Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Computer Science and Engineering(Cyber Security)

(Applicable from the academic session 2022-2023)

Curriculum Structure

Semester III (Second year)								
Sl No		**Type of Course**	**Code**	**Course Title**	**Hours per week**			**Credits**
					L	**T**	**P**	
1	THEORY	Engineering Science Course	ESC301	Analog and Digital Electronics	3	0	0	3
2		Professional Core Course	PCC-CS301	Data Structure and Algorithms	3	0	0	3
3		Professional Core Course	PCC-CS302	Computer Organization	3	0	0	3
4		Basic Science Course	BSC-CS301	Discrete Mathematics	2	0	0	2
5		Humanities Social Science including Management Course	HSMC301	Economics for Engineers (Humanities II)	3	0	0	3
6	PRACTICAL	Professional Core Course	PCC-CS391	Data Structure and Algorithms	0	0	4	2
7		Engineering Science Course	ESC391	Analog and Digital Electronics	0	0	4	2
8		Professional Core Course	PCC-CS392	Computer Organization	0	0	4	2
9		Professional Core Course	PCC-CS393	IT Workshop (Python/Matlab/R)	0	0	4	2
TOTAL CREDITS								22

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Semester IV (Second year)								
Sl No		Type of Course	Code	Course Title	Hours per week			Credits
					L	T	P	
1	THEORY	Professional Core Course	PCC-CSY401	Probability and Statistics	3	0	0	3
2		Professional Core Course	PCC-ICB401	Data Communication and Networks	3	0	0	3
3		Professional Core Course	PCC-CS403	Formal Languageand Automata Theory	3	0	0	3
4		Professional Core Course	PCC-CS404	Design and Analysis of Algorithm	3	0	0	3
5		Basic Science Course	BSC401	Biology	2	1	0	3
6		Mandatory Course	MC401	Environmental Science	2	0	0	2
7	PRACTICAL	Professional Core Course	PCC-ICB491	Data Communication and Networks Lab	0	0	4	2
8		Professional Core Course	PCC-CS494	Design and Analysis of Algorithm Lab	0	0	4	2
TOTAL CREDITS								21

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Semester-III

Name of the Course:	**Analog & Digital Electronics**	
Course Code: ESC-301	Semester: III	
Duration: 6 months	Maximum Marks: 100	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: hrs./week		End Semester Exam : 70 Marks
Credit Points:	3	

Objective:	
1	To acquire the basic knowledge of different analog components and their applications
2	To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
3	To prepare students to perform the analysis and design of various digital electronic circuits
Pre-Requisite:	
1	Basic Electronics Parts I & II learned in the First year, semesters 1 & 2. Basic BJTs,.
2	Basic concept of the working of P-N diodes, Schottky diodes,
3	Basic FETs and OPAMP as a basic circuit component. Concept of Feedback

Unit	Content	Hrs/Unit	Marks/Unit
1	Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency; Recapitulation of basic concepts of Feedback and Oscillation, Phase Shift, Wein Bridge oscillators Astable & Monostable Multivibrators; Schimtt Trigger circuits, 555 Timer.	9	

2	Binary Number System & Boolean Algebra (recapitulation); BCD, ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra (recapitulation); Representation in SOP and POS forms; Minimization of logic	11	
	expressions by algebraic method. Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator		
3	Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO, SIPO, PIPO, PISO) Ring counter, Johnson counter Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter	10	
4.	A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only [2L] A/D: successive approximation [2L]) Logic families- TTL, ECL, MOS and CMOS - basic concepts. (2L)	6	

Text book and Reference books:

1. Microelectronics Engineering –Sedra & Smith-Oxford.
2. Analog Electronics, A.K. Maini, Khanna Publishing House (AICTE Recommended -2018)
3. Analog Electronics, L.K. Maheswari, Laxmi Publications (AICTE Recommended -2018)
4. Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand
5. Digital Electronics – Kharate – Oxford
6. Digital Electronics – Logic & Systems by J.Bigmell & R.Donovan; Cambridge Learning.
7. Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP
8. Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI
9. Bell-Linear IC & OP AMP—Oxford
10. P.Raja- Digital Electronics- Scitech Publications
11. Morries Mano- Digital Logic Design- PHI
12. R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
13. H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.
14. D.RayChaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
15. Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
16. J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.
17. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill
18. Floyed & Jain- Digital Fundamentals-Pearson.

