

**ANNAMALAI UNIVERSITY**  
**BACHELOR OF COMPUTER SCIENCE**  
**CBCS PATTERN**  
(With effect from 2021-2022)

**The Course of Study and the Scheme of Examinations**

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER I</b>									
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	<b>Communicative English I</b>	25	75	100
3.	III	Core Theory	Paper-1	6	4	Programming in C	25	75	100
4.	III	Core Practical	Practical-1	3	2	Programming in C Lab	25	75	100
5.	III	Allied -1	Paper-1	7	3	(to choose any one) 1. Mathematics I 2. Mathematical Foundations I	25	75	100
6.	III	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English I</b>	<b>25</b>	<b>75</b>	<b>100</b>
7.	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER II</b>									
8.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9.	II	English (CE)	Paper-2	6	4	<b>Communicative English II</b>	25	75	100
10.	III	Core Theory	Paper-2	5	4	C++ & Data Structure	25	75	100
11.	III	Core Practical	Practical-2	2	2	C++ and Data Structures Lab	25	75	100
12.	III	Allied-1	Paper-2	7	5	(to choose any one) 1. Mathematics II 2. Mathematical Foundations II	25	75	100
13.	III	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English II</b>	25	75	100
14.	IV	Value Education		2	2	Value Education	25	75	100
15.	IV	Soft Skill		2	1	Soft Skill	25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>25</b>		<b>200</b>	<b>600</b>	<b>800</b>

S.NO.	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER III</b>									
16.	I	Language	Paper-3	6	4	Tamil/ OtherLanguages	25	75	100
17.	II	English	Paper-3	6	4	English	25	75	100
18.	III	Core Theory	Paper-3	3	3	Programming in JAVA	25	75	100
19.	III	Core Practical	Practical-3	3	3	Programming in JAVA Lab	25	75	100
20.	III	Allied II	Paper-3	4	3	<b>( Choose any one)</b> 1. Physics I 2. Statistical Methods and Their Applications I	25	75	100
	III	Allied II	Practical	3	0	Physics/Statistics Practical	0	0	0
21.	IV	Skill Based Subject	Paper-1	3	2	Digital Logic Design and Computer Organization	25	75	100
22.	IV	Non-Major Elective	Paper-1	2	2	Introduction to Information Technology	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>21</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER IV</b>									
23.	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100
24.	II	English	Paper-4	6	4	English	25	75	100
25.	III	Core Theory	Paper-4	3	3	Relational Database Management Systems	25	75	100
26.	III	Core Practical	Practical-4	3	3	RDBMS Lab	25	75	100
27.	III	Allied II	Paper-4	4	3	<b>(to choose any one)</b> 1. Physics II 2. Statistical Methods and their Applications II	25	75	100
28.	III	Allied II	Practical	3	2	Physics/Statistics Practical	25	75	100
29.	IV	Skill Based Subject	Paper-2	3	2	Wireless Data Communication	25	75	100
30.	IV	Non-Major Elective	Paper-2	2	2	Internet Technology	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>23</b>		<b>200</b>	<b>600</b>	<b>800</b>

S.NO.	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER V</b>									
31.	III	Core Theory	Paper-5	6	4	Mobile Application Development	25	75	100
32.	III	Core Theory	Paper-6	6	4	Operating System	25	75	100
33.	III	Core Theory	Paper-7	4	3	Design and Analysis of Algorithms	25	75	100
34.	III	Core Practical	Practical-5	4	3	Mobile Applications Development-Lab	25	75	100
35.	III	Core Practical	Practical-6	4	3	Operating System-Lab	25	75	100
36.	III	Internal Elective	Paper-1	3	3	<b>(to choose any one)</b> 1. Data Mining 2. Information Security 3. Software Testing	25	75	100
37.	IV	Skill Based Subject	Paper-3	3	2	Software Engineering	25	75	100
				<b>30</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER VI</b>									
38.	III	Core Theory	Paper-8	4	4	Open Source Software	25	75	100
39.	III	Core Theory	Paper-9	4	4	Python Programming	25	75	100
40.	III	Core Practical	Practical-7	4	3	Python Programming Lab	25	75	100
41.	III	Core Practical	Practical-8	4	2	Open Source Programming Lab	25	75	100
42.	III	Project		5	5	Project Work (Group/Individual Project)	25	75	100
43.	III	Internal Elective	Paper - 2	3	3	<b>(to choose any one)</b> 1. Big Data Analytics 2. Cryptography 3. Digital Image Processing	25	75	100
44.	III	Internal Elective	Paper - 3	3	3	<b>(to choose any one)</b> 1. Artificial Intelligence 2. System Software 3. Cloud Computing	25	75	100

45.	IV	Skill Based Subject	Paper - 4	3	2	Internet Of Things	25	75	100
46.	V	Extension Activities		0	1		100	0	100
		<b>Sem. Total</b>		<b>30</b>	<b>27</b>		<b>300</b>	<b>600</b>	<b>900</b>
					<b>140</b>				<b>4600</b>

Part	Subject	Papers	Credit	Total Credits	Marks	Total Marks
Part I	Languages	4	4	16	100	400
Part II	Communicative English & English	4	4	16	100	400
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Allied Practical	1			100	100
	Electives	3	3	9	100	300
	Core	9	(3-5)	34	100	900
	Core practical	8	(2-3)	21	100	800
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	<b>Total</b>	<b>46</b>		<b>140</b>		<b>4600</b>

**ANNAMALAI UNIVERSITY**  
**BACHELOR OF COMPUTER SCIENCE**

**SYLLABUS**  
**UNDER CBCS**  
**(With effect from 2021-2022)**

**SEMESTER I**

**CORE THEORY PAPER -1**  
**PROGRAMMING IN C**

**OBJECTIVES:**

- ✓ To understand simple algorithms,
- ✓ To understand language constructs
- ✓ To understand and develop programming skills in C.
- ✓ To understand the basic concepts of decision making and looping statements.
- ✓ To understand the concepts of arrays , structures, union, pointers and files.

**UNIT – I**

**Overview of C:** History – Importance – Sample Programs – Basic Structure – Programming Style – Executing – Unix System – MS-DOS System - **Constants, Variables, and Data Types:** Character Set – C Token – Keyword and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaration – Overflow and Underflow of Data - **Operators and Expressions:** Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special Operators – Arithmetic Expressions, Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions .

**UNIT – II**

**Managing Input and Output Operations:** Reading, Writing a Character – Formatted Input, Output - **Decision Making and Branching:** 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 - **Decision Making and Looping:** The while Statement – The do Statement – The for Statement – Jumps in Loops – Concise Test Expressions.

**UNIT – III**

**Arrays:** One-Dimensional Arrays - Declaration, Initialization of One-Dimensional Arrays – Two-Dimensional Arrays - Initializing Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays - **Character Arrays and Strings:** Declaring and Initializing String Variables –

Reading Strings from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting String Together – Comparison of Two Strings –String-Handling Functions – Table of Strings – Other Features of Strings - **User Defined Functions:** Need for User-Defined Functions – A Multi-Function Program – Elements of User-Defined Functions – Definition of Functions – Return Values and Their Types – Function Calls – Function Declaration – Category of Functions – No Arguments and No Return Values – Arguments but no return values – Arguments with Return Values – No Arguments but Returns a value – Functions that Return Multiple Values – Nesting of Functions – Recursion – Passing Arrays, Strings to Functions – The Scope, Visibility and Lifetime of Variables –Multi file Programs.

#### **UNIT – IV**

**Structure and Unions:** Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization and Copying and Comparing Structure Variable – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions – Size of Structures – Bit Fields **Pointers:** Understanding Pointers – Accessing the Address of Variable – Declaring, Initialization of Pointer Variables – Accessing a Variable through its pointer – Chain of Pointers – Pointer Expression – Pointer Increments and Scale Factor – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments – Functions Returning Pointers – Pointers to Functions – Pointers and Structures – Troubles with Pointers **File Management in C:** Defining and Opening a File – Closing a File – Input/Output Operations on File – Error Handling During I/O Operations – Random Access to Files – Command Line Arguments.

#### **UNIT – V**

**Fundamental Algorithms:** Exchanging the values of Two Variables- Counting- Summation of a Set of Numbers-Factorial Computation -Sine Function Computation –Generation of the Fibonacci Sequence-Reversing the Digits of an Integer- Base Conversion – Character to Number Conversion - **Factoring Methods:** Finding the square Root of a Number –The Smallest Divisor of an Integer-The Greatest Common Divisor of the two integers-Generating Prime Numbers- Computing the Prime Factors of an integer –Generation of Pseudo-random Numbers-Raising a Number to a Large Power-Computing the nth Fibonacci Number (Chapters: 2 & 3)

#### **TEXT BOOK:**

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013. ( Unit I to IV )
2. How to Solve it by Computer, R.G.Dromey, PHI International ( Unit V )

#### **REFERENCE BOOKS:**

1. The C Programming Language (ANSI C), Kernighan, B.W. and Ritchie, D.M., PHI.
2. C by Discovery , Foster & Foster , Penram International Publishers, Mumbai.

## **E - REFERENCES**

1. NPTEL, Introduction to C Programming, Prof.SatyadevNandakumar ,IIT, Computer Science and Engineering Kanpur.
2. NPTEL, Introduction to Problem Solving & Programming, by Prof. Deepak Gupta Department of Computer Science and Engineering IIT Kanpur.

## **Course Outcomes:**

- The Student will be able to understand the concepts of Constants, Variables, and Data Types, Operators and Expressions
- The Student will be able to understand the concepts of Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping.
- The Student will be able to understand the concepts of Arrays, Character Arrays and Strings, User Defined Functions.
- The Student will be able to understand the concepts of Structure and Unions, Pointers, File Management in C.
- The Student will be able to understand the concepts of Fundamental Algorithms, Factoring Methods.

## **CORE PRACTICAL-1**

### **Programming in C - Lab**

#### **Objectives:**

1. To understand concepts of for/while loop and switch.
2. To understand language Functions and recursions.
3. To understand and develop String Manipulations.
4. To understand the basic concepts of searching and sorting.
5. To understand the concepts of structures.

#### **Control Statements:**

1. Print n Fibonacci numbers – ( using for )
2. Print n Prime numbers – ( using while )
3. Simple arithmetic on two numbers – ( using switch/case )

#### **Functions:**

4. Swap two values using call by value / call by reference.

#### **Recursion:**

5. To compute  $NcR$  and  $NpR$
6. To Compute GCD and LCM

#### **String Manipulation.**

7. Operations on string such as length, concatenation, reverse, counting, and copy of a string to another.

#### **Matrices:**

8. Matrix Addition, Subtraction, Multiplication, Transpose of  $n \times m$  matrices.
9. Inverse of a square matrix.

#### **Searching:**

10. Binary Search.

#### **Sorting:**

11. Bubble Sort
12. Insertion Sort

#### **Structures:**

13. Students Mark statement

#### **Pointers:**

14. Arithmetic operations on pointers.

#### **Files**

15. Creating/ Reading/ Writing a text/binary file.

**REFERENCE BOOK:**

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013.

**Outcomes:**

- Enhance the analyzing and problem solving skills and use the same for writing programs in C.
- Write diversified solutions, draw flowcharts and develop a well-documented and indented program according to coding standards.
- Learn to debug a given program and execute the C program.
- To have enough practice the use of conditional and looping statements.
- To implement arrays, functions and pointers.

**ALLIED  
PAPER -1  
1. MATHEMATICS – I**

**Objectives of the Course:**

To Explore the Fundamental Concepts of Mathematics

**UNIT-I: ALGEBRA**

Partial Fractions - Binomial, Exponential and logarithmic Series (without Proof) - Summation - Simple problems

**UNIT-II : THEORY OF EQUATIONS**

Polynomial Equations with real Coefficients - Irrational roots - Complex roots- Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations - Newton's method to find a root approximately - Simple problems.

**UNIT-III : MATRICES**

Symmetric - Skew-Symmetric - Orthogonal and Unitary matrices - Eigen roots and eigen vectors – Cayley - Hamilton theorem (without proof)-Verification and computation of inverse matrix

**UNIT-IV: TRIGONOMETRY**

Expansions of  $\sin^n \theta$ ,  $\cos^n \theta$ ,  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  - Expansions of  $\sin \theta$ ,  $\cos \theta$ ,  $\tan \theta$  in terms of  $\theta$ .

**UNIT-V: DIFFERENTIAL CALCULUS**

Successive differentiation upto third order, Jacobians -Concepts of polar co-ordinates-Curvature and radius of curvature in Cartesian co-ordinates and in polar co-ordinates.

**Recommended Text:**

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II.Muhil Publishers, Chennai.

**Reference Books:**

1. P.Balasubramanian and K.G.Subramanian,(1997) *Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II. VikasPublications, New Delhi.
3. P.R.Vittal (2003) *Allied Mathematics* .Marghan Publications, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics* Vol-I, II S.Chand& company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai.

## ALLIED 1

### PAPER - I

#### 2. MATHEMATICAL FOUNDATIONS - I

##### Objectives

To know about Logical operators, validity of arguments, set theory and set operations, relations and functions, Binary operations, Binary algebra, Permutations & Combinations, Differentiation, Straight lines, pair of straight lines, Circles, Parabola, Ellipse, Hyperbola.

