

THIRUVALLUVARUNIVERSITY

B.Sc. COMPUTER SCIENCE

CBCS PATTERN

(With effect from 2022-2023)

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
SEMESTER I									
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	Communicative English I	25	75	100
3.	III	Core Theory	Paper-1	6	4	Programmingin C	25	75	100
4.	III	Core Practical	Practical-1	3	2	Programmingin CLab	25	75	100
5.	III	Allied -1	Paper-1	7	3	(tochooseanyone) 1. MathematicsI 2. Mathematical FoundationsI	25	75	100
6.	III	PE	Paper 1	6	3	Professional English I	25	75	100
7.	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		Sem. Total		36	22		175	525	700
SEMESTER II									
8.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9.	II	English (CE)	Paper-2	4	4	Communicative English II	25	75	100
10.	II	NMSDC I : Language Proficiency for Employability	Paper-1	2	2	Effective English	25	75	100
11.	III	Core Theory	Paper-2	5	4	C++& Data Structure	25	75	100
12.	III	Core Practical	Practical-2	2	2	C++ and Data Structures Lab	25	75	100
13.	III	Allied-1	Paper-2	7	5	(tochooseanyone) 1. MathematicsII 2. Mathematical FoundationsII	25	75	100
14.	III	PE	Paper 1	6	3	Professional English II	25	75	100
15.	IV	Value Education		2	2	Value Education	25	75	100
16.	IV	Soft Skill		2	1	Soft Skill	25	75	100
		Sem. Total		36	27		200	600	800

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

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

46.	IV	NMSDC III : Emerging Technology for Employability -	Paper - 3	2	2	(Choose any one) • PBL Android App Development • Machine Learning	25	75	100
47.	V	Extension Activities		0	1		100	0	100
		Sem. Total		30	27		300	600	900
					142				

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)	33	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
	Total	46		140		4600

ANNEXURE - I
THIRUVALLUVAR UNIVERSITY, VELLORE – 632 115
(B.Sc., Computer Science) – 2022-2023 onwards

Programme Objectives:

1. Graduates will be able to comprehend the concepts learnt and apply in real life situations with analytical skills.
2. Graduates with acquired skills and enhanced knowledge will be employable/ become entrepreneurs or will pursue higher Education.
3. Graduates with acquired knowledge of modern tools, communicative skills and will be able to contribute effectively as team members.
4. Graduates are able to read the signs of the time analyze and provide practical solutions.
5. Graduates imbued with ethical values and social concern will be able to understand and appreciate social harmony, cultural diversity ensure sustainable environment

Programme Outcomes:

1. Having clear understanding of subject related concepts and apply the same to identify, formulate and analyze Complex problems.
2. Confident enough to act as a productive contributor for both self and team growth.
3. Able to adapt work environment easily.
4. Clear understanding on Professional and ethical responsibility.
5. Able to work effectively by managing time and provide innovative solutions.
6. Help to understand the market's demand and ability to provide Quality and timely services.
7. Help to Provide Infinite Solutions to same problem.
8. Able to clear any competitive exams for higher education.
9. Able to identify and grab global opportunities.
10. Help to develop Problem solving and to analyze Critical data.

Programme Educational Objectives:

1. To equip the students with World class skills and knowledge about Software and how it rules the IT And ITES industry by providing requisite technical education.
2. To gather business requirement, analyze, and design software which helps to reduce manual errors and ensure to deliver quality Product.
3. To help the individuals/students to identify or create opportunity to grow as Professionals in the competitive environment.
4. To motivate them to fly high for higher education in renowned universities across the globe.
5. To help the Professionals to go above and beyond to satisfy Company/Clients.

Programme Specific Outcomes:

On Completion of B.Sc. Computer Science Programme, graduates will be able to

1. Understand the technical aspects of Hardware and Software of Computer Science domain and the art of programming.
2. Ability to understand the different programming languages and can be able to apply the same for effective results.
3. Ability to use emerging software techniques of computer science to provide innovative and quick solution on time.
4. Ability to understand, adjust and adapt with the dynamic technical environment for the growth of individual career and IT industry.
5. Ability to utilize social media effectively for learning and use productively.
6. Ability to make the world a better place by developing new software/ languages to support AI.
7. Able to understand the concepts of Niche skills like Python, Big Data, MDM.
8. Able to enter different streams of Computer Science like System engineer, IT Manager, Architect, Game developer, Mobile Application developer, R&D.
9. Able to adapt the ongoing technical developments.
10. Able to enter any industry as each industry is dependent on Computer Science for design and develop their ideology.