Course Outcomes:

On completion of the course students will be able to

ESC-301.1 Realize the basic operations of different analog components.ESC-301.2 Realize basic gate operations and laws Boolean algebra.

ESC-301.3 Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

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Name of the Course:	**Data Structure & Algorithms**	
Course Code: PCC-CS 301	Semester: III	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance : 5 marks
Practical: hrs./week		End Semester Exam :70 Marks
Credit Points:	3	

Objective:	
1	To learn the basics of abstract data types.
2	To learn the principles of linear and nonlinear data structures.
3	To build an application using sorting and searching
Pre-Requisite:	
1	CS 201 (Basic Computation and Principles of C
2	M101 & M201 (Mathematics), basics of set theory

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Technique sand their complexity analysis.	10	
2	Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.	9	

3	Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms andthe complexity analysis. Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis	10	
4.	Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	9	

Text book and Reference books:

1. "Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung.
2. "Data Structure & Algorithms Using C", 5th Ed., Khanna Publishing House (AICTE Recommended – 2018)
3. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
4. "Data Structures in C" by Aaron M. Tenenbaum.
5. "Data Structures" by S. Lipschutz.
6. "Data Structures Using C" by Reema Thareja.
7. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
8. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
9. "Data Structures through C" by Yashwant Kanetkar, BPB Publications.
10. "Expert Data Structures with C++" by R.B Patel, Khanna Publishing House

Course Outcomes:

On completion of the course students will be able to

PCC-CS301.1 Differentiate how the choices of data structure & algorithm methods impactthe performance of program.

PCC-CS301.2 Solve problems based upon different data structure & also write programs. PCC-CS301.3 Identify appropriate data structure & algorithmic methods in solving problem.

PCC-CS301.4 Discuss the computational efficiency of the principal algorithms for sorting,searching, and hashing

PCC-CS301.5 Compare and contrast the benefits of dynamic and static data structures implementations.

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Name of the Course:	**Computer Organization**
Course Code: PCC- CS302	Semester: III
Duration:6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz : 10 marks
	Attendance: 5 marks
Practical: hrs./week	End Semester Exam: 70 Marks
Credit Points:	3

Unit	Content	Hrs/Unit	Marks/Unit
1	Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. [7L] Commonly used number systems. Fixed and floating point representation of numbers.[1L]	8	
2	Overflow and underflow. Design of adders - ripple carry and carry look ahead principles. [3L] Design of ALU. [1L] Fixed point multiplication -Booth's algorithm. [1L] Fixed point division - Restoring and non-restoring algorithms. [2L] Floating point - IEEE 754 standard. [1L]	8	
	Memory unit design with special emphasis on		
3	implementation of CPU-memory interfacing. [2L] Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L] Cache memory, Virtual memory. Data path design for read/write access. [5L]	10	
4.	Design of control unit - hardwired and microprogrammed control. [3L] Introduction to instruction pipelining. [2L] Introduction to RISC architectures. RISC vs CISC architectures. [2L] I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]	10	

Text book and Reference books:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Behrooz Parhami “Computer Architecture”, Oxford University Press
3. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
4. Hamacher, “Computer Organisation”, McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and

Microcontrollers" OUP
6. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
7. P N Basu- "Computer Organization & Architecture" ,Vikas Pub
8. Rajaraman – "Computer Organization & Architecture", PHI
9. B.Ram – "Computer Organization & Architecture", Newage Publications

Course Outcomes:

On completion of the course students will be able to

PCC-CS302.1 Understand basic structure of digital computer, stored program concept anddifferent arithmetic and control unit operations.

PCC-CS302.2 Understand basic structure of different combinational circuits-multiplexer, decoder, encoder etc.

PCC-CS302.3 Perform different operations with sequential circuits.PCC-CS302.4 Understand memory and I/O operations.

