ARYAVART INTERNATIONAL UNIVERSITY

Tilthai, Dharmanagar, North Tripura-799250

Syllabus for B Tech (CSE)

Semester 1

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24EG101	Engineering Physics	3	1	0	4	70	30	0	100
24EG102	Engineering Mathematics	3	1	0	4	70	30	0	100
24CS102	C Programming	3	1	0	4	70	30	0	100
24EN102	Business Communication	3	1	0	4	70	30	0	100
24CS101	Fundamentals of IT	4	0	0	4	70	30	0	100
Practical									
24EG191	Engineering Physics Lab	0	0	2	2	0	30	70	100
24CS192	C Programming Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Detailed Syllabus

ENGINEERING PHYSICS

Code: 24EG101
Max Marks: 70

UNIT I (20 Hrs)
Mechanics, waves and oscillations
Newton Laws & Equations of Motion, Momentum, Energy, Angular Momentum, Rigid Body Motion, Periodic Motion & Superposition, Free and Forced Vibrations, Resonance and Coupled Oscillators.

UNIT II (08 Hrs)
Concepts of Quantum Mechanics
Particle properties of waves, Wave properties of particles, Atomic Structure, Schrödinger's Equation, Particle in a Box, Finite Potential Well, Quantum Harmonic Oscillator.

UNIT III (08 Hrs)
Statistical Mechanics
Statistical Distributions, Maxwell-Boltzmann Statistics, Molecular energies in an Ideal Gas Quantum Statistics, Applications of Statistical mechanics.

UNIT IV (16 Hrs)
Optics
Wave Optics: Electro Magnetic Radiation and Electro Magnetic Spectrum, Super Position of Waves, Refraction, Reflection, Interference, Diffraction and Polarisation.

Lasers: Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and their significance. Meta-stable State, Pumping, Population Inversion. Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

Fibre Optics: Principle and construction of optical fibre, Acceptance Angle and Numerical Aperture, Classification of Optical Fibres, Attenuation in Optical Fibers (scattering, absorption and bending losses) Applications of Optical Fibres.

UNIT V (08 Hrs)
Semiconductors and Semiconductor devices
Semi-conductors Fermi Level in Intrinsic and Extrinsic Semi-conductors. Carrier concentration of Intrinsic Semi-conductor. Carrier concentration of Extrinsic Semi-conductor (qualitative).
Semiconductor devices - Formation of a PN Junction and working of a PN Junction diode, Energy band Diagram of open circuited PN Diode, I-V Characteristics of PN Junction diode. Applications: LED, Solar Cell and Photo diode.

Text Book:

1. B. K. Pandey & S. Chaturvedi Engineering Physics, Cengage Learning.
2. Avadhanulu M. N., Kshirsagar P. G, A text book of Engineering Physics, S Chand publications Pvt. Ltd, 2014.
3. D. K Bhattacharya and Poonam Tandon, Engineering Physics, Oxford Higher Education press, 2015.

Reference Books:

1. P K Palanisamy, Engineering Physics, Sitech Publications.
2. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher.
3. A. S. Vasudeva, Modern engineering Physics, S Chand.
4. Dekker, Solid State Physics.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

ENGINEERING MATHEMATICS

Code: 24EG102
Max Marks: 70

UNIT I (12 Hrs)

Matrices: Rank of a matrix by echelon form, system of homogeneous and non-homogeneous linear equations. Eigen values, Eigen vectors of Matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

UNIT II (12 Hrs)

Quadratic forms: Symmetric matrix, Orthogonal matrices, Diagonalisation of a matrix by orthogonal process. Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT III (12 Hrs)

Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof); Properties and Problems.

UNIT IV (12 Hrs)

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

UNIT V (12 Hrs)

Multiple integrals: Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian and spherical polar co-ordinates.

Text Book:

1. E. Kreyszig, Advanced engineering mathematics", John Wiley & Son's publishers, new edition.
2. B. S. Grewal," Higher engineering mathematics", Khanna publishers, new edition.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2012.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

C PROGRAMMING

Code: 24CS102
Max Marks: 70

UNIT I (8 Hrs)

Computer Programming: Basic Programming concepts, Modular programming and structured programming, Problem solving using Computers, Concept of flowcharts and algorithms.
Overview of C: Introduction, Importance of C, Sample C Programs, Basic structure of C programs, Programming style, executing a C Program.
Constants, Variables and Data types: C Tokens, keywords, and identifiers, constants, variables, data types, declaration of variables, assigning values to variables, defining symbolic constants.
Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, increment and decrement operators, conditional operator, bitwise operators, type conversion in expressions, operator precedence and associability.
Mathematical functions.