##### UNIT-I: SYMBOLIC LOGIC

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments.

##### UNIT-II: SET THEORY

Sets, set operations, venn diagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions,

Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets,

Functions: Types of Functions, Composition of Functions.

##### UNIT-III: BINARY OPERATIONS

Types of Binary Operations: Commutative, Associative, Distributive and identity, Boolean algebra: simple properties. Permutations and Combinations.

##### UNIT-IV: DIFFERENTIATION

Simple problems using standard limits,

$$\text{Lt } \frac{x^n - a^n}{x - a}, \text{ Lt } \frac{\sin x}{x}, \text{ Lt } \frac{\tan x}{x}, \text{ Lt } \frac{e^x - 1}{x}, \text{ Lt } \frac{(1+1/n)^n - 1}{1/n}, \text{ Lt } (1+1/n)^n, \text{ Lt } (1+1/n)^{1/n}$$

$\infty \rightarrow 0, 0 \rightarrow \infty, 0 \rightarrow 0, \infty \rightarrow \infty$

Differentiation, successive differentiation, Leibnitz theorem, partial differentiation, Applications of differentiation, Tangent and normal, angle between two curves.

##### UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY

Straight Lines - Pair Straight Lines

##### Text Book.

P.R. Vittal, Mathematical Foundations – Maragham Publication, Chennai.

##### Reference Books

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V.Sundaram& Others, Discrete Mathematical Foundation - A.P.Publication, Sirkali.
3. P.Duraipandian& Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.
4. Manicavachagompillay&Natarajan. Analytical Geometry part I - Two Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

## SEMESTER II

### CORE THEORY PAPER -2

#### C++ & DATA STRUCTURES

##### Objectives:

1. To understand the concepts of object-oriented programming and master OOP using C++.
2. To understand the concepts of Inheritance, polymorphism and templates.
3. To understand the concepts of different view of data, stack and queues.
4. To understand the concepts of Programming with Recursion, Binary Search Tree and graphs.
5. To understand the concepts of Sorting and Searching Algorithms.

##### UNIT-I :

Principles of Object Oriented Programming – Beginning with C++ – Token , Expressions and Control Structures- Functions in C++ – Classes and Objects – Constructors and Destructors.

##### UNIT-II :

Operator Overloading and Type Conversions – Inheritance : Extending Classes – Pointers, Virtual Functions and Polymorphism - Managing Console I/O Operations. Working with Files - Templates – Exception Handling – Manipulating Strings.

##### UNIT-III:

**Data Design & implementations:** Different views of data – Abstraction and Built-in Types – Arrays ADTs Stacks and Queue (Linear and Linked) , Stack (Array and Pointer)- Applications- Infix to Postfix Conversions – Queue(Array and Pointer) – List(Array and Pointer) – Applications: (Polynomial Addition) - Doubly Linked Lists.

##### UNIT – IV:

**Programming with Recursion :** Recursion – Verifying and Writing Recursive Functions – **Binary Search Tree :** Implementation – Tree Traversal – **Graphs:** Implementations – BFS – DFS – Dijkstras Shortest Path Algorithm.(Chapter 7:Section 7.1,7.4 7.5, Chapter 8:Section 8.1,8.4, Chapter 9:Section 9.3)

##### UNIT-V:

**Sorting and Searching Algorithms:** Sorting – Searching – Hashing (Chapter 10: Section 10.1,10.2,10.3)

##### TEXT BOOK:

1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.  
(Units I, II )
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010. (Units III, VI & V)

**REFERENCES:**

1. C++ The Complete Reference, Herbert Schildt, Tata McGraw Hill, 4<sup>th</sup> Edition, 2003.
2. OOP In ANSI C and Turbo C, Ashok N.Kamthene, Pearson Education, 6<sup>th</sup> Edition, 2008.
3. Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison Wesley Longman Inc., 2<sup>nd</sup> Edition, 1999.

**Course Outcomes:**

- The Student will be able to understand the concepts of object oriented programming Apply structure and inline functions.
- The Student will be able to understand the concepts of the types of inheritances and Applying various levels of Inheritance for real time problems Apply the OOPs concepts class and object. Understand Explain the file concept and exception handlings in C++
- The Student will be able to understand the concepts of Stacks and Queue using array and pointers.
- The Student will be able to understand the concepts of Recursion, Binary Search Tree and graphs.
- The Student will be able to understand the concepts of Sorting and Searching Algorithms.

## **CORE PRACTICAL-2**

### **C++ & DATA STRUCTURES LAB**

#### **Objectives:**

1. To develop C++ programming skills in design
2. To understand the basic concepts of different abstract types and structure of data.
3. To understand the concepts of Function Overloading
4. To understand the concepts of Stack, Queue, List, Doubly Linked List - using Pointers-using Arrays.
5. To understand the concepts of Searching and Sorting Algorithms.

#### **LIST OF LAB EXERCISES**

1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept.
10. File Stream classes.
11. Array implementation of Stack, Queue : Infix to postfix
12. Implementation of Stack, Queue, List, Doubly Linked List - using Pointers- Polynomial Addition
13. Implementation of Binary Search Tree, Traversal
14. Implementation of Searching and Sorting Algorithms.
15. Graph Implementation of shortest path (Djikstras)

#### **REFERENCE :**

1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010.

#### **Course Outcomes:**

- Understand the Creating and Deleting the Objects with the Concepts of Constructors and Destructors.
- Demonstrate the Polymorphism Concepts and Operator Overloading.
- Understand basic Data Structures such as Arrays, Linked Lists, Stacks, Queues, Doubly Linked List and Infix to Postfix Conversion.
- Apply Algorithm for solving problems like Sorting and Searching.
- Apply Algorithms and use Graphs and Trees as tools to visualize and simplify Problems

**ALLIED 1**

**PAPER -2**

## 1. MATHEMATICS II

### Objectives of the Course

To Explore the Fundamental Concepts of Mathematics

### UNIT-I: Application of Integration

Evaluation of double, triple integrals - Simple applications to area, volume -Fourier series for functions in  $(0, 2\pi)$  and  $\square\square\square\square\square\square\square\square$

### UNIT-II: Partial Differential Equations

Formation, complete integrals and general integrals - Four standard types, Lagrange's equations.

### UNIT-III: Laplace Transforms

Laplace Transformations of standard functions and simple properties - Inverse Laplace transforms - Applications to solutions of linear differential equations of order 1 and 2-simple problems

### UNIT-IV: Vector Analysis

Scalar point functions - Vector point functions - Gradient, divergence, curl - Directional derivatives - Unit to normal to a surface.

### UNIT-V: Vector Analysis (continued)

Line and surface integrals - Gauss, Stoke's and Green's theorems (without proofs) - Simple problem based on these Theorems.

### Recommended Text

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II.Muhil Publishers, Chennai

### Reference Books:

1. P.Balasubramanian and K.G.Subramanian,(1997)*Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II.Vikas Publications, New Delhi.
3. P.R.Vittal(2003). *Allied Mathematics* .Marghan Publications, Chennai.
4. P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics* Vol-I, II S.Chand& company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai

## 2. MATHEMATICAL FOUNDATIONS II

### Objectives

To know about Matrix Operations, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary Matrices. Rank of a Matrix Solutions of linear equations Consistency and Inconsistency, Characteristic roots and Characteristics Vectors, Cayley - Hamilton Theorem, Integration of rational functions, Integration by parts, Reduction formulae, Area and volume using integration, Planes, Straight lines, Spheres, Curves, Cylinders.

### UNIT-I: MATRICES

Multiplication of matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a matrix Symmetric and Skew-Symmetric, Hermitian and Skew-Hermitian, Orthogonal and unitary matrices, Rank of a matrix, Solution of Simultaneous Linear equations by

- (i) Cramer's rule.
- (ii) Matrix Inversion Method.

### UNIT-II: MATRICES

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem, matrix of linear transformations: reflection about the x, y axes and the line  $y=x$ , rotation about the origin through an angle, expansion or compression, shears, translation.

### UNIT-III

Integration Simple problems, integration of rational function involving algebraic expressions of the form

$$\frac{1}{ax^2+bx+c}, \frac{1}{\sqrt{ax^2+bx+c}}, \frac{px+q}{ax^2+bx+c}, \frac{px+q}{\sqrt{ax^2+bx+c}}$$

integrations using simple substitutions integrations involving trigonometric functions of the form

$$\frac{1}{a+b\cos x}, \frac{1}{a^2\sin^2x+b^2\cos^2x}, \text{ Integration by parts.}$$

### UNIT-IV

Properties of definite integrals. Reduction formulae for

$$\int \quad \int$$

$\int x^n e^{ax} dx$ ,  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ ,  $\int x^m (1-x)^n dx$ , applications of integration for (i) Area under plane curves, (ii) Volume of solid of revolution.

## **UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION**

Planes, straight lines.

### **Text Book.**

P.R.Vittal, Mathematical Foundations - Margham Publication, Chennai.

### **Reference Books**

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V.Sundaram & Others, Discrete Mathematical Foundation - A.P.Publication, Sirkali.
3. P.Duraipandian & Others, Analytical Geometry 3 Dimension – Emerald publication 1992 Reprint.
4. Manicavachagompillay & Natarajan. Analytical Geometry part II - three Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

**SEMESTER III**  
**CORE PAPER - 3**  
**PROGRAMMING IN JAVA**

**COURSE OBJECTIVES:**

- Knowing about a General-purpose and Purely object-oriented programming language including data types, control statements, and classes
- Secured, well-suited for internet programming using applets and GUI-based

**UNIT I**

Declarations and Access Control: Identifiers and Keywords: Oracle's Java Code Conventions. Define Classes: Import Statements and the Java API - Static Import Statements. Use Interfaces: Declaring an Interface- Declaring Interface Constants. Declare Class Members: Access Modifiers - Non access Member Modifiers - Constructor Declarations - Variable Declarations. Declare and Use enums: Declaring enums. Object Orientation: Encapsulation - Inheritance and Polymorphism- Polymorphism - Overriding / Overloading: Overridden Methods -Overloaded Methods.

**UNIT II**

Object Orientation: Casting - Implementing an Interface - Legal Return Types: Return Type Declarations - Returning a Value. Constructors and Instantiation: Overloaded Constructors - Initialization Blocks. Statics: Static Variables and Methods. Assignments: Stack and Heap - Literals, Assignments, and Variables: Literal Values for All Primitive Types. Scope - Variable Initialization - Passing Variables into Methods: Passing Object Reference Variables - Passing Primitive Variables. Garbage Collection. Operators: Java Operators - Assignment Operators - Relational Operators - instanceof Comparison - Arithmetic Operators - Conditional Operator - Logical Operators.

**UNIT III**

Working with Strings, Arrays, and Array Lists: Using String and StringBuilder: The String Class - The StringBuilder Class - Important Methods in the StringBuilder Class. Using Arrays: Declaring an Array -Constructing an Array - Initializing an Array. Using ArrayList:ArrayList Methods in Action - Important Methods in the ArrayList Class. Flow Control and Exceptions: Using if and switch Statements -Creating Loops Constructs - Handling Exceptions - Catching an Exception Using try and catch - Using finally. String Processing, Data Formatting Resource Bundles: String, StringBuilder, and StringBuffer -Dates, Numbers, Currencies, and Locales.

## **UNIT IV**

I/O and NIO: File Navigation and I/O: Creating Files Using the File Class - Using FileWriter and FileReader. File and Directory Attributes -DirectoryStream - Serialization. Generics and Collections: toString(), hashCode(), and equals(): The toString() Method - Generic Types -Generic Methods - Generic Declarations. Inner Classes: Method – Local. Inner Classes - Static Nested Classes - Threads: Defining, Instantiating, and Starting Threads - Thread States and Transitions - Synchronizing Code, Thread Problems - Thread Interaction. Concurrency: Concurrency with the java.util.concurrent Package - Apply Atomic Variables and Locks - Use java.util.concurrent Collections - Use Executors and ThreadPools.

## **UNIT V**

Applets: Applet fundamentals - Applet class - Applet life cycle - Steps for developing an applet program - Passing values through parameters - Graphics in an applet - Event-handling. GUI Applications - Part 1: Graphical user interface - Creating windows - Dialog boxes - Layout managers - AWT component classes - Swing component classes. GUI Applications - Part 2: Event handling - Other AWT components - AWT graphics classes - Other swing controls.

## **TEXT BOOK(S):**

1. Kathy Sierra, Bert Bates — OCA/OCP Java SE 7 Programmer I & II Study Guide, Oracle Press. (Unit I,II,III,IV).
2. Sagayaraj, Denis, Karthik and Gajalakshmi, 2018, Java Programming - For Core and Advanced Learners, University Press (India) Private Limited, Hyderabad.(Unit V).

## **REFERENCE BOOKS:**

1. Hebert Schild, 2002, The Complete Reference Java2, [Fifth Edition]. Tata McGraw-Hill, New Delhi.
2. John Hubbard, R.2004. Programming with Java. [Second Edition]. Tata McGraw-Hill,New Delhi.
3. Debasish Jana. 2005. Java and Object-Oriented Programming Paradigm, [Second Printing]. Prentice-Hall of India, New Delhi.
4. Sagayaraj, Denis, Karthik and Gajalakshmi 2018, Java Programming for core and advanced Learners, University Press India Pvt. Ltd., Hyderabad.