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Name of the Course:	**Discrete Mathematics**	
Course Code: BSC-CS301	Semester: III	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial:		Assignment and Quiz : 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	2	

Unit	Content	Hrs/Unit
1	Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well- Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.	8
2	Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination	5
3	Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proofby Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.	8
4.	Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form	7

5	Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerianand Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi- connected component and Articulation Points, Shortest distances.	8

Text book and Reference books:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics andOptimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for ComputerScience, CENGAGE Learning
4. S.B. Singh, Discrete Structures – Khanna Publishing House (AICTE RecommendedTextbook – 2018)
5. S.B. Singh, Combinatorics and Graph Theory, Khanna Publishing House (AICTERecommended Textbook – 2018)

6. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH
7. J.K. Sharma, Discrete Mathematics, Macmillan
8. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics,PEARSON. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
9. Douglas B. West, Introduction to graph Theory, PHI
10. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
11. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures,World Scientific, 1999.
12. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed.,Addison-Wesley, 1994.
13. N. Deo, Graph Theory, Prentice Hall of India, 1974.
14. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
15. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications toComputer Science, Tata McGraw-Hill, 1997.
16. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics andOptimisation
17. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
18. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for ComputerScience, CENGAGE Learning
19. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

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Name of the Course:	**Economics for Engineers (Humanities-II)**	
Course Code: HSMC-301	Semester: III	
Duration: 6 months	Maximum Marks: 100	
Teaching Scheme	**Examination Scheme**	
Theory:3 hrs./week	Mid Semester exam: 15	
Tutorial: NIL	Assignment and Quiz: 10 marks	
	Attendance: 5 marks	
Practical: NIL	End Semester Exam: 70 Marks	
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	1. Economic Decisions Making – Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	9	
2	3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. 4. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis,Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	9	

3	5. Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. 6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. 7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	9	
4.	8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. 9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. 10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	9	

Text book and Reference books:

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

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Name of the Course:	**Data Structure & Algorithms Lab**
Course Code: PCC-CS391	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
Linear Data Structure	
1	Implementation of array operations
2	Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements
3	Merging Problem: Evaluation of expressions operations on Multiple stacks & queues:
4	Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists
5	Polynomial addition, Polynomial multiplication
Non Linear Data Structure	
6	Recursive and Non-recursive traversal of Trees
7	Threaded binary tree traversal. AVL tree implementation
8	Application of Trees. Application of sorting and searching algorithms
9	Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Any experiment specially designed by the college

(Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	**Analog & Digital Electronics Lab**
Course Code: ESC-391	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
Analog Electronics	
1	Design a Class A amplifier
2	Design a Phase-Shift Oscillator
3	Design of a Schmitt Trigger using 555 timer
Digital Electronics	
4	Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
5	Construction of simple Decoder & Multiplexer circuits using logic gates.
6	Realization of RS / JK / D flip flops using logic gates
7	Design of Shift Register using J-K / D Flip Flop
8	Realization of Synchronous Up/Down counter
9	Design of MOD- N Counter
10	Study of DAC

Any experiment specially designed by the college
(Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	**Computer Organization Lab**
Course Code: PCC-CS392	Semester: III
Duration:6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
1	Familiarity with IC-chips: a) Multiplexer, b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification from Data-book.
2	Design an Adder/Subtractor composite unit.
3	Design a BCD adder.
4	Design of a 'Carry-Look-Ahead' Adder circuit.
5	Use a multiplexer unit to design a composite ALU
6	Use ALU chip for multibit arithmetic operation
7	Implement read write operation using RAM IC
8	8. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

Any experiment specially designed by the college

(Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	IT Workshop (Sci Lab/MATLAB/Python/R)
Course Code: PCC-CS393	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: NIL	Continuous Internal Assessment
Tutorial: NIL	External Assessment: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points: 2	

Practical Syllabus

Programming with Python

Introduction History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator Conditional Statements If, If- else, Nested if-else, Looping, For, While, Nested loops Control Statements Break, Continue, Pass String Manipulation Accessing Strings, Basic Operations, String slices, Function and Methods Lists Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple Introduction, Accessing tuples, Operations, Working, Functions and Methods Dictionaries Introduction, Accessing values in dictionaries, Working with dictionaries, Properties Functions Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables Modules Importing module, Math module, Random module, Packages, Composition, InputOutput Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions Exception Handling Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

Programming in R

1. Introduction to mechanism for statistics, data analysis, and machine learning;

Introduction of R Programming, How to install and run R, Use of R help files, R Sessions, R Objects – Vectors, Attributes, Matrices, Array, Class, List, Data Frames etc.Operators in R.