UNIT II (12 Hrs)

Input and Output statements, reading a character, writing a character, formatted input, formatted output statements.
Decision-making, Branching and Looping: Decision making with IF statement, simple IF statement, The IF-ELSE statement, nesting of IF.. ELSE statements, The ELSE -IF ladder, The switch statement, The?: operator, The GOTO statement, The WHILE statement, The DO statement, The FOR statement, jumps in loops.

UNIT III (10 Hrs)

Arrays: one dimensional array, Two-dimensional arrays, initializing arrays, Programs based on arrays such as sorting, Fibonacci sequence, matrix operations, etc.
Handling of Characters and Strings: Declaring and initializing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together. Comparison of two strings, character and string handling functions.

UNIT IV (8 Hrs)

User defined functions: Need for user-defined functions, a multi-functional program, the form of 'C' function, Return values and their types, calling a function, category of functions: No arguments and no return values, arguments but no return values, arguments with return values, nesting of functions, recursion, functions with arrays as parameters.

UNIT V (5 Hrs)

Structure and Union: Structure definition, giving values to members, structure initialization; comparison of structure variables, array of structures, array within structure, union.
Pointers: Understanding pointers, accessing the address of variables, declaring andinitializing pointers, accessing a variable through its pointer.

Text Book:

1. Kamthane, Programming with ANSI and Turbo C; Pearson Education 2003

Reference Books:

1. E. Balaguruswamy. : Programming in ANSI C", Tata McGraw-Hill (1998)
2. Yeshvant Kanetkar: "Let us C"
3. V. Rajaraman.: "Programming in C", PHI (EEE) (2000)
4. Rajesh Hongal : "Computer Concepts & C language"
5. Brain Kernighan & Dennis M. Ritchie "ANSI C Programming" (PHI)

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

BUSINESS COMMUNICATION

Code: 24EN102
Max Marks: 70

UNIT I (10 Hrs)

Concepts and Fundamentals: Introduction to Technical Communication, Need and importance of communication, channel, Distinction between general and technical communication, nature and features of technical communication, Seven Cs of communication, Types of Technical communication, style in technical communication, technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

UNIT II (12 Hrs)

Oral Communication: Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee. Meetings: Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings. Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation). The technique of conducting Group Discussion and JAM session.

UNIT III (12 Hrs)

Written Communication: Overview of Technical Writing: Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing.
Note-Making, Notice, E-mail Writing.
Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters Office memorandum, Good news and bad news letters.
Report Writing: Definition & importance; categories of reports, Elements of a formal report, style and formatting in report.
Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements.
Proposal Writing: Purpose, Types, characteristics and structure.
Job Application: Types of application, Form & Content of an application, drafting the application, Preparation of resume.

UNIT IV (10 Hrs)

Soft Skills: Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle. Non-Verbal Communication: Kinesics and Proxemics, Paralanguage.
Inter-personal Skills.
Language Skills: Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), introduction to Business English.

Text Book:

1. Kavita Tyagi and Padma Misra , "Advanced Technical Communication", PHI, 2011
2. P.D.Chaturvedi and Mukesh Chaturvedi, "Business Communication – Concepts, Cases and Applications", Pearson, second edition.
3. Rayudu, "C.S- Communication", Himalaya Publishing House, 1994.
4. Asha Kaul , "Business Communication", PHI, second edition.

Reference Books:

1. Raymond Murphy, "Essential English Grammar- A self study reference and practice book for elementary students of English" , Cambridge University Press, second edition.

2. Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.
3. Kavita Tyagi and Padma Misra , "Basic Technical Communication", PHI, 2011.
4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, "Effective Business Communication", McGraw Hill, seventh edition.

ARYAVART
INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

FUNDAMENTALS OF IT

Code: 24CS101
Max Marks: 70

UNIT I (12 Hrs)

Fundamentals of Computers: Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.
Computer Hardware: Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.
Computer Memory: Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

UNIT II (12 Hrs)

Interaction with Computers: Computer Software: System software: Assemblers, Compilers, Interpreters, linkers, loaders.
Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).
Operating Systems: Elementary Operating System concepts, Different types of Operating Systems.
DOS: Booting sequence; Concepts of File and Directory, Types of DOS commands.
Computer Languages: Introduction to Low-Level Languages and High-Level Languages.

UNIT III (12 Hrs)

Computer Number System: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.
Binary Arithmetic: Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

UNIT IV (10 Hrs)

Computer Network & Internet: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analogue Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.
Internet: Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.
Advanced Trends in IT Applications: Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

Text Book:

1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.
2. Anita Goel "Computer Fundamentals", Pearson.

