand and apply concepts related to vector spaces and their properties**.**	Understand
CO3	Analyze and implement linear transformations and related theorems ffectively.	Analyze
CO4	Understand eigenvalues and eigenvectors and apply diagonalization methods.	Understand
CO5	Utilize quadratic forms, SVD, and PCA for applications in image processing and machine learning.	Utilize
	Section – I	
Unit-1	**Linear Statistical Models:** Correlation and Scatter diagram, Linear regression and Least squares method, Multiple regressions& multiple correlations, Rank correlation	06 Hours
Unit-2	**Statistical Inference – I (Estimation):** Point estimation, Criteria for good estimates (un-biasedness, consistency and sufficiency), Methodsof estimation including maximum likelihood estimation.	07 Hours
Unit-3	**Statistical Inference – II (Test of Significance):** Test of hypothesis, Sampling distribution of mean and standard error, Large sample tests: Test for an assumed mean and equality of two population means, Small sample tests: t-test for an assumed mean and equality of means of two populations, Paired t-test, Neyman Pearson lemma.	08 Hours
	Section – II	
Unit-4	**Analysis of Variance:** Test for single variance by using Chi – square distribution, Test for two variance by using F-distribution, Analysis of variance (one way, two ways with as well as without interaction)	08 Hours
Unit-5	**Non-parametric Inference:** Comparison with parametric inference, Use of order statistics, Sign test, Wilcoxon signed rank test, Mann Whitney test, Run test, Kolmogorov-Smirnov test, Spearman's and Kendall's test, Toleranceregion.	07 Hours

Unit-6	**Basics of Time Series Analysis & Forecasting:** Stationary ARIMA Models: Identification, Estimation and Forecasting	04 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Probability and Statistics for Engineers – 4th edition - LI.R. Miller, J.E.Freund and R.Johnson
2	Fundamentals of Statistics – Vol. I & II - Goon, M. Gupta and - World Press
3	The Analysis of Time Series: An Introduction – Chris Chatfield
Reference Books :	
1	Introduction to Linear Regression Analysis – D.C. Montgomery & E.Peck A.M. Mood,F.A.
2	Introduction to the Theory of Statistics – Graybill & D.C. Boes
3	Applied Regression Analysis – N. Draper & H. Smith
4	Hands-on Programming with R – Garrett Grolemund
5	R for Everyone: Advanced Analytics and Graphics – Jared P. Lander

24UGCBESC203 – Data Structures and Algorithms

Teaching Scheme	Credits: 03	Evaluation Scheme
Lectures : 3 Hrs/Week		**ISE** : 40 Marks
Tutorials : --		**ESE** : 60 Marks

Course Description:

This course provides a comprehensive overview of statistical methods and inference techniques. It covers linear statistical models, estimation, hypothesis testing, analysis of variance, and non-parametric inference methods. The course also introduces basics of time series analysis and forecasting, focusing on ARIMA models.

Prerequisites	Basic understanding of programming concepts

Course Objective: The objectives of this course are

1	**To** understand fundamental concepts of algorithms and data structures**.**
2	To develop skills in implementing and analyzing linear and non-linear data structures.
3	To apply various algorithms for searching, sorting, and managing data efficiently.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and explain fundamental concepts of algorithms and data structures.	Understand
CO2	Apply linear and non-linear data structures to solve various problems.	Apply
CO3	Analyze and evaluate the efficiency of searching and sorting algorithms.	Analyze
CO4	Implement file organization methods and access schemes for efficient data management.	Apply
CO5	Analyze and apply graph algorithms for effective search and traversal.	Analyze
	Section – I	
Unit-1	**Basic Terminologies and Introduction to Algorithm & DataOrganization:** Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O,Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction	05 Hours
Unit-2	**Linear Data Structure:** Array, Stack, Queue, Linked list and its types, Various Representations, Operations &Applications of Linear Data Structures	07 Hours
Unit-3	**Non-linear Data Structure:** Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, SplayTree), Applications of Non-Linear Data Structures.	08 Hours
	Section – II	
Unit-4	**Searching and Sorting on Various Data Structures**: Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heapsort, Introduction to Hashing	05 Hours
Unit-5	**Files:** Organization (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessingschemes	07 Hours
Unit-6	**Graphs:**Basic Terminologies and Representations, Graph search and traversal algorithms and complexityanalysis	08 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	2	-	2	-	-	-	-	-	-	-
CO4	2	2	2	-	2	-	-	-	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	-	-	-