2. R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, RVector Function, Recursive Function in R.
3. R Packages (Install and Use), Input/Output Features in R, Reading or Writing in File. Data Manipulation in R.Rearranging data, Random Number and Simulation, Statistical methods like min, max, median, mean, length, Linear Regression, Normal Distribution, Decision tree
4. Graphics, Creating Graphs, The Workhorse of R Base Graphics, Graphical Functions – Customizing Graphs, Saving Graphs to Files, Pie chart, Bar Chart, Histogram.

Programming in Matlab

Introduction

Why MATLAB?, History, Its strengths, Competitors, Starting MATLAB, Using MATLAB asa calculator, Quitting MATLAB

Basics

Familiar with MATLAB windows, Basic Operations, MATLAB-Data types, Rulesabout

variable names, Predefined variables
Programming-I
Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealingwith strings (Array of characters), Array of array (cell) concept

Programming-II
Script file, Input commands, Output commands, Structure of function file, Inline functions, Feval command, Comparison between script file and function file

Conditional statements and Loop
Relational and Logical Operators, If-else statements, Switch-case statements, Forloop, While loop, Special commands (Break and continue), Import data from large database, Export data to own file or database
2D Plotting
In-built functions for plotting, Multiple plotting with special graphics, Curvefitting, Interpolation, Basic fitting interface
3D Plotting
Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics Programming with Python
Introduction
History, Features, Setting up path, Working with Python, Basic Syntax, Variable andData Types, Operator
Conditional Statements
If, If- else, Nested if-else, Looping, For, While, Nestedloops
Control Statements
Break, Continue,
Pass String
Manipulation
Accessing Strings, Basic Operations, String slices, Function and Methods Lists
Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple
Introduction, Accessing tuples, Operations, Working, Functions and Methods Dictionaries
Introduction, Accessing values in dictionaries, Working with dictionaries, Properties Functions
Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables Modules
Importing module, Math module, Random module, Packages, Composition, Input-Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions
Exception Handling
Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

Maulana Abul Kalam Azad University of Technology, West Bengal

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Syllabus for B. Tech in Computer Science and Engineering(Cyber Security)

(Applicable from the academic session 2022-2023)

Semester-IV

Subject: Probability & Statistics	
Course Code: PCC-CSY401	**Semester: IV**
Teaching Scheme	**Maximum Marks: 100**
Theory: 3 hrs./week	**Examination Scheme**
Tutorial:	End Semester Exam: 70
Practical:0	Attendance: 5
Credit:3	Continuous Assessment: 25

Aim:

Sl. No.	
1.	The aim of this course is to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problemsin the discipline.
2.	The objective of this course is to familiarize the students with statistical techniques.

Objective: Throughout the course, students will be expected to demonstrate their understanding of probability & statistics by being able to learn each of the following

Sl. No.	
1.	The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2.	The basic ideas of statistics including measures of central tendency, correlation and regression.
3.	The statistical methods of studying data samples.

Pre-Requisite:

Sl. No.	
1.	Knowledge of basic algebra, calculus.
2.	Ability to learn and solve mathematical model.

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Contents		**Hrs./week**	**Contents**
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and nonhomogeneous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.	**16**	**20**
02	Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	**16**	**25**
03	Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi- square test for goodness of fit and independence of attributes.	**16**	**25**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**52**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Erwin Kreyszig	Advanced Engineering Mathematics	9 th Edition	John Wiley & Sons
N. G. Das	Statistical Methods	0070083274, 9780070083271	Tata Mc.Graw Hill
Reena Garg	Advanced Engineering Mathematics	First Edition	Khanna Publishing
Reference Books:			
P. G. Hoel, S. C. Port and C. J. Stone	Introduction to Probability Theory		Universal Book Stall
W. Feller	An Introduction to Probability Theory and its Applications	3rd Ed.	Wiley
Manish Sharma, Amit Gupta	The Practice of BusinessStatistics	First Edition	Khanna PublishingHouse

❖ DATA COMMUNICATION AND NETWORKS [3 0 0 3]- PCCICB40 1

Basic concepts of computer networks, Layered architecture and comparison between ISO/OSI, TCP/IP layered models. Significance of Datalink layer and protocols. Network layer functionalities, classful, classless IP addressing, address allocation and role of forwarding module in forwarding the packet using routing table. Roles played by IP, ARP, RARP, ICMP& IGMP protocols in network layer. Inter-domain and intra-domain routing algorithms for routing tables. Importance of transport layer in achieving process-to-process communication. Insight of connection oriented protocol TCP and connectionless protocol UDP. Features of TCP in achieving flow control, error control and congestion control. Requirement of different timers in TCP. Drawbacks of IPv4 addressing and new IP addressing scheme IPv6. Migrating from IPv4 to IPv6. Introduction to application layer, a client/server application program and a case study. Client-server application program-Dynamic Host Configuration Protocol (DHCP).