Reference Books:

1. B. Ram Computer fundamentals Architecture and Organization, New Age Intl.
2. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing.
3. Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.
4. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

ENGINEERING PHYSICS LAB

(BASED ON 24EG101) Engineering Physics:

Concepts of Experimental Physics

1. Error-Analysis and Drawing Graph.

Mechanics - waves and Oscillations

1. Compound Pendulum.
2. Estimation of the moment of inertia of a Fly wheel.
3. Estimation of the Young's modulus of a steel wire using a torsion pendulum.
4. Melde's Experiment.
5. Resonance in LCR Circuits.

Optics

1. Determine the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method.
3. Determination of wavelength by plane diffraction grating method.
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. To determine the numerical aperture and acceptance angle of a given optical fibre.

Semiconductor Physics

7. Energy Gap of a semi-conductor.
8. I-V Characteristics (Resistor, Diode, Solar Cell, LDR).

ARYAVART
INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

C PROGRAMMING LAB

(BASED ON 24CS102) C Programming:

Core Practical (Implement minimum 8 out of 10 practical)

1. Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
2. Write a program to find the greatest number among 3 numbers given by the user.
3. Write a program to check if a given number is a prime number or not.
4. Write a program to display the following pattern up to N rows, taking the value of N from the user:

```
1
2   3
4   5   6
7   8   9   10
```

5. Write a program to input marks of 50 students using an array and display the average marks of the class.
6. Write a program to search for a number entered by the user in a given array and display the array in ascending order.
7. Write a program to check if a string is palindrome or not.
8. Write a program to add, subtract, multiply and divide two numbers using pointers.
9. Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user.
10. Write a program to create two files with names EvenFile and OddFile. Input 20 numbers from the user and save even numbers in EvenFile and odd numbers in OddFile.

Application Based Practical (Implement minimum 5 out of 10 practical)

1. Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.
2. Write a menu driven program to perform the following operations:
   (i) Print armstrong numbers up to N, (ii) Display prime numbers between 1 to N,
   (iii) Reverse of an integer
3. Write a program to convert a hexadecimal number into a binary number.
4. Write a program to calculate factorial of a number and display fibonacci series up to N terms using recursive functions.
5. Write a program to perform matrix addition, (ii) matrix multiplication, and (iii) Matrix transpose on 2D arrays.
6. Write a program to make use of arrays with structures in the following ways:
   (i) Use array as a structure data member
   (ii) Create array of structure variables
7. Write a program to compare the contents of two files by taking names of the files through command line arguments.
8. WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions).
9. Write a menu driven program to implement the following string operations:
   (i) Calculate length of a string
   (ii) Concatenate at the end of a given
   (iii) Copy one string to another
   (iv) Compare contents of two strings
   (v) Copy nth character string to another
10. Write a program to read time in string format and extract hours, minutes and second also check time validity.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks

- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks

- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY

Tilthai, Dharmanagar, North Tripura-799250

Syllabus for B Tech (CSE)

Semester 2

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24MT201	Probability & Statistics	3	1	0	4	70	30	0	100
24EG201	Basic Electrical and Electronics Engineering	3	1	0	4	70	30	0	100
24CS102	Data Structure and Algorithm Using 'C'	3	1	0	4	70	30	0	100
24CS321	Basics of Python Programming	3	1	0	4	70	30	0	100
24GN101	Environmental Studies	4	0	0	4	70	30	0	100
Practical									
24EG291	Basic Electrical and Electronics Engineering Lab	0	0	2	2	0	30	70	100
24CS392	Python Programming Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Detailed Syllabus

PROBABILITY AND STATISTICS

Code: 24MT201
Max Marks: 70

UNIT I (12 Hrs)

Descriptive Statistics: Statistics Introduction, Measures of Variability (dispersion), Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.

UNIT II (12 Hrs)

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties.

UNIT III (12 Hrs)

Probability distributions: Discrete distribution - Binomial, Poisson approximation to the binomial distribution and their properties. Continuous distribution: normal distribution and their properties.

UNIT IV (12 Hrs)

Estimation and Testing of hypothesis, large sample tests: Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNIT V (12 Hrs)

Small sample tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Text Book:

1. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles - McGraw Hill Education, 4th Edition, 2001.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Code: 24EG201
Max Marks: 70

UNIT I (12 Hrs)

Fundamentals of Electrical Engineering and DC Machines:

Ohm's Law, Kirchhoff's Laws, types of sources, passive elements. Series parallel circuits, mesh and nodal analysis. Superposition, Reciprocity theorem.

DC Machines: Principle of operation of D.C generators, types, E.M.F equation. Principle of operation of D.C motors, Types motors, Torque equation, Losses and efficiency, simple problems on D.C Generators and motors.