## **Course Outcomes:**

- Students are able to know about a General-purpose and Purely object-oriented programming language including data types, control statements, and classes
- Students are able to Secured, well-suited for internet programming using applets and GUI-based

## **CORE PRACTICAL - Practical-3**

### **PROGRAMMING IN JAVA LAB**

#### **List of Practical's**

1. Implementation of Classes and Objects
2. Implementation of Inheritance and Polymorphism
3. Implementation of Interface and Package concepts
4. Implementation of Flow, Border ,Grid Layouts
5. Implementation of Tic-Tac Toe Application Using Applets
6. Implementation of Frames, Menus, Dialog
7. Implementation of Swing concepts
8. Implementation of Exception Handling
9. Implementation of Multi Threading
10. Implementation of I/O Streams
11. Implementation of Java Networking concepts
12. Implementation of Java Servlets ( Connecting Database)
13. Implementation of RMI
14. Implementation of Java Beans

**ALLIED - 2**  
**PAPER -1**  
**PHYSICS I**

**Course Objectives**

1. To understand the basics of gravitation and to study the properties of matter.
2. To learn the law of thermoelectric circuits and thermoelectric diagrams.
3. To teach the growth and decay of a transient current and magnetometer.
4. To explain production of ultrasonics and reverberation time.
5. To know the basics of laser and fibre optics principles and applications.

**UNIT-1: Properties of Matter**

Gravitation: Acceleration due to gravity -Determination of 'g' by Simple pendulum - Drawbacks of simple pendulum -Determination of time period of compound pendulum - 'g' by compound pendulum -Centre of Oscillation and Centre of Suspension are interchangeable-Determination of 'g' by Bar/compound pendulum.

Elasticity: Bending of beams -Expression for bending moment - Cantilever Depression at the loaded end of a cantilever Expression for Young's modulus -non-uniform bending-Pin and microscope method.

Torsion : Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Time period - Determination of rigidity modulus by Torsional oscillation (without masses).

Viscosity: Viscosity of a liquid -Viscous force - Co-efficient of viscosity of a liquid – Poiseuille's formula -Experimental method using Burette- Effect of temperature and pressure on viscosity-applications.

Surface Tension: Surface tension of a liquid-Surface Tension and interfacial surface tension by the method of drops-applications.

**UNIT-2: Thermo Electricity**

Seeback, Peltier and Thomson effects - laws of thermoelectric circuits -Peltier coefficient - Thomson coefficient -application of thermodynamics to a thermocouple and expressions for Peltier and Thomson coefficients -thermo electric power and thermo electric diagrams.

**UNIT-3: Transient Current and Magnetism**

Growth and decay of current in a circuit containing resistance and inductance- Growth and decay of charge in circuit containing resistance and capacitor - growth and decay of charge in a LCR circuit – condition for the discharge to be oscillatory – frequency of oscillation.

Magnetism -Magnetic moment and pole strength of a magnet – Deflection magnetometer – Tan C Position- Vibration magnetometer – Theory – Period of Oscillation – Determination of M and  $B_H$  using the deflection magnetometer and the vibration magnetometer .

#### **UNIT -4: Acoustics**

Sound: Transverse vibration of strings -Velocity and frequency of vibrations of a stretched string - laws -Sonometer -A.C. Frequency - Steel wire- Brass wire.

Introduction to Ultrasonics – Piezo electric effect–production by Piezo electric method – properties –applications- Acoustics of buildings – reverberation time – derivation of Sabine's formula – determination of absorption coefficient-Acoustic aspects of halls and auditoria.

#### **UNIT-5:Lasers and Fibre Optics**

Laser: Introduction - Principles of laser -Einstein's explanation for stimulated emission – Differences between stimulated and spontaneous emission - Population inversion –Properties of laser -Types of lasers - He- Ne Laser - Semiconductor Laser-Applications of laser.

Fibre optics: Basic principle of an optical fibre -Total internal reflection -Basic structure of an optical fibre -Numerical aperture –Coherent bundle – Attenuation and dispersion - classification of optical fibres-step index and graded index fibers – single mode and multi mode fibers-Fibre optic communication system block diagram.-applications.

#### **Text Books**

##### **Unit 1 and Unit 4**

1. R. Murugesan and KiruthigaSivaprasath, Properties of Matter and Acoustics, S. Chand & Co. New Delhi, Kindle edition.

##### **Unit 2 and Unit 3**

1. R. Murugesan, Electricity & Magnetism, S. Chand & Co. New Delhi, 2019.

##### **Unit 5**

1. N Subrahmanyam, BrijLal and M.N Avadhanulu, A Text Book of Optics, S. Chand &Co. New Delhi, Revised Edition as per UGC model syllabus.

#### **Reference Books**

1. BrijLal and N Subrahmanyam,Electricity and Magnetism, S Chand & Company Pvt Ltd, New Delhi, 2000.
2. D.C. Tayal, Electricity and Magnetism, Himalaya Publishing House,Bombay, 2014.
3. BrijLal and N.Subrahmanyam, A Text Book of Sound,Vikas Publications, New Delhi (2 Edition)
4. C.L.Arora, Physics for Degree Students B.Sc First Year, S. Chand Publishing, 2013.
5. K.Thyagarajan and Ajay Ghatak, Introduction to Fibre optics-, Cambridge University.
6. Ajay Ghatak and K.Thyagarajan, Fiber optics and Lasers-The two revolutions, Macmillan, 2006.
7. K.Thyagarajan and Ajay Ghatak, Lasers; Fundamentals and applications, Springer.
8. Modern Physics – R,Murugesan, KiruthigaSivaprasath, S.Chand&Co, New Delhi, 2016.

## **E-MATERIALS**

1. <https://courses.lumenlearning.com/physics/chapter/16-4-the-simple-pendulum/>
2. [https://www.youtube.com/watch?v=aw0\\_seEt4v0](https://www.youtube.com/watch?v=aw0_seEt4v0)
3. [https://en.wikipedia.org/wiki/Thermoelectric\\_effect](https://en.wikipedia.org/wiki/Thermoelectric_effect)
4. [https://www.youtube.com/watch?v=S0I37M2sx\\_0](https://www.youtube.com/watch?v=S0I37M2sx_0)
5. <https://physicscatalyst.com/electromagnetism/growth-and-decay-charge-R-C-circuit.php>
6. <https://www.youtube.com/watch?v=PLQOPXot6vE>
7. [https://www.youtube.com/watch?v=d0\\_Eff4MXwM](https://www.youtube.com/watch?v=d0_Eff4MXwM)
8. <https://www.techglads.com/cse/sem1/production-of-ultrasonics-by-piezoelectric-methods/>
9. [https://thefactfactor.com/facts/pure\\_science/physics/optical-fibre/5159/](https://thefactfactor.com/facts/pure_science/physics/optical-fibre/5159/)
10. <https://www.youtube.com/watch?v=aukIOS0SVWc> (Tamil video)

## **Course Objectives**

1. After studied unit-1, the student will be able to find the acceleration due to gravity at a place using simple pendulum and compound pendulum. Also can know the properties of matter like elasticity, viscosity and surface tension.
2. After studied unit-2, the student will be able to learn thermo emf using Seebeck and Peltier effects and hence understand thermoelectric circuits.
3. After studied unit-3, the student will be able to explain growth and decay of a transient current in a circuit containing resistance-inductance, resistance-capacitance and LCR in series. Also will be able to determine the horizontal components of earth's magnetic induction at a place using deflection magnetometer in Tan C position.
4. After studied unit-4, the student will be able to derive the expression for the velocity of a sound in a stretched string and hence they can determine the frequency of A.C mains.
5. After studied unit-5, the student will be able to understanding the principle of laser and can demonstrate the working of He-Ne laser and applications of laser. Also, the student will be able to learn the fibre optics, structure and application in communication.

**ALLIED - 2**  
**PAPER -1**

**STATISTICAL METHODS AND THEIR APPLICATIONS I**

**Objective**

To understand and computing statistical Methods by which to develop the programmingSkills.

**UNIT-I**

Introduction - scope and limitations of statistical methods - classification of data -Tabulation of data - Diagrammatic and Graphical representation of data - Graphical determination of Quartiles ,Deciles and Percentiles.

**UNIT-II**

Measures of location : Arithmetic mean, median, mode, geometric mean and Harmonicmean and their properties.

**UNIT-III**

Measures of dispersion : Range, Quartile deviation, mean deviation, Standard deviation,combined Standard deviation, and their relative measures.

**UNIT-IV**

Measures of Skewness Karl Pearson's, Bowley's, and kelly's and co-efficient ofSkewness and kurtosis based on moments.

**UNIT-V**

Correlation - Karl Pearson - Spearman's Rank correlation - concurrent deviation methods.

Regression Analysis: Simple Regression Equations.

Note : The proportion between theory and problems shall be 20:80

**Books for Reference:**

1. Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand
2. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII
3. Elements of Statistics - Mode . E.B. - Prentice Hall
4. Statistical Methods - Dr. S.P. Gupta - Sultan Chand & Sons

**SKILL BASED SUBJECT**  
**PAPER-1**  
**Digital Logic Design and Computer Organization**

**Objectives:**

This course aims to provide the students with a detailed knowledge on digital logic, internals of the System logic circuits and to know the working principles of the computers.

**UNIT-I BINARY NUMBER SYSTEM**

**Objective :**To understand the basics of Number System

Number system and its conversions-. Digital Computers and Digital Systems - Binary Number System – Binary Addition – Binary Subtraction- Binary Multiplication and Division-Number Base Conversion: decimal, binary, octal, hexadecimal. The Basic Gates - Boolean Algebra - Universal Gates - Boolean Laws and Theorem.

**UNIT-II SIMPLIFICATION**

**Objective:** To understand the concept of Simplification of Boolean expressions using K-map and arithmetic circuits.

Sum of products - Product of Sums - K-map simplifications - Don't care conditions- QuineMcclusky tabulation method. Combinational Arithmetic Circuits: Adders- Subtractors-full adder-subtractor-BCD Adder.

**UNIT-III COMBINATIONAL LOGIC CIRCUITS**

**Objective:** To understand the concept of Combinational Logic Circuits

Multiplexers-De-Multiplexers- Decoders : -Encoders- Decoders-Sequential Logic Circuit: Flip-Flops -RS Flip flop- JK Flip flop- D Flip flop-T Flip flop and Master Slave. Counters-Synchronous and Asynchronous –Shift Registers and its types.

**UNIT- IV BASIC STRUCTURE OF COMPUTERS**

**Objective:** To understand the concept of **Basic Structure of Computers**

Basic Operational Concepts, Bus Structures - Central Processing Unit: General Register and stack Organization-Instruction Formats Addressing Modes-Data Transfer and manipulation.

## **UNIT V- INPUT OUTPUT AND MEMORY ORGANIZATION**

**Objective:** To understand the basic concepts of Input Output and Memory Organization

Peripheral Devices- I/O Interface - Asynchronous Data Transfer- -Priority Interrupt – Direct Memory Access – I/O Processor. Memory Organization– Main Memory- Auxiliary Memory – Associative Cache and Virtual Memory.

### **TEXT BOOKS:**

1. M. Morris Mano -Digital Logic and Computer Design- PHI.
2. M. Morris Mano, Computer System Architecture, Pearson Education.

### **REFERENCE BOOKS:**

- 1 Thomas C. Bartee Digital Computer Fundamentals- McGraw HillPub.
- 2 Malvino& Leach- Digital Principles and Applications –McGraw HillPub.
3. S. Ramalatha - Digital Computer Fundamentals, MeenakshiAgency.
4. V. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky, Computer Organization, McGraw Hill HigherEducation.
5. John P. Hayes, Computer System Architecture, McGraw Hill HigherEducation

## NON-MAJOR ELECTIVE

### PAPER-1

#### Introduction to Information Technology

##### OBJECTIVES:

The subject aims to build the concepts regarding:

- Major components of Computer System and its working principles.
- Role of an Operating System and basic terminologies of networks.
- How the Information Technology aids for the Current Scenario.
- To understand the Computer Software.
- To understand internet applications

##### UNIT-I

**Introduction:** Characteristics of Computers-Technological Evolution of Computers-The Computer Generations-Categories of Computer. **Data and Information:** Introduction-Types of Data-A Simple Model of a Computer-Data Processing Using a Computer-Desktop Computer. **Acquisition of Number and Textual Data:** Introduction- Input Units-Internal Representation of Numeric Data-Representation of Characters in Computers–Error-Detecting Codes.

##### UNIT-II

**Data Storage:** Introduction-Memory Cell-Physical Devices Used as Memory Cells-Random Access Memory-Read Only Memory- Secondary Memory- Floppy Disk Drive- Compact Disk Read Only Memory (CDROM)-Archival Memory. **Central Processing Unit:** The Structure of a Central Processing Unit-Specification of a CPU-Interconnection of CPU with Memory and I/O Units.

##### UNIT-III

**Computer Networks:** Introduction-Local Area Network (LAN)- Applications of LAN-Wide Area Network (WAN)–The Future of Internet Technology. **Output Devices:** Introduction- Video Display Devices-Flat Panel Displays–Printers.

##### UNIT-IV

**Computer Software:** Introduction-Operating System-Programming Languages–A Classification of Programming Languages. **Data Organization:** Introduction-Organizing a Database-Structure of a Database- Database Management System-Example of Database Design.