References:

1. Behrouz A. Forouzan, *TCP/IP Protocol Suite,* 4th Edition, Tata McGraw Hill, 2010.
2. Tannenbaum, A.S, *Computer Networks, 5th Edition*, Prentice Hall of India EE Edition, 2011.
3. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, Tata McGraw Hill, 2013.
4. Leon Garcia and Widjala, *Communication Networks*, 5th Edition, Tata McGraw Hill, 2017.
5. Bhawneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2019.

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❖ Formal Language & Automata Theory [3 0 0 3]- PCC-CS403

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction:Alphabet,languagesandgrammars,productionsandderivation,Chomskyhierarchyoflanguages.	6	
2	Regularlanguagesandfiniteautomata:Regularexpressionsandlanguages,deterministicfiniteautomata(DFA)andequivalencewithregularexpressions,nondeterministicfiniteautomata(NFA)andequivalencewithDFA,regulargrammarsandequivalencewithfiniteautomata,propertiesofregularlanguages,pumpinglemmaforregularlanguages,minimizationoffiniteautomata)	7	
3	Context-freelanguagesandpushdownautomata:Context-freegrammars(CFG)andlanguages(CFL),Chomskyand Greibachnormalforms, nondeterministicpushdownautomata(PDA)andequivalencewithCFG,parsetrees,ambiguityinCFG,pumpinglemmaforcontext-freelanguages,deterministicpushdownautomata,closurepropertiesofCFLs.	6	
4.	Context-sensitivelanguages:Context-sensitivegrammars(CSG)andlanguages,linearboundedautomata andequivalencewithCSG.	6	
5	Turingmachines:ThebasicmodelforTuringmachines(TM),Turingrecognizable(recursivelyenumerable)andTuring-decidable(recursive)languagesandtheirclosureproperties,variantsofTuringmachines,nondeterministicTMsandequivalencewithdeterministicTMs,unrestrictedgrammarsandequivalencewithTuringmachines,TMsas enumerators	6	
6	Undecidability:Church-Turingthesis,universalTuringmachine,theuniversalanddiagonalizationlanguages,reductionbetweenlanguagesandRicestheorem,undecidableproblems about languages	6	

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Design and Analysis of Algorithms

Code: PCC-CS404

Contacts: 3L

Name of the Course:	**Design and Analysis of Algorithms**	
Course Code: PCC-CS404	Semester: IV	
Duration: 6 months	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: hrs./week		End Semester Exam: 70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit
1	Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem	8
2	Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch and- Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.	8
3	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.Tractable and Intractable Problems: Computability	6
4.	of Algorithms, Computability classes – P,NP, NP- complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.	10
5	Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	4

Text books/ reference books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald LRivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.
4. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
5. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael TGoodrich and Roberto Tamassia, Wiley.
6. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading,MA
7. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House (AICTERecommended Textbook – 2018)
8. Algorithms Design and Analysis, Udit Agarwal, Dhanpat Rai

world will be ruled by ideas, concept, and creativity.

1. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
2. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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❖ Biology [2 1 0 3]- BSC401