UNIT II (12 Hrs)

Fundamentals of AC circuits:

AC voltage wave form and basic definitions: Peak Value, R.M.S. value, Average values, Form factor and Peak factor, 'j' operator, Analysis of single phase AC circuits series and parallel (Simple circuits). Three phase circuits – Star - delta connection, Relation between line and phase voltages / currents in a 3-phase Star-Delta balanced system

UNIT III (12 Hrs)

Induction Motors and Measuring Instruments:

Concept of Faraday's laws, 3- phase induction motor working principle, operation and construction details.

Instruments: Introduction, classification of instruments, operating principles, essential features of measuring instruments, permanent magnet moving coil (PMMC) instruments, moving iron (MI) instruments.

UNIT IV (12 Hrs)

Diode and Transistor:

Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers. BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

UNIT V (12 Hrs)

Digital Electronics:

Number systems – binary codes –binary arithmetic - Boolean algebra, laws & theorems - simplification of Boolean expression using K maps - logic gates - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

Text Book:

1. Basic Electrical Engineering –T. K. Nagesarkar and M. S. Sukhja, Oxford University Press. 2nd edition.
2. Basic Electrical & Electronics Engineering –T. K. Nagesarkar and M. S. Sukhja, Oxford University Press.2nd edition.
3. Principles of Electronics - V. K. Mehta, S. Chand Publications, 2nd edition.

Reference Books:

1. Theory and problems of Basic electrical Engineering- D. P. Kotahari & I. J. Nagrath PHI.
2. Electronic Devices and Circuits, Millman & Halkias, TMH publications.
3. Electrical Machinery Dr. P. S. Bimbhra, Khanna Publication First Edition 2021.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DATA STRUCTURE AND ALGORITHM USING C

Code: 24CS201
Max Marks: 70

UNIT I (14 Hrs)

Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.
Arrays: Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.
Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.
Hashing: Hash Table, Hash Functions, and Collision Resolution.

UNIT II (10 Hrs)

Linear Data Structures- Dynamic
Introduction: Dynamic Memory Allocation, Dynamic Memory versus Static Memory Allocation.

Linked ListTypes: Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List.
Operations: Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.

UNIT III (9 Hrs)

Abstract Data Types:
Stacks: Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.
Queues: Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

UNIT IV (11 Hrs)

Non Linear Data Structures:
Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.
Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations.
Introduction and Creation (Excluding Implementation): AVL Tree, Heap Tree, M- Way Tree, and B Tree.

Text Book:

1. Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.
4. Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.
5. D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

Reference Books:

1. Ashok N Kamthane "Introduction to Data Structures in C", Pearson, Third Edition, 2009.
2. E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.
3. D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.
4. Y. Kanetkar " Data Structures through C", BPB Publication, Third Edition, 2019.
5. R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.
6. A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.

BASICS OF PYTHON PROGRAMMING

Code: 24CS321
Max Marks: 70

UNIT I (12 Hrs)

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II (12 Hrs)

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III (12 Hrs)

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, strings and basic operations of strings.

UNIT IV (12 Hrs)

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT V (12 Hrs)

Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods and Data hiding.
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Text Book:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W. Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ENVIRONMENTAL STUDIES

Code: 24GN101
Max Marks: 70

UNIT I (10 Hrs)

Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere.
- Scope and importance; Concept of sustainability and sustainable development.
- Emergence of environmental issues: Climate change, Global warming, Ozone layer depletion, Acid rain etc.
- International agreements and programmer: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc.

UNIT II (10 Hrs)

Ecosystems and Natural Resources

- Definition and concept of Ecosystem.
- Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), ecological pyramids and homeostasis.
- Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India.
- Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration.
- Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source.

UNIT III (10 Hrs)

Biodiversity and Conservation

- Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity.
- India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories.
- Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples.
- Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis.
- Biodiversity conservation strategies: in-situ and ex-situ methods of conservation (National Parks, Wildlife Sanctuaries, and Biosphere reserves.
- Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc).

UNIT IV (9 Hrs)

Environmental Pollution and Control Measures

- Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
- Nuclear hazards and human health risks
- Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.; Waste segregation and disposal
- Environmental Impact Assessment and Environmental Management System

Text Book:

1. Sanjay Kumar Batra , Kanchan Batra ,Harpreet Kaur; Environmental Studies; Taxmann's, Fifth Edition.
2. M. M. Sulphey; Introduction to Environment Management; PHI Learning, 2019
3. S.P. Mishra, S.N. Pandey; Essential Environmental Studies; Ane Books Pvt. Ltd. ; Sixth Edition.

Reference Books:

1. Asthana, D. K. (2006).Text Book of Environmental Studies. S. Chand Publishing.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
4. Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). Environment Reader for Universities, Centre for Science and Environment, New Delhi.
5. Masters, G. M., & Ela, W. P. (1991).Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
6. Odum, E. P., Odum, H. T., & Andrews, J. (1971).Fundamentals of ecology. Philadelphia: Saunders.
7. Sharma, P. D., & Sharma, P. D. (2005).Ecology and environment. Rastogi Publications.