References	
Text Books :	
1	E. Horowitz, S. Sahni, S. A-Freed (2008). Fundamentals of Data Structures. UniversitiesPress.
2	A. V. Aho, J. E. Hopcroft, J. D. Ullman (1982). Data Structures and Algorithms. Pearson
Reference Books :	
1	Donald E. Knuth (1997). The Art of Computer Programming: Volume 1: Fundamental Algorithms. Addison-Wesley
2	Thomas, H. Cormen, Charles E. Leiserson, R L. Rivest, Clifford Stein (2009). Introductionto Algorithms. PHI Learning Pvt. Ltd.
3	Pat Morin (2013). Open Data Structures: An Introduction (Open Paths to Enriched Learning).UBC Press.

24UGCBESC204 – Principles of Electronics Engineering

Teaching Scheme		Credits: 02	Evaluation Scheme		
Lectures	**:** 2 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:** --		**ESE**	**:**	60 Marks

Course Description:

This course offers an introduction to semiconductor devices and their applications. It covers the formation and characteristics of P-N junctions, diodes, and transistors, including both bipolar junction and field-effect transistors. The course also introduces operational amplifiers and basic digital electronics concepts, including logic gates, multiplexers, and flip-flops

Prerequisites	Basic understanding of electrical circuits and principles of electronics

Course Objective: The objectives of this course are

1	To understand the fundamental principles and characteristics of semiconductor devices.
2	To develop skills in designing and analyzing various diode and transistor circuits.
3	To apply basic concepts of operational amplifiers and digital electronics in practical applications.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and explain the formation and behavior of semiconductor junctions.	Understand
CO2	Apply diode and transistor characteristics to design and analyze electronic circuits.	Apply
CO3	Evaluate and implement operational amplifier configurations for different applications.	Evaluate
CO4	Understand and implement field-effect transistor principles and configurations.	Understand
CO5	Apply basic digital electronics principles to design and analyze logic circuits.	Apply

Section – I

Unit-1	**Introductory idea of semiconductors:** Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone. Formation of PNP / NPN junctions, energy band diagram	06 Hours
Unit-2	**Diodes and Diode Circuits:** V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation	06 Hours
Unit-3	**Bipolar Junction Transistors:** Transistor mechanism and principle of transistors, CE, CB, CC configuration, transistorcharacteristics: cut-off active and saturation mode.	06 Hours

Section – II

Unit-4	**Field Effect Transistors**: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structureand characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles	06 Hours
Unit-5	**Operational amplifier basics:** Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Proportional, Integral, Derivative circuits.	06 Hours

Unit-6	**Basic ideas of Digital electronics:** Basic idea of switching circuit, Realization of Logic gates, multiplexers and demultiplexers, Flipflop, Registers and Counters	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	-
CO2	3	1	-	1	-	-	-	-	-	-	-	-
CO3	3	-	3	2	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	-	-	-

References	
Text Books :	
1	Electronic Devices and Circuits – 8th edition 2005 - R. Boylestad & L. Nashelsky and –PHI
2	Electronic Devices and Circuits – Allen Mottershed and – PHI
3	Fundamentals of Digital Circuits – Anand Kumar and – PHI
Reference Books :	
1	Electronic Devices and Circuits – 4th edition - David A. Bell and – PHI
2	Electronic Devices and Circuits – 2th edition - Willim I. Fletcher and - PHI/ Pearson

24UGCBPCC205– Fundamentals of Economics

Teaching Scheme	Credits: 02	Evaluation Scheme
Lectures : 2 Hrs/Week		**ISE** : 40 Marks
Tutorials : --		**ESE** : 60 Marks

Course Description:

This course provides a comprehensive introduction to both microeconomics and macroeconomics. It covers fundamental principles such as demand and supply, consumer behavior, and production theory. Students will explore key macroeconomic concepts including national income, money supply, and business cycles. The course also examines welfare analysis, the theory of production, and stabilization policies

Prerequisites	Basic knowledge of introductory economics and mathematics.