##### UNIT-V

**Some Internet Applications:** Introduction- E-mail- Information Browsing Service- The World Wide Web- Information Retrieval from the World WideWeb-Other Facilities Provided by Browsers - Audio on the Internet.**Societal Impactsof Information Technology:** CareersinInformation Technology.

##### TEXTBOOKS:

1. *Rajaraman, V.* 2008. **Introduction to Information Technology**. [Sixth Printing]. Prentice Hall of India Pvt. Limited, New Delhi. (UNIT I to V)

2. Nagpal, D.P. 2010. **Computer Fundamentals**. [First Edition, Revised]. S. Chand & Company Ltd, New Delhi. (UNIT I (Introduction: Characteristics of Computers to Categories of Computer))

#### REFERENCE BOOKS:

1. ITL Education Solution Limited. 2009. **Introduction to Computer Science**. [Fourth Impression]. Pearson Education, New Delhi.
2. Alexis Leon and Mathews Leon. 1999. **Fundamentals of Information Technology**. [First Edition]. Leon TECHWorld, New Delhi.

#### COURSE OUT COMES :

- Students understand Major components of Computer System and its working principles.
- Students learn and understand the Role of an Operating System and basic terminologies of networks.
- Students understand how the Information Technology aids for the Current Scenario.
- Students understand the Computer Software.
- Students understand internet applications

**SEMESTER IV**  
**CORE PAPER-4**  
**RELATIONAL DATABASE MANAGEMENT SYSTEMS**

**Objective:**

- ✓ The students are able to understand database concepts and database management system software and have a high-level understanding of major DBMS components and their function.
- ✓ The students are able to understand the E R model and relational model.
- ✓ The students are able to be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- ✓ The students are able to Understand Functional Dependency and Functional Decomposition.
- ✓ The students are able to understand the architecture of database management system and also understand the various different architecture such as server system architecture, parallel systems and distributed database systems.

**UNIT- I : DATABASE ARCHITECTURE AND ER DIAGRAM**

**12 Hours**

Database system applications - Purpose of database systems - View of data- Database languages - Database architecture - Database users and administrators - History of database systems-Entity relationship modeling: entity types, entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, sub classes; super classes, inheritance, specialization and generalization

**UNIT- II: RELATIONAL DATA MODEL**

**12 Hours**

Relational model concepts, Relational constraints, Relational Languages : Relational Algebra, The Tuple Relational Calculus - The Domain Relational Calculus - SQL: Basic Structure-Set Operations- Aggregate Functions-Null Value-Nested Sub Queries- Views Complex QueriesModification Of Database-Joined Relations-DDL-Embedded SQL-Dynamic SQL-Other SQL Functions- -Integrity and Security.

**UNIT - III: DATA NORMALIZATION**

**12 Hours**

Pitfalls in relational database design – Decomposition – Functional dependencies – Normalization – First normal form – Second normal form – Third normal form – Boyce-codd normal form – Fourth normal form – Fifth normal form.

**UNIT- IV: STORAGE AND FILE ORGANIZATION**

**12 Hours**

Disks - RAID -Tertiary storage - Storage Access -File Organization – organization of files - Data Dictionary storage

## **UNIT- V: QUERY PROCESSING AND TRANSACTION MANAGEMENT                    12 Hours**

Query Processing - Transaction Concept - Concurrency Control - Locks based protocol Deadlock Handling -Recovery Systems.

### **TEXT BOOK:**

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, Database Systems Concepts, Sixth Edition, McGraw Hill, 2010.
2. Raghuram Ramakrishnan and Johannes Gehrke, Database management systems, Third Edition, 2002

### **REFERENCES**

1. Bipin Desai, An Introduction to database systems, Galgotia Publications, 2010.
2. Ramez Elmasri, Shankant B-Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2015

### **E - REFERENCES**

1. NPTEL, Introduction to database design, Dr P Sreenivasa Kumar Professor CS&E, Department, IIT, Madras
2. NPTEL, Indexing and Searching Techniques in Databases Dr. Arnab Bhattacharya, IIT Kanpur

### **Course Outcomes:**

- Describe the database architecture and its applications Sketch the ER diagram for real world applications Uses various ER diagram for a similar concepts from various sources.
- Discuss about the relational algebra and calculus Construct various queries in SQL and PL/SQL Compiles various queries in SQL, Relational Calculus and Algebra.
- Describe the various normalization forms Apply the normalization concepts for a table of data Practices a table and implement the normalization concepts.
- Explain the storage and accessing of data.
- Illustrate the query processing in database management. Define the concurrency control and deadlock concept

## **CORE PRACTICAL - 4**

### **RELATIONAL DATABASE MANAGEMENT SYSTEMS LABS**

#### **Objectives:**

- ✓ To understand the concepts of DDL/DML/DCL/TCL commands.
- ✓ To understand the concepts of Join queries.
- ✓ To understand the concepts of exception handling.
- ✓ To understand the concepts of cursors.
- ✓ To understand the concepts of packages.

#### **LAB EXERCISES:**

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table.
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

#### **REFERENCE BOOK:**

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, Database Systems Concepts, Sixth Edition, McGraw Hill, 2010. 2. Raghu Ramakrishnan and Johannes Gehrke, Database management systems, Third Edition, 2002

**Course Outcomes:**

- Design and Implement a database schema for a given problem domain.
- Populate and Query a database using SQL DDL/DML Commands.
- Build well formed in String Date/Aggregate Functions.
- Design and Implement a database query using Joins, Sub-Queries and Set Operations.
- Program in SQL including Objects (Functions, Procedures, Triggers)

# **ALLIED -2**

## **PAPER - 2**

### **Course Objectives**

1. To study the concept of special theory of relativity.
2. To expose the structure of atom with different models.
3. To know the definition of binding energy and to study about nuclear models
4. To learn the different number system in digital electronics and logic gates
5. To give an introduction about nanomaterial.

### **UNIT-1: Special Theory of Relativity**

Frames of reference-inertial frames and non-inertial frames -Galilean transformations -Michelson-Morley experiment-interpretation of results - postulates of special theory of relativity Lorentz transformation equations -length contraction - time dilation - transformation of velocities -variation of mass with velocity -Mass-energy equation.

### **UNIT-2: Atomic Physics**

Bohr atom model – Critical Potentials - Experimental determination of critical potentials - Franck and Hertz's experiment -Sommerfield's Relativistic atom model The vector atom model – spatial quantization–spinning of an electron –quantum numbers associated with the vector atom model – coupling schemes –LS and jj coupling – the Pauli's exclusion principle – Stern and Gerlach experiment

### **UNIT-3: Nuclear Physics**

Binding energy-Binding energy per nucleon-Packing fraction-Nuclear models – liquid drop model – semi empirical mass formula – merits and demerits -shell model -evidences for shell model – nuclear radiation detectors –ionization chamber – G.M Counter-Wilson cloud chamber-Particle accelerators-Cyclotron-Betatron.

### **Unit-4: Digital Electronics**

Number systems -Decimal, Binary, Octal and Hexadecimal system – Conversion from one number system to another- Binary Arithmetic -Addition –Subtraction- 1's and 2's complement -Binary codes- BCD code – Excess 3 code, Gray code.

NAND, NOR and EXOR – functions and truth tables. NAND & NOR as universal gates-Half adder and Full adder - Half subtractor and Full subtractor using NAND gate only.

### **UNIT-5: Nanomaterial**

Introduction-Nanomaterial- Properties of nanomaterial (size dependent) -synthesis of nanomaterial- sol gel- hydrothermal method-Scanning Electron Microscope (SEM)- Principle and Instrumentation-Fullerenes- Carbon nanotubes- Fabrication and structure of carbon nanotubes -

Properties of carbon nanotubes (Mechanical and Electrical) - Applications of CNT's.

### **Text Books**

#### **Unit 1 to Unit 3**

1. Modern Physics – R, Murugesan, Kiruthiga Sivaprasath, S.Chand & Co, New Delhi, 2016

#### **Unit 4**

1. V. Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007

#### **Unit 5**

1. V. Raghavan, *Material Science and Engineering*, Printice Hall India., 2004.

### **Reference Book**

1. Allied Physics – R. Murugesan S. Chand & Co. New Delhi, 2005.
2. A Text book of Digital electronics – R.S.Sedha, S.Chand & Co, 2013
3. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGraw Hill, New Delhi, 2000.
4. Dr. M.N. Avadhanulu, *Material science*, S.Chand & Company, New Delhi, 2014.
5. M.Arumugam, *Material science*, Anuradhapuplishers, 1990.
6. V. Rajendran, *Material Science*, Tata McGraw Hill Ltd, New Delhi, 2001.
7. D.C.Tayal, Nuclear Physics, Himalaya Publishing House, 2009

### **E-MATERIALS**

1. [https://en.wikipedia.org/wiki/Galilean\\_transformation](https://en.wikipedia.org/wiki/Galilean_transformation)
2. [https://www.youtube.com/watch?v=NH3\\_IkSB9s](https://www.youtube.com/watch?v=NH3_IkSB9s)
3. <https://www.youtube.com/watch?v=EEWuUst2GK4>
4. [https://en.wikipedia.org/wiki/Vector\\_model\\_of\\_the\\_atom](https://en.wikipedia.org/wiki/Vector_model_of_the_atom)
5. <https://www.tutorialspoint.com/what-is-a-geiger-muller-counter>
6. <https://www.youtube.com/watch?v=jxY6RC52Cf0>
7. [https://www.tutorialspoint.com/digital\\_circuits/digital\\_circuits\\_number\\_systems.htm](https://www.tutorialspoint.com/digital_circuits/digital_circuits_number_systems.htm)
8. <https://www.youtube.com/watch?v=4ae9sJBBkvw>
9. <https://en.wikipedia.org/wiki/Nanomaterials>
10. <https://www.youtube.com/watch?v=mPxoJz6treE> (Tamil video)

### **Course Outcomes**

1. After studied unit-1, the student will be able to study the frames of reference, Galilean transformation equations and special theory of relativity.
2. After studied unit-2, the student will be able to describe the different atomic models and Stern and Gerlach Experiment.
3. After studied unit-3, the student will be able to explain binding energy, liquid drop model, G.M counter and particle accelerators.
4. After studied unit-4, the student will be able to know the conversion of number systems from one to other and also will be able to design universal gates using NAND and NOR gates.
5. After studied unit-5, the student will be able to understanding the basics of nanomaterial, synthesis and its applications.

## ALLIED PRACTICAL- PHYSICS

### List of Experiments (Any 12 Experiments only)

1. Determination of 'g' using Compound pendulum.
2. Young's modulus-Non-Uniform bending-Pin & microscope
3. Rigidity Modulus – Torsional oscillation method (without masses).
4. Rigidity Modulus – Static Torsion method using Scale and Telescope.
5. Surface tension and Interfacial Surface tension by Drop Weight method.
6. Sonometer – Frequency of a Tuning fork.
7. Sonometer –Determination of A.C. frequency- using steel and brass wire
8. Air Wedge – Determination of thickness of a thin wire
9. Newton's Rings – Radius of Curvature of a convex lens.
10. Spectrometer – Refractive index of a liquid – Hollow prism.
11. Spectrometer grating – Minimum Deviation- Wavelength of Mercury lines.
12. Potentiometer – Calibration of Low range voltmeter.
13. Deflection magnetometer and Vibration magnetometer-Tan C Position-Determination of  $\mu$  and  $B_H$ .
14. Figure of merit- Table galvanometer.
15. Construction of AND, OR gates using diodes and NOT gate using a transistor.
16. NAND/NOR as universal gate.
17. Half adder and Full adder using NAND gate.
18. Half subtractor and Full subtractor using NAND gate.
19. Lasers: Study of laser beam parameters.
20. Measurement of Numerical aperture (NA) of a telecommunication graded index optic fiber.
21. Fiber attenuation of a given optical fiber.

### Text Books

1. C.C. Ouseph, U.J. Rao, V. Vijayendran, Practical Physics and Electronics, S. Viswanathan, Printers & Publishers Private Ltd, Chennai,2018.
2. M.N.Srinivasan, S. Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, Sultan Chand & Sons, New Delhi, 2015.

### Reference Books

1. Dr. S. Somasundaram, Practical Physics, Apsarapublications,Tiruchirapalli, 2012.
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

## **ALLIED -2 PAPER - 2**

### **STATISTICAL METHODS AND THEIR APPLICATIONS II**

#### **Objective**

To understand and computing statistical Methods by which to develop the programming Skills.

#### **UNIT-I**

Curve fitting by the methods of least squares -

$Y = a x + b$ ,  $Y = a x^2 + b x + c$ ,  $Y = a x^b$ ,  $Y = a e^{bx}$  and  $Y = ab^x$

#### **UNIT-II**

Sample Space - events - probability - Addition and Multiplication Theorem - conditional probability -Baye's Theorem. Mathematical expectation Addition and Multiplication theorem, Chebychev's Inequality.

#### **UNIT-III**

Standard distributions - Binomial, Poisson, Normal distribution and fitting of these distributions.

#### **UNIT-IV**

Test of Significance- small sample and large sample test based on mean, S.D. correlation and proportion - confidence interval.

#### **UNIT-V**

Analysis of variance - One and Two way classifications - Basic principle of design of Experiments - Randomisation, Replication and Local control - C.R.D., R.B.D. and L.S.D.