ARYAVART
INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(BASED ON 24EG201) Basic Electrical and Electronics Engineering:

Part A: Electrical experiments

1. Verification of Thevenin's Theorem.
2. Speed control of DC shunt motor by:
   a) Armature Voltage Control
   b) Field flux control method.
3. Brake test on DC shunt motor.
4. Swinburn's test on DC shunt machine.
5. OC & SC tests on Single – Phase transformer (Predetermination of efficiency and regulation at given power factors).
6. Brake test on 3-phase induction motor (performance characteristics).

Part B: (Electronics Laboratory experiments)

1. Identification of various electronic components and Devices Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Bread Boards.
2. Identification and Specifications of Active Devices like Diodes, BJTs, JFET etc.
3. Study and operation of Digital Multi meters
4. Function Signal Generator
5. Regulated Power Supplies
6. Study and Operation of CRO: Measurement of amplitude and frequency. Time Period measurement
7. PN Junction and Zener diode characteristics A. Forward bias B. Reverse bias.
8. Half wave and Full wave Rectifiers.
9. Transistor CE characteristics (Input and Output)
10. FET characteristics
11. CE Amplifier

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

PYTHON PROGRAMMING LAB

(BASED ON 24CS201) Basics of Python Programming:

1. Basics & operations

a) Running instructions in Interactive interpreter and a Python Script.

b) Write a program to purposefully raise Indentation Error and correct it.

c) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).

d) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

2. Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10.

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

3. Control Flow - Continued

a) Find the sum of all the primes below 200.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89,...

b) By considering the terms in the Fibonacci sequence whose values do not exceed 400, find the sum of the even-valued terms.

4. DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

c) Write a program combining lists that combines these lists into a dictionary.

d) Write a program to count the frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

5. Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

6. Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centres) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

7. Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

8. Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write a function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

9. Multi-D Lists

a) Write a program that defines a matrix and prints.

b) Write a program to perform addition of two square matrices.
c) Write a program to perform multiplication of two square matrices.

10. Modules

a) Install packages requests, flask and explore them using (pip).
b) Write a script that imports requests and fetches content from the page Eg. (Wiki).
c) Write a simple script that serves a simple HTTP Response and a simple HTML Page.

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks

Program Writing: 10 + 10 Marks
Algorithm& Flowchart: 5 + 5 Marks
Program Execution: 15 + 15 Marks
Viva: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks

Record: 5 Marks
Attendance: 5 Marks
Program Writing: 15 Marks
Program Execution: 15 Marks
Viva: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY

Tilthai, Dharmanagar, North Tripura-799250

Syllabus for B Tech (CSE)

Semester 3

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24MT101	Discrete Mathematical Structure	3	1	0	4	70	30	0	100
24CS304	Design and Analysis of Algorithms	3	1	0	4	70	30	0	100
24CS401	Java Programming	3	1	0	4	70	30	0	100
24CS305	Digital Logic Design	3	1	0	4	70	30	0	100
Discipline Specific Elective (DSE-1) (Choose any one)									
24CS313	Advanced Data Structure	4	0	0	4	70	30	0	100
24CS314	Analog Circuits	4	0	0	4	70	30	0	100
24CS315	Computer Graphics	4	0	0	4	70	30	0	100
Practical									
24CS491	Java Lab	0	0	2	2	0	30	70	100
24CS395	Digital Logic Design Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Detailed Syllabus

DISCRETE MATHEMATICAL STRUCTURE

Code: 24MT101
Max Marks: 70

UNIT I (13 Hrs)

SETS: Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operations on Sets: Union, Intersection difference and Complements of Sets, Algebra of sets, Cartesian product, Simple applications.

RELATION AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation, Composition of relations, and Representation of relations using digraph and Matrix, Function: Domain and Range, onto, into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

PROPOSITIONAL LOGIC: Introduction, Proposition, First order logic, Basic logical operations, truth tables, tautologies, contradictions, Algebra of Propositions, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

UNIT II (10 Hrs)

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Totally ordered set, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal elements, Greatest lower bound, least upper bound, Lattices and Algebraic Structure, Principle of Duality, Elementary Properties of Lattices, Atoms. Sub lattices, Bounded lattice, Distributed & Complemented Lattices, Isomorphic lattices. Boolean lattice.

UNIT III (11 Hrs)

COMBINATORICS: Introduction, Basic Counting Principles, Permutations, Permutations of things not all different, Circular Permutations, Combinations, Restricted Permutations and Combinations, Derangement, Pascal's Triangle, Binomial Theorem (only for natural Numbers).