Unit	Content	Hrs/Unit
1	ToconveythatBiologyis as importanta scientificdisciplineas Mathematics,PhysicsandChemistryBringout the fundamentaldifferences betweenscience and engineering by drawing a comparisonbetweeneye and camera,Bird flyingand aircraft.Mentionthemostexciting aspectofbiology asan independentscientificdiscipline.Whywe need to studybiology? Discusshowbiologicalobservationsof18thCenturyt hat lead to majordiscoveries. ExamplesfromBrownianmotionandtheoriginofthermodyna mics byreferring to the originalobservationofRobertBrownandJuliusMayor.Thesee xamples willhighlightthefundamentalimportanceofobservationsinan yscientificinquiry.	2
2	Theunderlyingcriterion,such as morphological,biochemicalor ecological behighlighted. Hierarchyoflifeformsatphenomenologicallevel.A commonthreadweaves this hierarchyClassification.Discuss classificationbased on(a)cellularity-Unicellularor multicellular(b)ultrastructure-prokaryotes or eucaryotes.(c) energyandCarbonutilisation- Autotrophs,heterotrophs,lithotropes (d)Ammoniaexcretion – aminotelic,uricoteliec,ureotelic(e)Habitata- acquaticor terrestrial(e)Moleculartaxonomy-three major kingdoms oflife. Agivenorganismcancomeunder different categorybasedonclassification.Modelorganismsforthestud yofbiologycomefromdifferentgroups.E.coli, S.cerevisiae,D.Melanogaster, C.elegance, A.Thaliana,M.musculus	3
3	Toconveythat“Genetics is to biologywhatNewton’s lawsare to PhysicalSciences”Mendel’slaws,Conceptofsegregation and independentassortment.Conceptofallele.Gene mapping, Geneinteraction,Epistasis.Meiosis andMitosis betaught asa partofgenetics. Emphasis to begivenotto themechanics ofcelldivisionnor thephases but howgeneticmaterialpasses fromparentto offspring. Conceptsofrecessivenessand dominance.Conceptofmapping ofphenotypeto genes.Discuss aboutthesinglegenedisorders inhumans. Discusstheconceptofcomplementationusinghumangenetics.	4

4.	Biomolecules:Toconveythat all formsoflife havethesamebuilding blocksand yetthemanifestations are asdiverse as onecanimagineMolecules oflife. In this contextdiscussmonomeric unitsandpolymericstructures. Discuss aboutsugars,starchandcellulose.Aminoacids and proteins.Nucleotides andDNA/RNA.Twocarbonunits andlipids.	4
5	Enzymes**:**Toconvey that withoutcatalysis lifewould not have existed onearth Enzymology:Howto monitorenzymecatalysedreactions.Howdoesanenzymec atalysereactions?Enzymeclassification.Mechanismofen zymeaction. Discuss atleast two examples.Enzymekineticsandkineticparameters.Whyshoul d weknowtheseparameters to understandbiology? RNA catalysis.	4
6	InformationTransfer:Themolecular basisofcodinganddecoding genetic informationisuniversal Molecular basis ofinformationtransfer.DNA asageneticmaterial.Hierarchyof DNA structure-fromsinglestranded to doublehelixtonucleosomes.Conceptofgeneticcode. Universality and degeneracyofgeneticcode.Definegeneinterms ofcomplementation andrecombination.	4
7	Macromolecularanalysis**:** How to analysebiologicalprocesses atthereductionistlevelProteins-structure andfunction.Hierarchinproteinstructure.Primarysecondary, tertiary andquaternarystructure.Proteins asenzymes,transporters,receptorsandstructuralelements.	5
8	Metabolism**:**Thefundamentalprinciplesofenergytransacti ons arethesameinphysicalandbiologicalworld. Thermodynamics asappliedto biologicalsystems. Exothermic and endothermicversusendergonicandexergoincreactions.C onceptofKeqand its relation tostandardfreeenergy. Spontaneity.ATP asanenergycurrency.Thisshouldinclude thebreakdownofglucosetoCO2 + H2O(GlycolysisandKrebscycle) andsynthesis ofglucose from CO2 and H2O(Photosynthesis).Energyyielding andenergyconsumingreactions.ConceptofEnergychar ge	4
9	MicrobiologyConceptofsinglecelled organisms.Conceptofspecies andstrains.Identificationandclassificationofmicroorganis ms.Microscopy. Ecological aspects ofsinglecelled organisms.Sterilizationandmediacompositions.Growthkin etics.	3

Textbooks/referencebooks:

1. Uma Devi, General Biology, Khanna Publishing House.
2. Biology:A globalapproach:Campbell, N.A.; Reece,J.B.; Urry,Lisa; Cain,M, L.;Wasserman,S. A.;Minorsky,P.V.; Jackson, R.B.PearsonEducationLtd
3. OutlinesofBiochemistry,Conn,E.E;Stumpf,P.K;Bruening,G;Doi,R.H.JohnWileyandSons
4. PrinciplesofBiochemistry(VEdition),ByNelson,D.L.;andCox,M.M.W.H.FreemanandCompany
5. MolecularGenetics(Secondedition),Stent,G.S.;andCalender,R.W.H.Freemanandcompany,Distributedby Satish Kumar Jainfor CBSPublisher