#### **Books for Reference:**

1. Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand
2. Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor – Sultan Chand
3. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII
4. Elements of Statistics - Mode . E.B. – Prentice Hall

## ALLIED PRACTICAL

### STATISTICAL METHODS AND THEIR APPLICATIONS - Practical

1. Formation of uni-variate and bi-variate frequency distribution
2. Diagrams and Graphs
3. Measures of Location
4. Measures of Dispersion
5. Skewness and Kurtosis
6. Correlation and Regression
7. Curve Fitting :  $y = ax+b$ ,  $y=ax^2+bx+c$ ,  $y=ax^b$ ,  $y=ae^{bx}$
8. Fitting of distributions - Binomial, Poisson, Normal
9. Test of significance small sample and large sample tests
10. Analysis of Variance: one way classification, Two way classification and Design of Experiments - C.R.D, R.B.D & L.S.D

### BOOKS FOR REFERENCE:

1. Statistical Methods by S.P. Gupta, Sultan chand & Sons
2. Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor

### Note:

Use of Scientific Calculator shall be permitted for Practical Examination.  
Statistical Table may be provided to the students at the Examination Hall.

**SKILL BASED SUBJECT  
PAPER-2  
WIRELESS DATA COMMUNICATION**

**Objectives:**

- ✓ This course introduces the concepts and theories of networking
- ✓ To apply them to various situations, classifying networks, analyzing performance and implementing new technologies.
- ✓ To implement the various new wireless technologies.
- ✓ To implement the various TCP/IP protocols.
- ✓ To implement the various security threads.

**UNIT-1 BASIC CONCEPTS OF OSI LAYERS 9**

**Hours**

Data Communication – Networks – Protocol and Standards – Line Configuration – Topology – Transmission Modes – Categories of Networks – Internetworks- OSI Models – Functions of OSI Layers.

**UNIT-II SIGNALS AND TRANSMISSION MEDIA 9**

**Hours**

Analog and digital – Periodic and Non Periodic signals – Analog Signals – Time And Frequency Domain - Composite Signals- Digital signals – Guided Media – UnGuided Media – Transmission Impairment – Performance.

**UNIT-III ERROR DETECTION, CORRECTION AND DATA LINK CONTROL 9**

**Hours**

Type of errors –Detection-Vertical Redundancy Check (VRC) -Longitudinal Redundancy Check (LRC) Cyclic Redundancy Check (CRC) – check sum – Error Corrections – Flow Control – Error Control.)**SWITCHING & NETWORK DEVICES:** Circuit Switching-Packet Switching-Message Switching Repeaters-Bridges-Routers-Gateways-other Devices - Routing Algorithms-Distance Vectors Routing- Link State Routing.

**UNIT- IV: WIRELESS NETWORKS 9 Hours**

Wireless LAN: Advantages and Disadvantages-Infrared Vs Radio Transmission – Infrastructure Networks- Ad hoc Networks – Bluetooth- Wireless ATM: Working Group Services- Reference Model – Functions – Radio Access Layer – Handover- Handover reference model- Requirements and Types.

**UNIT-V TCP/IP PROTOCOL SUITE: PART I, PROTOCOLS & NETWORK SECURITY**

**9 Hours**

Overview Of TCP/IP – Network Layer – Addressing – Subnetting – Other Protocols In The Network Layer – Transport Layer – Client/Server Model – Bootstrap Protocol and DHCP - Domain Name System (DNS) – Tel Net –File Transmission Protocol (FTP) – Simple Mail Transfer Protocol (SMTP) – SNMP Protocol – Hyper Text Transmission Protocol (HTTP) – World Wide Web (WWW) –Four Aspects of Security – Privacy – Digital Signature – PGP – Access Authorization.

**Text Book:**

1. Data Communication and Networking 2nd Edition Behrouz A. Forouzan, McGraw Hill Education 2014.
2. Stojmenovic and Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley, 2002, ISBN 0471419028.

**Reference Books:**

1. Data and Communication Network, William Stalling PHI 2014.
2. Computer Networks, Andrew S. Tanenbaum , David J. Wetherall, 5th Edition,Prentice Hall. 2010

**E REFERENCES**

1. <http://nptel.ac.in/video.php?subjectId=117102062>

**Course Outcomes:**

- To understand the concepts of basic OSI layers.
- To understand the concepts of signals and transmission media.
- To understand the basic concepts of error detection and DLC
- To understand the Characterize of wireless transmission technologies
- To understand the concepts of Security.

**NON-MAJOR ELECTIVE**  
**PAPER-2**  
**INTERNET TECHNOLOGY**

**OBJECTIVS**

The subject aims to build the concepts regarding:

- Fundamentals of Internet, Connectivity and its Resource Requirements.
- To understand the Internet Technology and its applications
- To Understand WWW and Web Browsers.
- Mailing system and applications of Internet.
- To Understand relay chat

**UNIT-I**

**Introduction to internet:** What is Internet? Evolution and History of Internet- Growth of Internet-Owners of Internet- Internet Services- How does the Internet Works?-Anatomy of Internet-Internet Addressing-Internet vs Intranet-Impact of Internet- Governance of Internet.

**UNIT-II**

**Internet Technology and Protocol:** ISO-OSI Reference Model-**Internet Connectivity:** Getting Connected- Different Types of Connections- Levels of Internet Connectivity- Internet Service Provider. **Internet Tools and Multimedia:** Current Trends on Internet- Multimedia and Animation.

**UNIT-III**

**WWW and Web Browser:** WWW-Evolution of Web-Basic Elements of WWW-Web Browsers- Search Engines- Search Criteria. **Web Publishing:** Web Publishing- Web Page Design.

**UNIT-IV**

**Email:** E-Mail Basics- E-Mail System-E-Mail Protocol-E-Mail Addresses-Structure of an E-Mail Message-E-Mail Clients&Servers-MailingList-E-MailSecurity.

**UNIT-V**

**Usenet and Internet Relay Chat:** What is Usenet?-Newsgroup Hierarchies-What is a Newsreader?- How do you Read Newsgroups?- Who Administers Usenet?- Common News reading Tasks- How to Read Articles from Network News?- Relationship between Netnews and E-Mail-What is IRC?-Channels-Nicknames- Microsoft NetMeeting. **Internet and Web Security:** Overview of Internet Security- Aspects and Need of Security-E-Mail Threats and Secure E-mail-Web Security and Privacy Concepts-Firewall.

**TEXTBOOK:**

1. *ISRD Group*. 2012. **Internet Technology and Web Design**. [Fourth reprint]. Tata

McGraw-Hill Education Private Limited., New Delhi.

**REFERENCE BOOKS:**

1. *Deitel, H.M. Deitel, P.J. and Goldberg A.B. 2008. Internet & Worldwide Web- How to Program.* [Third Edition]. PHL, New Delhi.
2. *Comdex. 2000. Teach yourself computers and the internet visually.* [First Edition]. IDG Book India (p) Ltd.
3. *Ramachandran, T.M. Nambissan. 2003. An Overview of internet and web development.* [First Edition]. T M-Dhruv Publications.

**COURSE OUT COMES :**

- Students understand the Fundamentals of Internet, Connectivity and its Resource Requirements.
- Students understand the Internet Technology and its applications
- Students Understand the basis of WWW and Web Browsers.
- Students learn how to Mailing system and applications of Internet.
- Students Understand relay chat that is how to read e- contents.

## SEMESTER V

### CORE PAPER - 5

#### MOBILE APPLICATION DEVELOPMENT

##### **Objectives:**

This course aims to provide the students with a detailed knowledge on Mobile Application Development and Deployment about Android programming from basics to building mobile applications for digital world.

##### **UNIT I: INTRODUCTION TO ANDROID PLATFORM**

**Objective:** To understand the basics of smart phones and android platforms.

Introduction to Mobile Application Development – Various platforms – Smart phones – Android platform: features – Architecture – Versions – ART (Android Runtime) – ADB (Android Debug Bridge) – Development environment/IDE: Android studio and its working environment – Emulator setup – Application framework basics – XML representation and Android manifest file – Creating a simple application.

##### **UNIT II: ANDROID UI DESIGN**

**Objective:** To understand the basic concepts of user interface related to app development.

GUI for Android: activities lifecycle – Android v7 support library – Intent: Intent object – Intent filters – Adding categories – Linking activities – User Interface design components – Basic Views – Picker Views – List View – Specialized Fragment – Gallery and Image View – Image Switcher – Grid View, Options Menu – Context Menu – Clock View – Web view – RecyclerView.

##### **UNIT III: DATA PERSISTENCE**

**Objective:** To understand the important of data persistence in mobile environment.

Different Data Persistence schemes: Shared preferences – File Handling – Managing data using SQLite database – Content providers: user content provider – Android in build content providers.

## **UNIT IV: ANDROID SERVICES & NETWORK ENVIRONMENT**

**Objective:** To understand the various services and network facilities provided by android platform.

Services: Introduction to services – Local service – Remote service – Binding the service –Communication between service and activity – Intent Service – Multi-Threading: Handlers – AsyncTask– Android network programming: HttpURLConnection– Connecting to REST-based – SOAP based Web services – Broad cast receivers: LocalBroadcastManager– Dynamic broadcast receiver – System Broadcast – Telephony Manager: Sending SMS and making calls.

## **UNIT V: ADVANCED APPLICATIONS**

**Objective:** To understand the various apps deployed and developed on by mobile platform.

Location based services: Google maps V2 services using Google API – Animations and Graphics: Property Animation – View Animations –Drawable Animations – Media and Camera API: Working with video and audio inputs – camera API – Sensor programming: Motion sensors – Position sensors – Environmental sensors – Publishing Android Apps: Guide lines – policies and process of uploading Apps to Google play.

### **TEXT BOOKS:**

1. “Head First: Android Development”, Dawn Griffiths, David Griffiths, OReilly, 1<sup>st</sup> Edition, 2015.
2. Barry Burd, “Android Application Development – All-in-one for Dummies”, 2nd Edition, Wiley India, 2016.

### **REFERENCES:**

1. “Professional Android™ Sensor Programming”, Greg Milette,Adam Stroud, John Wiley and Sons, Inc 2012.
2. “Android 6 for Programmers, App Driven approach”, Paul Deital, Harvey Deital, Alexander Wald, Prentice Hall, 2015.



## **CORE PAPER - 6**

### **OPERATING SYSTEM**

#### **Objectives:**

Enable the student to get sufficient knowledge on concepts, functions and various system resources of operating systems.

#### **UNIT I: OPERATING SYSTEM BASICS**

**Objective:** To understand the structure and functions of operating systems.

Basic Concepts of Operating System – Services of Operating System – Operating System Types – Computer System Operation – I/O Structure – Storage Structure – Memory Hierarchy – System Components – System Calls – System Programs – System Design and Implementation – Introduction to Process – Process State – Process Control Block – Process Scheduling – Operations on Process – Interprocess Communication – Communication in Client/Server Systems – Threads.

#### **UNIT II: CPU SCHEDULING ALGORITHM AND PREVENTION**

**Objective:** To understand the principles of scheduler, scheduler algorithms and Deadlock.

Introduction –Types of CPU Scheduler – Scheduling Criteria – Scheduling Algorithms – Semaphores – Classic Problems of Synchronization – Basic Concept of Deadlocks – Deadlock Characterization – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery of Deadlock.

#### **UNIT III: STORAGE MANAGEMENT**

**Objective:** To learn various memory management schemes.

Memory Management – Basics Concept of Memory – Address Binding – Logical and Physical Address Space – Memory Partitioning – Memory Allocation – Paging – Segmentation – Segmentation and Paging – Protection – Fragmentation – Compaction – Demand Paging – Page Replacement Algorithm – Classification of Page Replacement Algorithm .

#### **UNIT IV: I/O SYSTEMS**

**Objective:** To study I/O management, File system and Mass Storage Structure .

File System Storage – File Concept– File Access Methods – Directory Structure – File Sharing – File Protection – File System Implementation – File System Structure – Allocation Methods – Free Space Management – Mass Storage Structure – Disk structure – Disk Scheduling and Management – RAID Levels.

## **UNIT V: CASE STUDIES**

**Objective:** To learn the basics of UNIX, LINUX systems and perform administrative tasks on LINUX servers.

UNIX System – A Case Study – LINUX System – Case Study – Design Principles – Process Management – Scheduling – Memory Management – File Systems – Security .

### **TEXT BOOKS:**

1. “Operating System Concepts” –Abraham Silberschatz Peter B. Galvin, G. Gagne, Sixth Edition, Addison Wesley Publishing Co., 2003.
2. “Operating System” – William Stalling, Fourth Edition, Pearson Education,2003.

### **REFERENCES:**

1. “Operating systems – Internals and Design Principles”, W. Stallings, 6th Edition, Pearson.
2. “Modern Operating Systems”, Andrew S.Tanenbaum, Second Edition, Addison WesleyPublishing Co., 2001.
3. “Fundamentals of Operating System”, Prof. R. Sridhar, Dynaram Publication, Bangalore Company.

## CORE PAPER - 7

### DESIGN AND ANALYSIS OF ALGORITHMS

#### **Objectives:**

The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm.