Course Objective: The objectives of this course are

1	To understand core concepts of microeconomics and macroeconomics.
2	To analyze consumer behavior and market structures.
3	To apply economic theories to real-world scenarios and policy analysis.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain fundamental microeconomic principles and their applications.	Understand
CO2	Apply welfare analysis concepts to evaluate consumer and producer surplus.	Apply
CO3	Analyze production functions and cost structures in different market conditions.	Evaluate
CO4	Understand and interpret key macroeconomic indicators and models.	Understand
CO5	Evaluate the effects of monetary and fiscal policies on business cycles and economic stability.	Apply

Section – I

Unit-1	**Microeconomics:** Principles of Demand and Supply - Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households - Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve)	06 Hours
Unit-2	**Welfare Analysis:** Consumers' and Producers' Surplus - Price Ceilings and Price Floors; Consumer Behaviour - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium - Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve; Applications - Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect	06 Hours
Unit-3	**Theory of Production:** Production Function and Iso-quants - Cost Minimization; Cost Curves - Total, Average and MarginalCosts - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopolyand Monopolistic Competition.	06 Hours

Section – II

Unit-4	Macroeconomics: National Income and its Components - GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector - Taxes and Subsidies; External Sector - Exports and Imports	06 Hours

Unit-5	Money: Definitions; Demand for Money -Transitionary and Speculative Demand; Supply of Money - Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model	06 Hours
Unit-6	Business Cycles and Stabilization**:** Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm - Price andWage Rigidities - Voluntary and Involuntary Unemployment	06 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	-	-	-	-	-	-	1
CO2	-	2	3	1	-	-	-	-	-	-	-	-
CO3	-	-	-	1	-	-	-	-	-	-	-	1
CO4	-	2	1	1	-	1	-	-	-	-	-	1
CO5	-	-	-	-	-	-	-	-	-	-	-	1

References	
Text Books :	
1	Microeconomics – 8th edition - Chris Chatfield - Pindyck, Robert S., and Daniel L.Rubinfeld and- Pearson
2	Microeconomics – 12th edition - Dornbusch, Fischer and- McGraw Hill.
3	Economics – 20th edition - P.A.Samuelson, W.D.Nordhaus and - McGraw Hill.
4	Microeconomics – 8th edition - M.L.Jingan and – Vrinda publications, New Delhi.
Reference Books :	
1	Intermediate Microeconomics: A Modern Approach – 8th edition - Hal R, Varian - SpringerIndia Pvt. Ltd. India
2	Principles of Macroeconomics – 7th edition - N.Gregory Mankiw - Cengage India Pvt. Ltd.

24UGCBHSM206– Business Communication & Value Science –II

Teaching Scheme			**Credits: 01**	**Evaluation Scheme**		
Lectures	**:**	2 Hrs/Week		**ISE**	**:**	40 Marks
Tutorials	**:**	--		**ESE**	**:**	60 Marks

Course Description:

This course provides a comprehensive introduction to both microeconomics and macroeconomics. It covers fundamental principles such as demand and supply, consumer behavior, and production theory. Students will explore key macroeconomic concepts including national income, money supply, and business cycles. The course also examines welfare analysis, the theory of production, and stabilization policies

Prerequisites	No specific prerequisites.