Microbiology,Prescott,L.MJ.P.HarleyandC.A.Klein1995.2ndeditionWm,C.BrownPublishers

❖ Environmental Science [2 0 0 2]- MC401

Unit	Content	Hrs/Unit
1	Basicideas ofenvironment,basicconcepts,man,society &environment,their interrelationship(1L) Mathematicsofpopulationgrowthandassociatedproblems,Importanceofpopulationstudyinenvironmental engineering,definitionofresource,typesofresource,renewable,non-renewable,potentiallyrenewable,effectofexcessiveusevis-à-vispopulationgrowth,Sustainable Development.(2L) Materialsbalance:Steadystateconservationsystem,steadystatesystemwithnon-conservativepollutants,stepfunction. (1L) Environmentaldegradation:NaturalenvironmentalHazardslikeFlood,earthquake,Landslide-causes,effectsand control/management;Anthropogenic degradationlikeAcidrain-cause,effectsandcontrol.NatureandscopeofEnvironmentalScienceandEngineering.(2L)	6
2	Elementsofecology:System,opensystem,closedsystem,definitionofecology,species,population,community,definitionofecosystem-componentstypesandfunction. (1L) Structureandfunctionofthefollowingecosystem:Forestecosystem,Grasslandecosystem,Desertecosystem,Aquaticecosystems,Mangroveecosystem(specialreferencetoSundarban);Food chain[definitionandoneexampleofeachfoodchain],Foodweb.(2L) BiogeochemicalCycle-definition,significance,flowchartofdifferentcycleswithonlyelementaryreaction[Oxygen, carbon,Nitrogen,Phosphate,Sulphur].(1L) Biodiversity-types,importance,Endemicspecies,BiodiversityHot-spot,Threatstobiodiversity,Conservationofbiodiversity.(2L)	6

3	AtmosphericComposition:Troposphere,Stratosphere,Mesosphere,Thermosphere,TropopauseandMesopause.(1L) Energybalance:ConductiveandConvectiveheattransfer,radiationheattransfer,simpleglobaltemperaturemodel[Earthasablackbody,earthasalbedo],Problems.(1L) Greenhouseeffects:Definition,impactofgreenhousegasesontheglobalclimateandconsequentlyonseawaterlevel,agricultureandmarinefood.Globalwarminganditsconsequence,Controlof Globalwarming.Earth's heat budget.(1L) Lapserate:AmbientlapserateAdiabaticlapserate,atmosphericstability,temperatureinversion(radiationinversion).(2L) Atmosphericdispersion:Maximummixingdepth,ventilationcoefficient,effectivestackheight, smokestack plumes andGaussian plume model.(2L) Definitionofpollutantsandcontaminants,Primaryandsecondarypollutants: emissionstandard,criteria pollutant.Sourcesandeffectofdifferentairpollutants- Suspendedparticulatematter,oxidesofcarbon,oxidesof nitrogen,oxides ofsulphur,particulate,PAN.(2L)Smog, Photochemical smog and London smog.DepletionOzonelayer:CFC,destructionofozonelayerby CFC,impact ofothergreen-housegases,effectofozonemodification. (1L) Standardsandcontrolmeasures:Industrial,commercialandresidentialairqualitystandard,controlmeasure(ESP.cycloneseparator,baghouse,catalyticconverter,scrubber(ventury),Statementwithbriefreference).(1L)	11
4.	Hydrosphere,HydrologicalcycleandNaturalwater.Pollutantsofwater,theiroriginandeffects: Oxygendemandingwastes,pathogens,nutrients,Salts,thermalapplication,heavymetals,pesticides,volatileorganiccompounds.(2L) River/Lake/groundwaterpollution:River:DO,5-dayBODtest,SeededBODtest,BODreactionrateconstants,Effectofoxygendemandingwastesonriver[deoxygenation,reaeration],COD,Oil,Greases,pH.(2L) Lake:Eutrophication[Definition,sourceandeffect].(1L) Groundwater:Aquifers,hydraulicgradient,groundwater flow(Definition only)(1L) Standardandcontrol:Wastewaterstandard[BOD,COD,Oil,Grease], WaterTreatmentsystem[coagulationandflocculation,sedimentation and filtration,disinfection,hardness andalkalinity,softening]Wastewatertreatmentsystem,primaryandsecondarytreatments[Tricklingfilters,rotatingbiologicalcontractor,Activatedsludge,sludgetreatment,oxidationponds]tertiarytreatmentdefinition.(2L) Waterpollutionduetothetoxicelementsandtheirbiochemicaleffects:Lead,Mercury,Cadmium, andArsenic (1L)	9