#### **UNIT – I: ALGORITHM AND ANALYSIS**

**Objective:** Understanding various algorithm design techniques.

Elementary Data Structures: Stack – Queues – Trees – Priority Queue – Graphs – What is an Algorithm? – Algorithm Specification – Performance Analysis: Space Complexity – Time Complexity – Asymptotic Notation – Randomized Algorithms.

#### **UNIT – II: DIVIDE AND CONQUER**

**Objective:** This technique is the basis of efficient algorithms for all kinds of problems.

General Method – Binary Search – Recurrence Equation for Divide and Conquer – Finding the Maximum and Minimum— Merge Sort – Quick Sort – Performance Measurement – Randomized Sorting Algorithm – Selection Sort – A Worst Case Optimal Algorithm – Implementation of Select2 – Stassen’s Matrix Multiplications.

#### **UNIT – III: THE GREEDY METHOD**

**Objective:** This is a simple approach which tries to find the best solution at every step.

The General Method – Container Loading – Knapsack Problem – Tree Vertex Splitting – Job Sequencing with Deadlines – Minimum Cost Spanning Trees – Prim’s Algorithm – Kruskal’s Algorithm – An optimal Randomized Algorithm – Optimal Storage on Tapes – Optimal Merge Pattern – Single Source Shortest Paths.

## **UNIT – IV: DYNAMIC PROGRAMMING, TRAVERSAL & SEARCHING**

**Objective:** Providing a general insight into the dynamic programming approach.

The General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – String Editing – 0/1 Knapsack – Reliability Design – The Traveling Salesperson Problem. Techniques for Binary Trees – Techniques for Graphs – BFS – DFS.

## **UNIT – V: BACKTRACKING & BRANCH AND BOUND**

**Objective:** Algorithm design paradigm for discrete and combinatorial optimization problems.

The General Method – The 8– Queens Problem – Sum of Subsets– Graph Coloring – Hamiltonian Cycles – Branch and Bound: General Method – LC Branch and Bound – FIFO Branch and Bound.

### **TEXT BOOKS:**

1. “Fundamentals of Computer Algorithms”, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Galgotia Publications, Second Edition 2015.
2. “Introduction to Algorithms”, Cormen T.H., Leiserson C.E. and Rivest R.L., PHI Publications, Third Edition, 1998.

### **REFERENCES:**

1. “Introduction to the Design and Analysis of Algorithms”, AnanyLevitin, Pearson Education, 2nd Edition.
2. “Introduction to Algorithms” Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Prentice Hall of India, New Delhi, Second Edition, 2007.
3. “Computer Algorithms – Introduction to Design & Analysis” Sara Baase and Allen Van Gelder, Pearson Education New Delhi, Third Edition, 2000.

## **CORE PRACTICAL - 5**

### **MOBILE APPLICATIONS DEVELOPMENT LAB**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Intent and Activity.
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of RSS Feed.
6. Implement an application that implements Multi-threading.
7. Develop an application that create alarm clock.
8. Develop an application Using Widgets.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Develop an application that makes use of database.



## **CORE PRACTICAL - 6**

### **OPERATING SYSTEM LAB**

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
  - a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
  - a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
  - a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement e all page replacement algorithms
  - a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications.

**INTERNAL ELECTIVE  
PAPER-1  
(to choose one out of 3)  
A. DATA MINING**

**Objectives:**

To enable the students to understand the importance of Data Mining and its techniques with recent trends and tools.

**UNIT I: DATA MINING BASICS**

**Objective:** To understand about the basics of Data Mining and Data

What is Data Mining– Kinds of Data – Kinds of patterns – Technologies used for Data Mining– Major Issues in Data Mining– Data –Data Objects and Attribute types– Data Visualization– Measuring Data Similarity and Dissimilarity–Data Preprocessing– overview– Data Cleaning– Data Integration– Data Reduction– Data Transformation and Data Discretization.

**UNIT II: DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING**

**Objective:** To understand about the methods of Data Warehousing

Data Warehouse– Basic concepts–Data Warehouse Modeling: Data Cube and OLAP– Data Warehouse Design and Usage– Data Warehouse Implementation– Data Generalization by Attribute–Oriented Induction– Data Cube Technology– Data Cube Computation Methods– Exploring Cube Technology– Multidimensional Data Analysis in cube space.

**UNIT III: PATTERNS AND CLASSIFICATION**

**Objective:** To understand about the techniques of Data Mining

Patterns– Basic concepts– Pattern Evaluation Methods–Pattern Mining: Pattern Mining in Multilevel– Multidimensional space–Constraint–Based Frequent Pattern Mining– Mining High Dimensional Data and Colossal patterns– Mining compressed or Approximate patterns– Pattern Exploration and Application. Classification–Decision tree Induction– Bayes Classification methods– Rule based Classification–Model Evaluation and selection– Techniques to Improve Classification Accuracy– Other Classification methods.

## **UNIT IV: CLUSTERING AND OUTLIER DETECTION**

**Objective:** To understand about the importance of Cluster and outlier detection

Cluster Analysis– Partitioning Methods–Hierarchical Methods–Density–Based Methods– Grid–Based Methods – Evaluation of Clustering.– Clustering High – Dimensional Data–Clustering Graph and Network Data – Clustering with Constraints–Web Mining– Spatial Mining. Outlier Detection – Outliers and Outliers Analysis–Outlier Detection Methods–Outlier Approaches–Statistical– Proximity–Based– Clustering–Based– Classification Based – High–Dimensional Data.

## **UNIT V: RECENT TRENDS IN DATA MINING AND TOOLS**

**Objective:** To improve the student’s knowledge with recent trends and tools

Other Methodologies of Data Mining –Data Mining Applications–Data Mining Trends– Recent Data Mining Tools–Rapid miner–Orange–Weka–Klime– Sisense–Ssdtd (SQL Server Data Tools)–Oracle–Rattle–Data melt–Apache Mahout.

### **TEXT BOOKS:**

1. “Data Warehousing Fundamentals”, PaulrajPonnaiah, Wiley Publishers, 2001.
2. “Data Mining: Concepts and Techniques”, Jiawei Han, MichelineKamber, Morgan Kaufman Publishers, 2006.
3. “Introduction to Data mining with case studies”, G.K. Gupta, PHI Private limited, New Delhi, 2008. 2<sup>nd</sup> Edition, PHI, 2011

### **REFERENCES:**

1. “Advances in Knowledge Discover and Data Mining”, Usama M. Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth RamasamyUthurusamy, the M.I.T. Press, 2007.
2. “The Data Warehouse Toolkit”, Ralph Kimball, Margy Ross, John Wiley and Sons Inc., 2002
3. “Building Data Mining Applications for CRM”, Alex Berson, Stephen Smith, Kurt Thearling, Tata McGraw Hill, 2000.
4. “Data Mining: Introductory and Advanced Topics”, Margaret Dunham, Prentice Hall, 2002.

5. “Discovering Knowledge in Data: An Introduction to Data Mining”, Daniel T. Larose John Wiley & Sons, Hoboken, New Jersey, 2004

**INTERNAL ELECTIVE  
PAPER-1  
B. INFORMATION SECURITY**

**Objectives:**

To enable the student to understand various methodologies available for securing information.

**UNIT I: INFORMATION SECURITY BASICS**

**Objective: To understand the basic concepts of Information Security**

Introduction – History – What is Information Security?– Critical Characteristics of Information– NSTISSC Security Model– Components of an Information System– Securing the Components– Balancing Security and Access– The SDLC– The Security SDLC.

**UNIT II SECURITY INVESTIGATION**

**Objective: To understand the legal, ethical and professional issues in Information Security**

Security– Business Needs– Threats– Attacks– Legal– Ethical and Professional Issues– Relevant U.S. Laws – International Laws and Legal Bodies – Ethics and Information Security – Codes of Ethics and Professional Organizations

**UNIT III SECURITY ANALYSIS**

**Objective: To know about risk management**

Risk Management – Introduction – An Overview of Risk Management – Risk Identification – Risk Assessment – Risk Control Strategies – Selecting a Risk Control Strategy – Quantitative versus Qualitative Risk Control Practices – Risk Management Discussion Points

**UNIT IV SECURITY MODELS**

**Objective: To understand the technological aspects of Information Security**

LOGICAL DESIGN– Blueprint for Security– Information Security Policy –

Standards and Practices– ISO 17799/BS 7799– NIST Models– VISA International Security Model– Design of Security Architecture– Planning for Continuity – Security Physical Design –Firewalls –Security Technology– IDS–IPS–Honey Pots– Honey Nets–Padded cell Systems Scanning and Analysis Tools–Access Control Devices.

## **UNIT V: CRYPTOGRAPHY AND ETHICAL HACKING**

**Objective: To understand the concepts of Cryptography and Hacking methods**

Cipher methods– Cryptographic Algorithms and Tools–Attacks on Cryptosystems–Hacking– Effects of Hacking– Hacker – Types of Hacker– Ethical Hacker–Hacktivism–Networking & Computer Attacks – Malicious Software (Malware) – Protection Against Malware– Intruder Attacks on Networks and Computers – Wireless Hacking– Windows Hacking– Linux Hacking Session.

### **TEXT BOOKS:**

1. “Principles of Information Security”, Michael E Whitman and Herbert J Mattord, 5<sup>th</sup> Edition, Vikas Publishing House, New Delhi, 2003.
2. “Fundamentals of Information Systems Security”, David Kim,MichaelG.Solomon, 3<sup>rd</sup> Edition ,Jones & Bartlett Learning, October 2016.
3. “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Patrick Engebretson, 2<sup>nd</sup> Edition, Syngress Basics Series – Elsevier, 2011.
4. “Hands-On Ethical Hacking and Network Defense”, Michael T. Simpson, Kent Backman, James E. Corley, Second Edition, CENGAGE Learning, 2010.

### **REFERENCES:**

1. “Handbook of Information Security Management”, Micki Krause, Harold F. Tipton, sixth Edition, CRC Press LLC, 2004.
2. “Hacking Exposed”, Stuart McClure, Joel Scrambray, George Kurtz, Tata McGraw–Hill, 2003.
3. “Computer Security Art and Science”, Matt Bishop, 2<sup>nd</sup> Edition , Pearson/PHI, 2002.

**INTERNAL ELECTIVE  
PAPER-1  
C. SOFTWARE TESTING**

**Objectives:**

To study the concepts of software engineering with the aim of acquiring skills to develop Software applications, following all standardized procedures and techniques.

**UNIT I: INTRODUCTION TO SOFTWARE TESTING**

**Objective:** To understand the concept of software testing, and software quality

Fundamentals of software testing – need for software testing– Psychology of testing – various approaches – characteristics of testing – principles of testing – testing strategies – verification and validation – Defect and Prevention strategies.

**UNIT II: SOFTWARE DEVELOPMENT MODEL AND TESTING**

**Objective:** To learn to inspect and detect errors by going through each and every code segment

Water fall model– V–model– Spiral model– Agile model – Life cycle of testing– Static Testing – dynamic testing – White box testing – Block box testing – Regression testing – Integration Testing – System and Performance Testing – Usability Testing

**UNIT III: FUNCTIONAL AND STRUCTURAL TESTING**

**Objective:** To gain knowledge of various functional and structural testing techniques

Boundary Value Analysis – Equivalence Class Testing – Decision Table – Based Testing – Cause Effect Graphing Technique – Path testing – Cyclomatic Complexity – Graph Metrics – Data Flow Testing – Slice based testing

#### **UNIT IV: TEST MANAGEMENT AND TOOLS**

**Objective:** To understand basic concept of Software Management tools and object oriented testing

Test planning – cost–benefit analysis of testing – monitoring and control–Test reporting –Test control – Specialized testing – Object Oriented Testing – Automated Tools for Testing – Tool Selection and Implementation – Challenges in test automation – GUI Testing

#### **UNIT V: SOFTWARE QUALITY AND SOFTWARE QUALITY ASSURANCE**

**Objective:** To understand basic concept of Software quality and software quality assurance

Introduction to software quality and software quality assurance – basic principles about the software quality and software quality assurance – Planning for SQA – various models for software product quality and process quality – SCM – RAD – System Documentation

#### **TEXT BOOKS:**

1. “Software Testing– A Craftsman’s Approach” – Paul C. Jorgensen – Second Edition – CRC Press 2008
2. “Software Testing”, – Ron Patton, Second Edition –Sams Publishing, Pearson Education, 2007.
3. “Software Testing– A Craftsman’s Approach” – Paul C. Jorgensen, Second Edition – CRC Press, 2008

#### **REFERENCES:**

1. “Software Testing and Analysis: Process, Principles and Techniques” – Mauro Pezze, Michal Young – Wiley India , 2008
2. “Software Engineering” – K.K. Aggarwal&Yogesh Singh – New Age International Publishers – New Delhi, 2003.
3. “Software Testing – Principles and Practices” –SrinivasanDesikan and Gopalswamy Ramesh, Pearson Education, 2006.

**SKILL BASED SUBJECT**  
**PAPER-3**  
**SOFTWARE ENGINEERING**

**Objectives:**

This course is intended to provide the students with an overall view over Software Engineering discipline and with insight into the processes of software development.

**UNIT-I: INTRODUCTION TO EVOLVING SOFTWARE**

**Objective:** Introduces the concepts and methods required for the construction of large software intensive systems.

Evolving Role of Software – Nature of Software – Software Engineering – The Software Process– Software Engineering Practices – Software Myths – A Generic View of Process Model – Process Assessment and Improvement – Process Models : Waterfall Model – Incremental Process Models – Evolutionary Process Models – Concurrent Models.