Course Objective: The objectives of this course are

1	To improve reading comprehension and writing proficiency.
2	To develop effective employment communication tools, including cover letters and resumes.
3	To enhance presentation skills and strategies for professional settings.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Understand and apply effective reading strategies to improve text comprehension and retention.	Understand
CO2	Create and organize professional written documents	Apply
CO3	Demonstrate effective communication skills during job interviews and group discussions.	Apply
CO4	Design and deliver engaging professional presentations using advanced presentation techniques.	Apply
CO5	Utilize life skills such as emotional intelligence	Apply
	Section – I	
Unit-1	**Enhancing Reading and Writing Skills:** Effective reading: Importance, types, overcoming common obstacles, tips and strategies Effective writing: Importance, paragraph writing techniques, journal/blog writing, Catherine Morris and Joanie McMahon's writing techniques	02 Hours
Unit-2	**Employment Communication:** Covering letter and resume, Group discussion, Interviews	02 Hours
Unit-3	**Presentation skills:** Techniques of effective professional presentations, collaborative/team presentations.	02 Hours
	Section – II	
Unit-4	**Business Meetings:** Types of meetings, strategies of conducting meetings effectively, Documentation (notice, agenda,minutes)	02 Hours
Unit-5	**Life Skills/Soft Skills-1:** Developing personality Self esteem: Know thyself	02 Hours
Unit-6	**Life Skills/Soft Skills-2:** Emotional Intelligence, Leadership and Teamwork, Time management	02 Hours

Mapping of POs & COs:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-
CO5	-	-	-	-	-	-	-	1	1	2	-	-

References	
Text Books :	
1	Communication Skills - 2013 edition - Meenakshi Raman and Sangeeta Sharma and - Oxford University Press (OUP).
2	Business Communication – 2015 edition - S. Kalia and S. Agarwal and – Wiley
3	An Introduction to Professional English and Soft Skills - 2012 edition - Das et al andCambridge University Press
Reference Books :	
1	Guiding Souls: Dialogues on the purpose of Life- 2015 edition - Kalam A.A.Alred, G. J., - Prabhat Prakashan
2	Handbook of Technical Writing – 10th edition - Brusaw, C. T., & Oliu, W. E.- St. Martin'sPress Sherman
3	Skimming and Scanning Techniques- 2014 edition- Barbara - Liberty University

24UGCBBSC202LP - Statistical Methods Lab

Teaching Scheme			Credits: 01	Evaluation Scheme		
Lectures	**:**	--		**ISE**	**:**	25 Marks
Practical	**:**	2 Hrs/Week		**POE**	**:**	---

Course Objective: The objectives of this course are	
1	To Understand fundamental concepts of data analysis using R programming.
2	To Perform statistical operations on various datasets using R.
3	To Apply advanced statistical techniques to analyze and interpret data.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Apply R programming to import and export data from real-life datasets.	Apply
CO2	Analyze data by computing summary statistics and visualizing results through graphs and tables.	Analyze
CO3	Evaluate the results of hypothesis tests and regression analyses, interpreting the significance of findings.	Evaluate

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-

List of Experiments:

01	Explore data types in R and practice importing and exporting datasets.
02	Compute basic summary statistics (mean, median, mode) for a given dataset.
03	Create various plots (bar charts, histograms, scatter plots) to visualize data distributions.
04	Apply correlation techniques to examine relationships between two variables in a dataset.
05	Fit a simple linear regression model to a dataset and interpret the coefficient of determination (R^2).
06	Conduct a hypothesis test for a sample mean and proportion using real-time data.
07	Test the hypothesis for two sample means and proportions to compare groups.
08	Perform ANOVA on a randomized block design dataset to analyze group differences.
09	Apply ANOVA techniques to a Latin square design dataset to examine treatments.
10	Use non-parametric tests (Sign test and Mann-Whitney test) to analyze datasets without normality assumptions.