RECURRENCE RELATIONS: Introduction, Order of Recurrence Relations, Degree of Recurrence Relations, Linear Homogeneous Recurrence Relations, Non Homogeneous Recurrence Relations, Solution of linear homogeneous and non-non homogeneous recurrence relations.

UNIT IV (10 Hrs)

GRAPHS: Introduction, Degree of a vertex of a graph, Handshaking Theorem, types of Graphs, sub graph, Matrix representation of a graph: adjacent and incidence matrices, Isomorphic graphs, path and circuit (Floyd's and Warshall algorithms), Connected graph, Hamiltonian graph, Euler graph, Graph colouring (Vertex, Edges and Map).

Text Book:

1. Rosen, K. H., Discrete Mathematics and its Applications, McGraw Hill Education, 8th edition 2021.
2. Kolman, Busby and Ross, "Discrete Mathematical Structures", Pearson, 10th edition 2015.
3. Babu Ram, "Discrete Mathematics", Pearson Education, 1st edition 2010.

Reference Books:

1. D. S. Malik, M. K. Sen, "Discrete Mathematics" Cengage Learning, 2012.
2. S. K. Sarkar "A Text Book of Discrete Mathematics" S. Chand Publications, 9th edition 2019.
3. Singh J. P. "Discrete Mathematics for Undergraduates" ANE Books, 1st edition, 2013.
4. Tremblay J. P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DESIGN AND ANALYSIS OF ALGORITHMS

Code: 24CS304
Max Marks: 70

UNIT I (12 Hrs)

Introduction

Algorithm - Pseudo Code for Expressing Algorithms - Performance Analysis- Space Complexity - Time Complexity- Asymptotic Notation - Big Oh Notation - Omega Notation - Theta Notation and Little Oh Notation. - Recurrences - Substitution method, Recursion-tree method, Master method.

UNIT II (12 Hrs)

Disjoint Sets, Divide and Conquer

Disjoint Sets: Disjoint Set Operations - Union and find Algorithms.
Divide and Conquer: General Method - Applications-Binary Search – Quick Sort - Merge Sort-Strassen's Matrix Multiplication.

UNIT III (12 Hrs)

Dynamic Programming

General Method –Applications-Matrix Chain Multiplication - Optimal Binary Search Trees - 0/1 Knapsack Problem - All Pairs Shortest Path Problem - Travelling Sales Person Problem – Reliability Design Problem.

UNIT IV (12 Hrs)

Greedy Method and Backtracking

Greedy Method: General Method –Applications- Job Sequencing with Deadlines - Knapsack Problem - Minimum Cost Spanning Trees - Single Source Shortest Path Problem - Backtracking: General Method – Applications-N-Queens Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Cycles.

UNIT V (12 Hrs)

Branch and Bound, Np-Hard and Np-Complete Problems

Branch and Bound: General Method - Applications - Travelling Sales Person Problem - 0/1 Knapsack Problem- LC Branch and Bound Solution - FIFO Branch and Bound Solution.
NP Hard and NP-Complete Problems: Basic Concepts - Non deterministic algorithms - NP – Hard and NP Complete Classes - Cook's Theorem.

Text Book:

1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2015.
2. 2. Alfred V. Aho, John E. Hopcroft, Jeffrey D, "The Design And Analysis Of Computer Algorithms", Pearson India, 1st Edition, 2013.

Reference Books:

1. Knuth Donald E, "Art of Computer Programming: Fundamental Algorithms Volume 1 - Fundamental Algorithms", Third Edition, Pearson Publishers, 2011.
2. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd Edition, 2012.
3. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press, 2009.
4. Jon Kleinberg, Éva Tardos , Algorithm Design, Pearson education, 2014.

ARYAVART INTERNATIONAL UNIVERSITY

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

JAVA PROGRAMMING

Code: 24CS401
Max Marks: 70

UNIT I (12 Hrs)

Java Basics: Java as Object-oriented Programming Language History of Java, Features of Java, Difference between Java and C++, Java Architecture (JDK, JVM, JRE), Java Tokens: Data types, Literals, Variables, Scope and lifetime of variables, Operators. Control Structures, Arrays.

Introducing Classes: Creating a Class: properties, methods and constructors. Object Access modifiers, Method Overloading, Garbage collection, this keyword, Static (variable, method, block), final keyword, Wrapper Classes, String class and methods.

UNIT II (12 Hrs)

Inheritance: Types, Super keyword, method overriding, covariant return type, abstract class.

Interfaces and Packages: Creation and implementing an interface, difference between abstract class and interface, Packages, and importing a package.

Exception Handling: Exception Class, built-in checked and unchecked exceptions, user-defined exceptions, use of try, catch, throw, throws, finally.

UNIT III (10 Hrs)

Using I/O: Elementary concepts of Input/Output, using the byte streams, reading and writing using byte streams, automatically closing a file, using the character-based streams, File I/O using character streams (using a File Writer and using a File Reader).