**UNIT-II: REQUIREMENTS ENGINEERING**

**Objective:** Gets the idea of choosing the Requirements in Software Engineering.

Requirements Engineering: Establishing the Groundwork – Initiating the Requirements Engineering Process – Eliciting Requirements – Collaborative Requirements Gathering – Quality Function Deployment – Usage Scenarios – Elicitation work Products – Building the Requirements Model – Elements of

Requirements Model – Analysis Pattern – Requirements Analysis – Data Modeling Concepts.

### **UNIT–III: DATA ENGINEERING**

**Objective:** Gives an understanding the concept of Data Engineering.

Data Engineering: Design Process and Design Quality – Design Concepts – The Design Model– Creating an Architectural Design – Software Architecture – Data Design – Architectural style – Architectural Design – Architectural Mapping Using Data Flow – Performing User Interface Design – Golden Rules.

### **UNIT–IV: TESTING STRATEGIES**

**Objective:** To impart knowledge on Testing and Debugging.

Testing Strategies: Strategic Approach to Software Testing – Strategic Issues – Test Strategies for Conventional and Object Oriented Software – Validation Testing – System Testing – Art of Debugging. Software Testing Fundamentals – White Box Testing – Basis Path Testing – Control Structure Testing – Black Box Testing – Model Based Testing.

### **UNIT–V: PROJECT MANAGEMENT**

**Objective:** To enable the students to learn the basic of Project Management & Scheduling.

Project Management: Management Spectrum – People – Product – Process – Project – Critical Practices – Estimation: Project Planning Process – Software Scope and Feasibility – Resources – Software Project Estimation – Project Scheduling – Quality Concepts – Software Quality Assurance – Elements of Software Quality Assurance – Formal Technical Reviews.

### **TEXT BOOKS:**

1. "Software Engineering – A Practitioner's Approach", Roger S Pressman, McGraw Hill International Edition, New York: 2005, Seventh Edition
2. " Software Engineering", Mall Rajib, PHI Learning, 2009, 3 Third Edition.

### **REFERENCES:**

1. "Software Engineering", Ian Somerville, Pearson Education, 2006, 7th Edition.

2. "Software Engineering Concepts" Richard Fairley, Tata McGraw–Hill Education, 2011.
3. "Software Engineering: Theory and Practice ", Pfleeger and Lawrence, Pearson Education, 2001, Second Edition.

## SEMESTER VI

### CORE PAPER - 8

#### OPEN SOURCE SOFTWARE

##### **Objectives:**

To study the concepts of open source techniques that can be effectively applied in practice about HTML5, JavaScript, PHP, and PERL.

##### **UNIT I: INTRODUCTION TO HTML, CSS**

**Objective:** To understand the concept of HTML, HTML5 and CSS.

Need of Open Source –Advantages of Open source –Application of Open Source – HTML – HTML tags –Dynamic Web content– HTTP Request and Response Procedure–Introduction to HTML5– HTML5 Canvas – HTML5 Audio and Video–Introduction to CSS – CSS Rules –Style Types – CSS Selectors– CSS Colors.

##### **UNIT II: LINUX**

**Objective:** To learn to inspect and detect errors by going through each and every code segment.

Introduction: Linux Essential Commands – Kernel Mode and user mode – File system Concept – Standard Files – The Linux Security Model – Vi Editor – Partitions Creation – Shell Introduction – String Processing – Investigation and Managing Processes – Network Clients – Installing Application.

##### **UNIT III:JAVA SCRIPT AND MYSQL**

**Objective:** To understand basic concept of Java Script and MySQL.

Java script :Advantages of JavaScript –JavaScript Syntax–Data type– Variable– Array – Operators and Expressions– Loops – functions – Dialog box– MySQL – The show Databases and Table – The USE command –Create Database and Tables – Describe Table – Select, Insert, Update, and Delete statement.

##### **UNIT IV: PHP**

**Objective:** To understand basic concept of PHP

PHP Introduction – General Syntactic Characteristics – PHP Scripting – Commenting your code – Primitives, Operations and Expressions – PHP Variables – Operations and Expressions Control Statement – Array – Functions – Basic Form Processing – File and Folder Access – Cooking – Sessions – Database Access with PHO.

## **UNIT V: PERL**

**Objective:** To understand basic concept of PERL

PERL : Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – Statements and Control structures – Subroutines, Packages, and Modules– Working with Files – Data Manipulation.

### **TEXT BOOKS:**

1. “The Complete Reference Linux”, Peterson, Tata McGraw HILL–2010
2. “Perl: The Complete Reference”, Martin C. Brown, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009.
3. “MYSQL: The Complete Reference”, VikramVaswani, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009
4. “PHP: The Complete Reference”, Steven Holzner, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009.
5. “Complete Reference HTML”, T. A. Powell, 3rd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2002.
6. “Mastering Java script” – J. Jaworski, BPB Publications, 1999

### **REFERENCES:**

1. “Fundamentals of Open Source Software”, by M.N. Rao, PHI publishers.
2. “MySQL Bible”, Steve Suchring, John Wiley, 2002
3. “The Linux Kernel Book”, Remy Card, Eric Dumas and Frank Mevel, Wiley Publications, 2003
4. Ivan Byross, HTML, DHTML, Javascript, Perl, BPB Publication

## **CORE PAPER - 9**

### **PYTHON PROGRAMMING**

#### **UNIT I:**

Identifiers – Keywords - Statements and Expressions – Variables – Operators – Arithmetic operators – Assignment operators – Comparison operators – Logical operators – Bitwise operators - Precedence and Associativity – Data types - Number – Booleans – Strings - Indentation – Comments – Single line comment – Multiline comments - Reading Input – Print Output – Type Conversions – int function – float function – str() function – chr() function – complex() function – ord() function – hex() function – oct() function - type() function and Is operator – Dynamic and Strongly typed language.

#### **UNIT II:**

Control Flow Statements – If statement – If else statement – If elif else statement – nested if statement - while loop – for loop – continue and break statements – catching exceptions using try and except statement – syntax errors – exceptions – exception handling – Strings – str() function - Basic string operations – String comparison – Built in functions using strings – Accessing characters in string – String slicing – String joining – split() method – string traversing.

#### **UNIT III:**

Functions – Built in functions – function definition and calling - return statement – void function – scope and lifetime of variables – args and kwargs – command line arguments - Tuples – creation – basic tuple operations – tuple() function – indexing – slicing – built-in functions used on tuples – tuple methods – packing – unpacking – traversing of tuples – populating tuples – zip() function - Sets – Traversing of sets – set methods – frozenset.

#### **UNIT IV:**

Lists: Using List- List Assignment and Equivalence – List Bounds- Slicing - Lists and Functions- Prime Generation with a List.List Processing: Sorting-Flexible Sorting- Search- List Permutations- Randomly Permuting a List- Reversing a List.

### **UNIT V:**

Objects: Using Objects- String Objects- List Objects. Custom Types: Geometric Points- Methods- Custom Type Examples- Class Inheritance. Handling Exceptions: Motivation- Exception Examples- Using Exceptions - Custom Exceptions.

### **TEXT BOOKS:**

1. Gowrishankar S, Veena A, “Introduction to Python programming”, 1<sup>st</sup> Edition, CRC Press/Taylor & Francis, 2008. (Units 1-3)
2. Learn to Program with Python, 3th Edition, Richard L. Halterman, Southern Adventist University. (Units 4-5)

### **REFERENCE BOOKS:**

1. Core Python Programming, 2thEdition, Wesley J. Chun, Prentice Hall.
2. Jake VanderPlas,“Python Data Science Handbook:Essential Tools for working with Data”,1<sup>st</sup> edition, O’Reilly Media, 2016.



## CORE PRACTICAL - 7

### PYTHON PROGRAMMING LAB

Write a Python program to find the area and perimeter of a circle.

1. Write a Python program to generate Fibonacci series.
2. Write a Python program to compute the GCD of two numbers.
3. Write a Python program to generate first n prime numbers.
4. Write a Python program to find the sum of squares of n natural numbers.
5. Write a Python program to find the sum of the elements in an array.
6. Write a Python program to find the largest element in the array.
7. Write a Python program to check if the given string is a palindrome or not.
8. Write a Python program to store strings in a list and print them.
9. Write a Python program to find the length of a list, reverse it, copy it and then clear it.

## **CORE PRACTICAL - 8**

### **OPEN SOURCE SOFTWARE LAB**

1. Create a web page with Frames and Tables.
2. Create a web page incorporating CSS (Cascading Style Sheets).
3. Write a shell program to find the factorial of an integer positive number.
4. Write a shell program to find the details of a user session.
5. Create a simple calculator in JavaScript.
6. Write a JavaScript program to scroll your name in the scrollbar.
7. Develop a program and check message passing mechanism between pages.
8. Application for Email Registration and Login using PHP and MySQL.
9. Program to Create a File and write the Data into it using PHP.
10. Program to perform the String Operation using Perl.

## **INTERNAL ELECTIVE**

### **PAPER -2**

**(to choose one out of 3)**

#### **A. BIG DATA ANALYTICS**

##### **Objectives:**

- To explore the fundamental concepts of big data analytics.
- To learn to analyze the big data using intelligent techniques and mining data stream.
- To understand the applications using Map Reduce Concepts.

##### **UNIT-I: INTRODUCTION TO BIG DATA**

**Objective: To explore the fundamental concepts of big data analytics.**

Introduction to big data: Introduction to Big Data Platform – Challenges of Conventional Systems – Intelligent data analysis – Nature of Data – .Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – Volume, Velocity, Variety – Other Characteristics of Data – Need for Big Data– Analytic Processes and Tools – Analysis vs. Reporting.

##### **UNIT-II: MINING DATA STREAMS**

**Objective:To learn to use various techniques for mining data stream.**

Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis– Stock Market Predictions.

##### **UNIT III: BIG DATA FROM DIFFERENT PERSPECTIVES**

**Objective: To learn the Big data Business Perspective**

Big data from business Perspective: Introduction of big data–Characteristics of big data–Data in the warehouse and data in Hadoop– Importance of Big data– Big data Use cases– Patterns for Big data deployment. Big data from

Technology Perspective– Application Development in Hadoop–Getting your data in Hadoop.

#### **UNIT –IV:HADOOP AND MAP REDUCE**

**Objective: To understand the applications using Map Reduce Concepts.**

Hadoop: The Hadoop Distributed File System – Components of Hadoop  
Analysing the Data with Hadoop– Scaling Out–Hadoop Streaming–  
Design of HDFS–Java interfaces to HDFS Basics– Developing a Map Reduce  
Application–How Map Reduce Works–Anatomy of a Map Reduce Job run–  
Failures–Job Scheduling–Shuffle and Sort – Task execution – Map Reduce  
Types and Formats– Map Reduce Features–Hadoop environment.

#### **UNIT – V: FRAMEWORKS**

**Objective:To introduce programming tools HIVE in Hadoop echo system.**

Frameworks: Applications on Big Data Using Pig and Hive – Data processing  
operators in Pig – Hive services – HiveQL – Querying Data in Hive –  
fundamentals of HBase and ZooKeeper– IBM InfoSphereBigInsights and  
Streams.

#### **TEXT BOOKS:**

1. “Intelligent Data Analysis”, Michael Berthold, David J. Hand, Springer, 2007.
2. “Hadoop: The Definitive Guide “, Tom White Third Edition, Oreilly Media, 2012.

#### **REFERENCES:**

1. “Big Data and Analytics” SeemaAcharya, SubhasiniChellappan, Wiley 2015.
2. “Mining of Massive Datasets”,AnandRajaraman and Jeffrey David Ullman,CUP,2012.
3. “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data” .Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,McGrawHill Publishing, 2012.
4. “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Bill Franks, John Wiley& sons, 2012.

5. "Making Sense of Data", Glenn J. Myatt, John Wiley & Sons, 2007.

## **INTERNAL ELECTIVE**

### **PAPER -2**

#### **B. CRYPTOGRAPHY**

##### **Objectives:**

- Understand various Security practices and System security standards
- Understand different cryptographic operations
- Understand the various Authentication schemes to simulate different applications.

##### **UNIT-I: COMPUTER AND NETWORK SECURITY**

**Objective:** Understand OSI security architecture and classical encryption techniques.

Computer Security Concepts – OSI security architecture –Security trends – Security attacks – Security Services – Security Mechanisms – Fundamental Security Design Principles – Attack Surfaces and Attack Trees – Model for Network Security – Network Standards.

##### **UNIT-II:SYMMETRIC CRYPTOGRAPHY**

**Objective:**Understand the different cryptographic operations of symmetric cryptographic algorithms.

Symmetric Cipher – Classical Encryption Technique – Symmetric Cipher Model – Substitution Techniques, Transposition Technique – Steganography – Block Cipher and the Data Encryption Standard – The Data Encryption Standard – Differential and Linear Cryptanalysis – Block Cipher Principles. Advanced Encryption Standard – AES Structure – AES Transformation Function.

##### **UNIT-III: PUBLIC KEY CRYPTOGRAPHY**

**Objective:** Understand the different cryptographic operations of Public key cryptographic algorithms.

Public Key Cryptography and RSA Principles– RSA Algorithm, Key Management and other Public Key Cryptosystems Key Management, Diffie–Hellman Key Exchange, Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation.