Textbooks:
3. R- Software – Professional Version with 1+25 users subscription
References:
1. 3. Hands-on Programming with R - Garrett Grolemund 2. R for Everyone: Advanced Analytics and Graphics- Jared P. Lander

24UGCBESC203LP – Data structures and Algorithms - Lab

Teaching Scheme			Credits: 01	Evaluation Scheme		
Lectures	**:**	--		**ISE**	**:**	25Marks
Practical	**:**	2 Hrs/Week		**POE**	**:**	50 Marks

Course Objective: The objectives of this course are	
1	To Understand and apply fundamental concepts of data structures in programming.
2	To Develop proficiency in implementing algorithms for searching and sorting.
3	To Utilize abstract data types to address and solve practical computational problems.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Demonstrate the ability to develop programs that effectively manage and manipulate data.	Demonstrate
CO2	Apply searching and sorting techniques to efficiently organize and retrieve information.	Apply
CO3	Implement and operate various data structures to solve computational challenges.	Implement

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-

List of Experiments:	
01	Implement binary search on a sorted array to find a given integer.
02	Develop a program to perform push, pop, and palindrome check operations on a stack.
03	Convert an infix expression to postfix using stack operations..
04	Implement a circular queue with insert, delete, and overflow/underflow detection.
05	Perform insertion, deletion, and display operations on a singly linked list.
06	Implement insertion, deletion, and double-ended queue operations on a doubly linked list.
07	Sort a list of integers using the selection sort algorithm..
08	Create and traverse a binary search tree, and search for a key.
09	Implement hashing with the remainder method and resolve collisions using linear probing.
10	Implement a program to create a graph using an adjacency matrix and traverse it using Depth-First Search (DFS) or Breadth-First Search (BFS).

Textbooks:

1. The C++ Programming Language -2005 edition- Bjarne Stroustrup and - Pearson Education

2. C++ and Object-Oriented Programming Paradigm -2004 edition- Debasish Jana and- PHILearning Pvt. Ltd.

References:

1. Let us C++- -2019 edition - Yashavant Kanetkar - BPB publications.
2. A Complete Guide to Programming in C++ - 2001 edition- Peter Prinz and Ulla Prinz -Jonesand Bartlett Publishers

24UGCB ESC204LP – Principals of Electronics Engineering - Lab

Teaching Scheme			Credits: 01	Evaluation Scheme		
Lectures	**:**	--		**ISE**	**:**	25Marks
Practical	**:**	2 Hrs/Week		**POE**	**:**	50 Marks

Course Objective: The objectives of this course are	
1	To Understand the principles of diodes and diode circuits.
2	To Learn the principles of bipolar junction transistors and field effect Transistor.
3	To Learn the working of operational amplifiers and digital electronic

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Explain operation of diode and its applications.	Understand
CO2	Understand the concept of BJT and FET & its applications.	Understand
CO3	Understand the concept of operational amplifiers anddigital electronics.	Understand

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	-	-	-	-	-	-	-	-
CO2	2	2	2	1	-	-	-	-	-	-	-	-
CO3	2	2	2	1	-	-	-	-	-	-	-	-

List of Experiments:

01	Performance Evaluation of a Half-Wave Rectifier
02	Performance Evaluation of a Full-Wave Rectifier
03	Investigation of Transistor Characteristics
04	Examination of Oscillator Circuits
05	Implementation of Integrator and Differentiator Using Operational Amplifier
06	Exploration of Basic Logic Gates
07	Design and Simulation of Half and Full Adders
08	Implementation of Multiplexers and Demultiplexers
09	Study and Application of Shift Registers
10	Performance Evaluation of a Half-Wave Rectifier

Textbooks:

1. Electronic Devices and Circuits -8th edition 2005- R. Boylestad & L. Nashelsky and - PrenticeHall
2. Electronic devices & circuits - Allen Mottershed and- PHI
3. Fundamentals of Digital Circuits- Anand Kumar and- PHI

References:
1. Electronic devices & circuits – IV edition- David A. Bell - Prentice- Hall India 2. Electronic devices & circuits - II edition- Millman & C.Halkias - Tata McGraw Hill Publication 3. An Engineering Approach to Digital Design - Willim I. Fletcher - PHI/ Pearson

24UGCBHSSM206LP – Business Communication & Value Science –II- LAB

Teaching Scheme		Credits: 01	Evaluation Scheme		
Lectures	**:** --		**ISE**	**:**	25 Marks
Practical	**:** 2 Hrs/Week		**POE**	**:**	--

Course Objective: The objectives of this course are to	
1	Enhance communication skills through effective group discussions and mock interviews.
2	Develop teamwork and leadership capabilities by creating and presenting a vision for an NGO.
3	Cultivate presentation and documentation skills essential for business environments and professional settings.