Multi-threaded programming: Multithreading fundamentals, Thread class, and Runnable interface, the life cycle of thread, creation of single and multiple threads, implementation of Thread methods, Synchronization (using Synchronized methods, synchronized statement).

UNIT IV (10 Hrs)

Swings Fundamentals: Components (JLabel and ImageIcon, using swing Buttons (JButton, JToggleButton, JCheckBox, JRadioButton), JTextField, JScrollPane, JList, JComboBox) and Containers, Layout managers, event delegation Model, event handling (event sources, event listeners, event classes and interfaces, adapter classes).

JDBC: JDBC Architecture, JDBC Drivers, Connection, Statement, Prepared Statement, Result set, Connecting to the Database using JDBC.

Text Book:

1. Herbert Schildt, “Java 2 -The Complete Reference” – Tata McGraw Hill Education Private Limited, 2010.
2. Trilochan Tarai, “Java Core Concepts and Applications”, I.K. International Publishing house pvt. Ltd., 2015.

Reference Books:

1. E. Balaguruswamy, “Programming with Java A Primer”, McGraw Hill Education Private Limited, 5th edition.
2. Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehensive Introduction” – Tata McGraw Hill EducationPrivate Limited, 2013.
3. Cay S. Horstmann, “Core Java Volume 1 – Fundamentals”, 10th edition, Pearson, 2017.
4. Ken Arnold, Davis Holmes, James Gosling, Prakash Goteti, “The Java Programming Language”, 3rd edition, Pearson, 2008.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधन सर्वधनप्रधान

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DIGITAL LOGIC DESIGN

Code: 24CS305
Max Marks: 70

UNIT I (8 Hrs)
Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess-3 code, Gray code, Complement representation of negative numbers: Signed Magnitude, One's complement method, Two's complement method, Binary Arithmetic.

UNIT II (8 Hrs)
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion

UNIT III (10 Hrs)
Combinational Logic Design: Analysis of combinational circuits, Design Procedure – Binary Adder, Subtractor, BCD Adder, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, Code Converters.

UNIT IV (10 Hrs)
Sequential Circuits: Latches: RS latch and JK latch, Flip-flops: RS, JK, D, T flip flops, Master-slave flip flops, Edge-triggered flip-flops. Shift registers, Universal Shift register, ripple counters, synchronous counters, Ring counter, Johnson counter, Up-Down counter.

UNIT V (9 Hrs)
VLSI Design flow: Design entry, Schematic, HDL, different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Text Book:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.
2. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989

Reference Books:

1. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI, 2014.
2. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.
3. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ADVANCED DATA STRUCTURE

Code: 24CS313
Max Marks: 70

UNIT I (9 Hrs)

Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.

UNIT II (8 Hrs)

Priority Queues (Heaps): Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.
Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queue, Priority Queues in the Standard Library.

UNIT III (11 Hrs)

Trees: AVL: Single Rotation, Double Rotation, B-Trees.
Multi-way Search Trees: 2-3 Trees: Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree.
Red-Black Trees: Properties of red-black trees, Rotations, Insertion, Deletion.

UNIT IV (8 Hrs)

Graphs Algorithms: Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT V (7 Hrs)

Disjoint Sets: Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm.
String Matching: The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

Text Book:

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, 2009, The MIT Press

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ANALOG CIRCUITS

Code: 24CS314
Max Marks: 70

UNIT I (10 Hrs)

Multistage and Differential Amplifiers

Introduction –Recap of Small Signal Amplifiers, Multistage Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non-ideal Characteristics of the Differential Amplifier.

UNIT II (9 Hrs)

Frequency Response

Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers and Multistage amplifiers.

UNIT III (11 Hrs)

Feedback Amplifiers & Oscillators

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Trans-conductance Amplifier (Series—Series), The Feedback Trans-resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary. Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

UNIT IV (8 Hrs)

Power Amplifiers

Introduction, Classification of Output Stages, Class-A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.

UNIT V (7 Hrs)

Tuned Amplifiers and Multi-vibrators

Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers. Multi-vibrators: Analysis and Design of Bistable, Monostable, and Astable Multi-vibrators.

Text Book:

1. Adel. S. Sedraand Kenneth C. Smith, “Micro Electronic Circuits,” 6thEdition, Oxford University Press, 2011.
2. J. Millman, C Chalkias, “Integrated Electronics”, 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.
3. Millman and Taub, “Pulse, Digital and Switching Waveforms”, 3rd Edition, Tata McGraw-Hill Education, 2011.