#### **UNIT –IV:HASH FUNCTIONS AND DIGITAL SIGNATURES**

**Objective:** To make use of application protocols to design and manage a secure system.

Cryptographic Hash Functions – Application of Hash Functions – Two Simple Hash Functions – Secure Hash Algorithm(SHA) –Message Authentication Codes – Authentication requirement – Authentication function – MAC – HMAC – CMAC – Digital signature and authentication protocols – Digital Signature Standards –Digital Signatures Schemes– Digital Certificate – Key Management and Distribution.

#### **UNIT – V: SECURITY APPLICATIONS**

**Objective:** To learn the configuration and manage E–mail and WLAN Security.

Intrusion Detection System – Password Management – Introduction to Firewall – Firewall Generations– Web Security – Wireless network Security – Electronic Mail Security– Internet Mail Architecture–S/MIME – Pretty Good Privacy (PGP).

#### **TEXT BOOKS:**

1. “Cryptography and Network security Principles and Practices”, William Stallings, Pearson/PHI, Seventh Edition, 2017.
2. “CRYPTOGRAPHY & NETWORK SECURITY” – Principles and Practices, William Stallings, Pearson Education, Third Edition.

#### **REFERENCES:**

1. “Modern Cryptography Theory and Practice”, Wenbo Mao, Pearson Education, 2004.
2. “Cryptography and Network Security”, Behrouz Forouzan, Debdeep Mukhopadhyay, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2010.

3. “Quantum Cryptography and Secret–Key Distillation”, Gilles van Assche, Cambridge University Press, 2010.

## INTERNAL ELECTIVE

### PAPER -2

#### C. DIGITAL IMAGE PROCESSING

##### **Objectives:**

This course enables the student knowledge about various image processing concepts like enhancement, restoration, segmentation, compression and recognition.

##### **UNIT I: FUNDAMENTALS**

**Objective:** To know the basics of Digital image and techniques.

Introduction – Origin – Steps in Digital Image Processing – Components – Applications of DIP – Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Images in Matlab– Pixels – Color models– Digital Image Processing in Multimedia.

##### **UNIT II: IMAGE ENHANCEMENT**

**Objective:** To understand various Image enhancement ideas.

Spatial Domain – Gray level transformations – Histogram Quantization – Histogram matching and processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering – Introduction to Fourier Series – Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal – Butterworth and Gaussian filters.

##### **UNIT III: IMAGE RESTORATION AND SEGMENTATION**

**Objective:** To understand Image restoration techniques.

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation– Active Contour Models – Snakes – Fuzzy Connectivity – Morphological processing– erosion and dilation.

#### **UNIT IV: WAVELETS AND IMAGE COMPRESSION**

**Objective:** To understand degrees of image resolution and compression methods.

Wavelets – Subband coding – Multi resolution expansions – Compression: Fundamentals – Image Compression models – Error Free Compression – Predictive Compression Methods – Vector Quantization – Variable Length Coding – Bit–Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

#### **UNIT V: IMAGE REPRESENTATION AND RECOGNITION**

**Objective:** To understand concepts of image representation and recognition.

Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Fuzzy Systems – Chain Code – Polygonal approximation, signature, boundary segments – Shape number – Fourier Descriptor moments– Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

#### **TEXT BOOKS**

1. "Digital Image Processing," Rafael C. Gonzalez, Richard E.Woods, Prentice Hall, Third Edition, 2008.
2. "Digital Image Processing and Computer Vision," Sonka, Hlavac, Boyle, Cengage Learning, 2009
3. "Fundamentals of Digital Image Processing", Anil Jain K, PHI Learning Pvt. Ltd., 2011.

#### **REFERENCES:**

1. "Digital Image Processing", S. Sridhar, Oxford University Press; Second edition, 2016.
2. "Digital Image Processing", Gonzalez & woods, Pearson Education India, 2016.



**INTERNAL ELECTIVE  
PAPER -3  
(to choose one out of 3)  
A. ARTIFICIAL INTELLIGENCE**

**Objectives:**

To induce the innovative ideas of students, related to Robotics, Artificial Intelligence and Machine Learning. This course enables the student's level to compete in the world of information and technology era.

**UNIT I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE:**

**Objective:** To know the basics of Artificial Intelligence.

History of AI – Artificial Narrow Intelligence (ANI) – Artificial General Intelligence (AGI) – Artificial Super Intelligence (ASI) – Characteristics – Types of AI – Domains – Programming Languages of AI – Applications of AI – Future of AI.

**UNIT II: AI – PROBLEM SOLVING METHODS:**

**Objective:** To Understand the Methods and algorithms in AI.

Problem solving Methods – Search Strategies: Uninformed – Informed – Heuristics – Generate and test – hill climbing – Best first search – problem reduction – Local Search Algorithms and Optimization – Game Playing mini-max procedure – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

**UNIT III: AI – KNOWLEDGE REPRESENTATION:**

**Objective:** To learn to represent knowledge in solving AI problems.

Procedural Versus declarative knowledge – logic programming – Forward Versus backward reasoning – Matching – Control knowledge – Ontological Engineering– Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories –Reasoning with Default Information.

**UNIT IV: STATISTICAL REASONING AND AGENTS:**

**Objective:** To Understand Statistical logics and know about Software agents.

Probability and Bayes Theorem – Certainty factors – Probabilistic Graphical Models – Bayesian Networks – Markov Networks – Fuzzy Logic. Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

## **UNIT V: MACHINE LEARNING AND APPLICATIONS**

**Objective:** To learn how Machine learning is related to AI.

Types of Machine Learning – Neural Networks – Deep Learning – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

### **TEXT BOOKS:**

1. “Artificial Intelligence”, Elaine Rich, Kevin Knight, Tata McGraw Hill, II Edition.
2. "Artificial Intelligence: A Modern Approach," Stuart Russell, Peter Norvig, Third Edition, Prentice Hall of India, New Delhi, 2010.
3. “Prolog: Programming for Artificial Intelligence”, I. Bratko, Addison – Wesley Educational Publishers Inc., Fourth edition 2011.

### **REFERENCES:**

1. “Machine Learning for Beginners 2019”, [Matt Henderson, This Is Charlotte, 2019](#)
2. “Introduction to Artificial Intelligence and Expert Systems”, Dan W. Patterson, [Pearson, 2015](#)

**INTERNAL ELECTIVE  
PAPER -3  
B. SYSTEM SOFTWARE**

**Objectives:**

To have an understanding the basic design of assemblers, loaders, linkers, macro processor.

**UNIT I: INTRODUCTION TO SYSTEM SOFTWARE**

**Objective:** To understand the basic concepts of system software

System software vs. Application software – Different types of system software – SIC& SIC/XE Architecture – traditional (CISC) machines – RISC machines.

**UNIT II: ASSEMBLERS**

**Objective:** Ability to trace the path of a source code to object code and to executable file

Basic assembler functions– Machine dependent and independent assembler features– Assembler design options–One pass assemblers–Multi pass assemblers– MASM assembler.

**UNIT III: LOADERS AND LINKERS**

**Objective:** To design and implementation of loaders and linkers

Basic loader functions–Simple bootstrap loaders – Machine dependent and independent loader features–Linkage editors– Dynamic linking.

**UNIT IV: MACRO PROCESSOR**

**Objective:** To understand the concepts of macro processor

Basic macro processor functions–Machine dependent and independent macro processor features–Macro processor design options.

**UNIT V: COMPILERS**

**Objective:** Ability to analyze the functions of compilers

Basic compiler functions–Machine dependent compiler features–Machine independent compiler features–Compiler design options the YACC compiler– Compiler.

**TEXT BOOKS:**

1. "System Software—An introduction to system programming", Leland L. Beck & D. Manjula, Pearson Education, 3rd edition, 2007.
2. "Compilers – Principles, techniques and tools", A.V. Aho, Ravi Sethi, J.D. Ullman, 2<sup>nd</sup> Edition, Pearson Education, 2011.

**REFERENCES:**

1. "Systems Programming and Operating Systems", D.M. Dhamdhare, Second Revised Edition, Tata McGraw Hill, 2000.
2. "Systems Programming", John J. Donovan, Tata McGraw Hill Edition, 2000.
3. "Systems Programming", Srimanta Pal, Oxford University Press, 2011.

**INTERNAL ELECTIVE  
PAPER -3  
C. CLOUD COMPUTING**

**Objectives:**

To enable the students to learn the basic functions, principles and concepts of cloud computing Systems.

**UNIT I: UNDERSTANDING CLOUD COMPUTING**

**Objective:** To understand the concepts in Cloud Computing.

Computing Paradigms – Cloud Computing Fundamentals – History of Cloud Computing – Cloud Computing Architecture & Management – Cloud Computing Deployment Models – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Cloud Services.

**UNIT II: DEVELOPING CLOUD SERVICES**

**Objective:** To understand the concepts of Cloud Computing Services.

Cloud Service Models – SOA & Cloud – Multicore Technology – Memory and Storage Technologies – Networking Technologies – Web 2.0 – 3.0 – Software Process Models for Cloud – Agile SDLC for Cloud Computing – Pervasive Computing – Application Environment – Virtualization.

**UNIT III: PROGRAMMING MODELS FOR CLOUD COMPUTING**

**Objective:** To enable the Students to learn Programming Models in Cloud Computing and its Environments.

Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – CGL– Map Reduce – Programming models for Aneka – Hadoop Library from Apache – Mapping Applications – Programming Support – Google App Engine, Amazon AWS – Cloud Software Environments –Eucalyptus, Open Nebula, Open Stack, CloudSim – SAP Labs – EMC – Sales force – VMware.

**UNIT IV: SOFTWARE DEVELOPMENT IN CLOUD**

**Objective:** The student should be made to learn the basics of Software Development in Cloud.

Different Perspectives on SaaS Development – New Challenges in Cloud – Cloud Aware Software Development Using PaaS Technology – Networking for Cloud Computing – Networking Issues in Data Centers – Transport Layer Issues in DCNs – TCP Enhancements for DCNs – Open Source Support for Cloud – Open Source Tools for IaaS Open Source Tools for IaaS – Open Source Tools for PaaS – Open Source Tools for Research.

## **UNIT V: SECURITY IN CLOUD COMPUTING**

**Objective:** At the end of the course, the student should be able to learn Security Aspects of Cloud Computing.

Security Aspects – Platform Related Security – Audit and Compliance – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security – Identity Management and Access Control – Autonomic Security – Advance Concepts in Cloud Computing.

### **TEXT BOOKS:**

1. “Essentials of Cloud Computing “– K.CHANDRASEKARAN – CRC Press Taylor and Francis Group an Informal Business – 2015.
2. Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014

### **REFERENCES:**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
4. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India, 2011.

5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly.

## **SKILL BASED SUBJECT**

### **PAPER-4**

## **INTERNET OF THINGS**

### **Objectives:**

This course presents the Introduction to IoT, M2M, IoT Architecture, IoT Model And Views, IOT protocols and Real world design constraints enable the students to learn the concepts of IoT.

### **UNIT I: INTRODUCTION TO IoT**

**Objective:** To understand the fundamentals of Internet of Things.

Introduction to Internet of Things –Definition and Characteristics of IoT– Physical Design– Logical Design–IoT Enabling Technologies –IoT Levels & Deployment Templates – Domain Specific IoTs – Home – City – Environment – Energy – Retail – Logistics – Agriculture – Industry – health and Lifestyle.

### **UNIT II: M2M and IoT ARCHITECTURE**

**Objective:** To understand the M2M and IoT Architecture

IoT and M2M – Difference between IoT and M2M –SDN –IoT System Management with NETCONF–YANG–IoT Platforms Design Methodology – M2M high–level ETSI architecture – IETF architecture for IoT– OGC architecture – Service Oriented Architecture – IoT reference architecture

### **UNIT III: IoT MODEL AND VIEWS**

**Objective:**To understand the IoT Model And Views

IoT reference model – Domain model – information model – functional model – communication model – Functional View – Information View – Deployment and operational View – other relevant architectural views – data representation and visualization.

### **UNIT IV: IoT PROTOCOLS**

**Objective:** To learn about the basics of IOT protocols.

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN – CoAP – Security

## **UNIT V: REAL–WORLD APPLICATIONS**

**Objectives:** Analyze applications of IoT in real time scenario.

Real world design constraints – Applications – Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities – participatory sensing – Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs – Cloud for IoT– Amazon Web Services for IoT.

### **TEXT BOOKS:**

1. “Interconnecting Smart Objects with IP: The Next Internet”, Jean–Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, 2010.
2. Internet of Things – A Hands–on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

### **REFERENCES:**

1. “Internet of Things – A hands–on approach”, ArshdeepBahga, Vijay Madisetti, Universities Press, 2015
2. “Architecting the Internet of Things”, DieterUckelmann, Mark Harrison, Michahelles, Florian (Eds), Springer, 2011.
3. “The Internet of Things in the Cloud: A Middleware Perspective”, Honbo Zhou, CRC Press, 2012.
4. "From Machine–to–Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Hö ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand, David Boyle, Elsevier, 2014.

5. “The Internet of Things – Key applications and Protocols”, Olivier Hersent, David Boswarthick, Omar Elloumi ,Wiley, 2012.

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