5	Lithosphere;Internalstructureofearth,rockandsoil(1L) SolidWaste:Municipal,industrial,commercial,agricultural,domestic,pathologicalandhazardoussolidwastes; Recoveryanddisposalmethod- Opendumping,Landfilling,incineration,composting,recycling. Solidwastemanagementandcontrol(hazardousandbiomedicalwaste).(2L)	3
6	Definitionofnoise,effectofnoisepollution,noiseclassification[Transportnoise,occupationalnoise,neighbourhoodnoise] (1L) Definitionofnoisefrequency,noisepressure,noiseintensity,noisethresholdlimitvalue,equivalentnoiselevel, *L*10(18hrIndex) ,*nLd*.Noise pollution control.(1L)	3
7	Environmentalimpactassessment,EnvironmentalAudit,Environmentallawsandprotectionactof India,Differentinternationalenvironmentaltreaty/agreement/ protocol.(2L)	2

Textbooks/referencebooks:

1. M.P.Poonia&S.C.Sharma,EnvironmentalStudies,KhannaPublishingHouse(AICTERecommendedTextbook–2018)
2. Masters,G.M.,"IntroductiontoEnvironmentalEngineeringandScience",Prentice-HallofIndiaPvt.Ltd.,1991.
3. De,A.K.,"EnvironmentalChemistry",NewAgeInternational

❖ Data Communication and Networking Lab -PCCICB491

Objectives :

• Student should be able to configure peer-to-peer network. This will help to understand different issues involved in peer-to-peer network.
• Apply computer engineering discipline specific knowledge to solve core computer engineering related problems.
• Function effectively as a leader and team member in diverse/multi disciplinary teams.
• Ability to install and configure TCP/IP protocol. Ability to configure peer ϖ network.

List of Experiments

1) Configure Peer-to-Peer Network at least three Host.
2) Create desired standard network cable including cross cable and test it by using cable tester
3) Connect computer using given topology with wired media.
4) Connect Computers Using Wireless Media
5) Write a C Program for CRC Error Detection
6) Create a Network Using Bluetooth. Setting up wireless network
7) Configure File Server. Configure client to file server and use file services
8) Configure static and dynamic IP addresses. Configure DHCP server
9) Run basic utilities and network commands: ipconfig, ping,tracert,netstat, path ping ,route.
10) Create two subnets and implement it with calculated subnet masking
11) Set access rights and security permissions for user.
12) Create IPv6 environment in a small network using simulator
13) Linux network configuration, measurement and analysis tool: Wireshark
14) Socket Programming: TCP and UDP, peer to peer applications
15) Client Server using RPC using threads or processes
16) Simulation of LAN and Wi-Fi

Reference Books :

1) “Data and Computer Communication” by William Stallings
2) “Data Communication and Networking” by Behrouz A Forouzan
3) “Internetworking with TCP/IP, Volume 1” by Douglas Comer
4) “Computer Networks 5th Edition” by Tanenbaum
5) “An Integrated Approach to Computer Networks” by Bhawneet Sidhu

❖ DESIGN & ANALYSIS OF ALGORITHMS LAB [0 0 4 2]- PCCCS494

Exercises to implement doubly linked list & Binary Search Tree, GCD Techniques. Sorting algorithms. String Matching, DFS, BFS, Topological sorting, AVL tree, 2-3 tree, Horspool algorithm, Open hash table, Floyd's algorithm, Warshall's algorithm, Greedy Techniques, Dijkstra's algorithm, Backtracking.

References:

2. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, (3e), Pearson Education, India, 2011.
3. Ellis Horowitz and SartajSahni, *Computer Algorithms/C++,* (2e), University Press, 2007
4. Thomas H. Cormen, Charles E. Leiserson, Ronal L, Rivest, Clifford Stein, *Introduction to Algorithms,* (2e), PHI, 2006.