Course Outcomes:

COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Analyze group discussions for communication strategies	Analyze
CO2	Demonstrate interview techniques through mock interviews.	Demonstrate
CO3	Create and present business proposals effectively.	Create

Mapping of POs & COs:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-

List of Experiments:

01	**Beginner Group Discussion**: Learn tips and analyze individual performances.
02	**Master Group Discussion**: Conduct evaluations and progress checks.
03	**Beginner Mock Interview**: Explore interview FAQs and participate in mock interviews.
04	**Master Mock Interview**: Engage in prepared and formal mock interviews.
05	**NGO Formation**: Develop a vision, mission, and design a logo.
06	**Presentation Skills - Part 1**: Present your NGO and receive audience feedback.
07	**Presentation Skills - Part 2**: Address social issues through ICT-enhanced presentations.
08	**Business Meetings**: Draft documentation and participate in mock meetings.
09	**Business Proposals**: Collaborate on and present a business proposal.
10	**Life Skills Movie Session**: Analyze life skills and values from a selected film

Textbooks:
1. Orell Talk Digital Language Lab Software–Professional Version with 1+50users subscription
References Books :
1. Better English Pronunciation -2nd edition- J.D. O'Connor and – OUP 2. A Practical Course in Spoken English – 1st edition- J.K. Gangaj - PHI LearningPvt. Ltd. 3. English Language Laboratories – 2nd edition- Nira Konar - PHI Learning

24UGCBVSEC207T –Web Designing LAB			
Teaching Scheme	**Credits: 01**	**Evaluation Scheme**	
Lectures : --		**ISE** : 25 Marks	
Practical : 2 Hrs/Week		**POE** : --	

Course Objective: The objectives of this course are	
1	To Develop foundational knowledge of web technologies and the structure of web pages.
2	To Foster problem-solving skills by designing and implementing functional, user-friendly web interfaces.
3	To Encourage creativity in web development by applying best practices and innovative design techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course, the students will be able to**	**Bloom's Taxonomy**
CO1	Create static web pages with text, images, and links.	Create
CO2	Develop functional web forms for user input.	Develop
CO3	Design accessible web pages using HTML5 semantic elements.	Develop

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	2	-	-	-	-	-	-	-
CO2	2	3	1	1	2	-	-	-	-	-	-	-
CO3	2	3	2	2	2	-	-	-	-	-	-	-

List of Experiments:	
01	Create a simple webpage using basic HTML elements like headings, paragraphs, and lists.
02	Design a webpage demonstrating various text formatting options like bold, italic, and underline.
03	Add an image and hyperlinks to a webpage with proper alt text and clickable links.
04	Build a table to display data with column and row spans for better formatting.
05	Create a form with input fields, checkboxes, radio buttons, and a submit button to collect user information.
06	Embed a video and audio file into a webpage with proper descriptions and controls.
07	Implement HTML5 semantic elements like `<header>`, `<footer>`, and `<section>` to structure a webpage.
08	Develop a webpage with a navigation bar using unordered lists for internal or external linking.

09	Design an image map with clickable areas that link to different pages or sections.
10	Create a simple multi-page website with a homepage, about page, and contact page without using CSS.

Textbooks:

1 J. Duckett, HTML and CSS: Design and Build Websites. Hoboken, NJ: John Wiley & Sons
2. J Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, 5th ed. Sebastopol, CA: O'Reilly Media, 2018.

References Books:

1. Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, 5th ed. Sebastopol, CA: O'Reilly Media, 2018.
2. **M**. MacDonald, *HTML5:* The Missing Manual, 2nd ed. Sebastopol, CA: O'Reilly Media