Reference Books:

1. Behzad Razavi, “Fundamentals of Micro Electronics”, Wiley, 2010.
2. Donald A Neamen, “Electronic Circuits –Analysis and Design,” 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th Edition, Pearson/Prentice Hall, 2006.
4. K. Lal Kishore, “Electronic Circuit Analysis”, 2ndEdition, B S Publications, 2008.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

COMPUTER GRAPHICS

Code: 24CS315
Max Marks: 70

UNIT I (6 Hrs)
Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.

UNIT II (8 Hrs)
Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.

UNIT III (8 Hrs)
2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang-bersky, NLN), polygon clipping.

UNIT IV (6 Hrs)
3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.

UNIT V (8 Hrs)
3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

UNIT VI (6 Hrs)
Advance Topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), and Colour models: properties of light, XYZ, RGB, YIQ and CMY colour models.

Text Book:

1. Donald Hearn & M. Pauline Baker, “Computer Graphics with OpenGL”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-NianLi and Mark S. Drew, “Fundamentals of Multimedia”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Computer Graphics, D. Hearn And P. Baker - Pearson Education - C Version
2. Computer Graphics, with OpenGL Hearn and Baker, - Pearson
3. Computer Graphics, Sinha & Udai, - TMH
4. Computer Graphics, Foley and van Dam - Person Education

ARYAVART INTERNATIONAL UNIVERSITY
शिक्षितं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

JAVA LAB

(BASED ON 24CS401) Java Programming

Core Practicals (Implement minimum 10 out of 15 practical)

1. Write a program declaring a class Rectangle with data member's length and breadth and member functions Input, Output and Calc Area.
2. Write a program to demonstrate use of method overloading to calculate area of square, rectangle and triangle.
3. Write a program to demonstrate the use of static variable, static method and static block.
4. Write a program to demonstrate concept of ``this``.
5. Write a program to demonstrate multi-level and hierarchical inheritance.
6. Write a program to use super() to invoke base class constructor.
7. Write a program to demonstrate run-time polymorphism.
8. Write a program to demonstrate the concept of aggregation.
9. Write a program to demonstrate the concept of abstract class with constructor and ``final`` method.
10. Write a program to demonstrate the concept of interface when two interfaces have unique methods and same data members.
11. Write a program to demonstrate checked exception during file handling.
12. Write a program to demonstrate unchecked exception.
13. Write a program to demonstrate creation of multiple child threads.
14. Write a program to use Byte stream class to read from a text file and display the content on the output screen.
15. Write a program to demonstrate any event handling.

Application Based Practical (Implement minimum 5 out of 10 practical)

1. Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format:
   Name:
   Age:
   Address:
2. Write a Java program to perform basic Calculator operations. Make a menu driven program to select operation to perform (+ - * /). Take 2 integers and perform operation as chosen by user.
3. Write a program to make use of Buffered Stream to read lines from the keyboard until 'STOP' is typed.
4. Write a program declaring a Java class called Savings Account with members ``account Number`` and ``Balance``. Provide member functions as ``deposit Amount ()`` and ``withdraw Amount ()``. If user tries to withdraw an amount greater than their balance then throw a user-defined exception.
5. Write a program creating 2 threads using Runnable interface. Print your name in ``run ()`` method of first class and "Hello Java" in ``run ()`` method of second thread.
6. Write program that uses swings to display combination of RGB using 3 scrollbars.
7. Write a swing application that uses at least 5 swing controls.
8. Write a program to implement border layout using Swing.
9. Write a java program to insert and update details data in the database.
10. Write a java program to retrieve data from database and display it on GUI.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DIGITAL LOGIC DESIGN LAB

(BASED ON 24CS2305) Digital Logic Design:

LIST OF EXPERIMENTS (Hardware)

1. Realization of Boolean Expressions using Gates.
2. Design and realization of logic gates using universal gates.
3. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter.
4. Verify the functionality of Mux and De-Mux ICs.
5. Verify the functionality of Encoder and Decoder ICs.
6. Design and realization of 4-bit comparator.
7. Verify the functionality of D & T Flip-Flop ICs.
8. Verify the functionality of S-R & J-K Flip-Flop ICs.
9. Mod-N counter using 7490 and 74190.
10. Shifts register IC 7495.

LIST OF EXPERIMENTS (Hardware)

VHDL Programming:

1. Write structural and dataflow VHDL models for
    a. Half adder / Half subtractor
    b. Full adder / Full subtractor
2. Write a VHDL program in structural model for
    a. 16:1 mux realization
    b. 3:8 decoder realization through 2:4 decoder
3. Write a VHDL program in behavioural model for
    a. 3:8 decoder
    b. 8:3 encoder
4. Write a VHDL program in structural and behavioural models for 8 bit asynchronous up-down counter
5. Write a VHDL program in structural model for 8-bit Universal Shift Register

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY
विद्याधनं सर्वधनप्रधानं