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:I **Papertype:CoreTheory–Paper1**

Papercode: **Name of the Paper :Programming inC** **Credit:4**

TotalHours perWeek:6Hrs.LectureHours:78Hrs.TutorialHours: - **PracticalHours: -**

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Course Objectives

1. Tounderstandsimplealgorithms,
2. Tounderstandlanguageconstructs
3. TounderstandanddevelopprogrammingskillsinC.
4. Tounderstandthebasicconceptsofdecisionmakingandloopingstatements.
5. Tounderstandtheconceptsofarrays, structures,union, pointersandfiles.

CourseOutcomes

1. Afterstudiedunit-1,thestudentwillbeabletounderstandtheconceptsofConstants, Variables,andDataTypes,Operators andExpressions
2. Afterstudiedunit-2,thestudentwillbeabletounderstandtheconceptsofManagingInputandOutput Operations,DecisionMaking andBranching,DecisionMaking andLooping.
3. Afterstudiedunit-3,thestudentwillbeabletounderstandtheconceptsofArrays, CharacterArraysandStrings,UserDefinedFunctions.
4. Afterstudiedunit-4,thestudentwill beabletounderstandtheconceptsofStructureandUnions,Pointers,FileManagementinC.
5. Afterstudiedunit- 5,thestudentwillbeabletounderstandtheconceptsofFundamentalAlgorithms,FactoringMethods.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: OVERVIEW OF C

Teaching Hours: 15 Hrs.

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-2: MANAGING INPUT AND OUTPUT OPERATIONS

Teaching Hours: 15 Hrs.

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-3: ARRAYS

Teaching Hours: 16 Hrs.

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 – Multifile Programs.

Unit-4: STRUCTURE AND UNIONS

Teaching Hours: 16 Hrs.

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-5: FUNDAMENTAL ALGORITHMS:**Teaching Hours: 16 Hrs.**

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)

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from textbooks and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

CourseMaterial:**E-References**

1. NPTEL,IntroductiontoCProgramming,Prof.SatyadevNandakumar,IIT,ComputerScienceandEngineeringKanpur.
2. NPTEL,IntroductiontoProblemSolving&Programming,byProf.DeepakGuptaDepartmentofComputerScienceandEngineeringIITKanpur.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	S	S	M	S
CO2	S	M	M	S	S	S	S	S	S	S
CO3	S	S	M	M	S	S	S	S	S	S
CO4	S	M	M	M	M	M	S	S	S	S
CO5	S	S	M	M	S	S	S	S	S	S

PO–ProgrammeOutcome,CO – Courseoutcome

S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:I **Papertype:CorePractical– 1**

Papercode: **Name of the Paper :Programming inCLab** **Credit:**

2TotalHoursperWeek:3Hrs.LectureHours:...TutorialHours:.....PracticalHours: 39 Hrs.

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Course Objectives

1. Tounderstandconceptsoffor/whileloopandswitch.
2. Tounderstandlanguage Functionsandrecursions.
3. TounderstandanddevelopStringManipulations.
4. Tounderstandthebasicconceptsofsearchingandsorting.
5. Tounderstandthe conceptsofstructures.

CourseOutcomes

1. Afterstudied,thestudentwillbeabletoEnhancetheanalyzingandproblemsolvingskillsandusethe sameforwritingprograms inC
2. Afterstudied,thestudentwillbeabletoWritediversifiedsolutions,drawflowchartsanddevelop a well-documented andindented programaccordingtocodingstandards
3. Afterstudied,thestudentwillbeabletoLearn todebugagiven programandexecutetheCprogram
4. Afterstudied,thestudentwillbeabletohaveenoughpracticetheuseofconditionalandloopingstate ments
5. Afterstudied, thestudentwillbeabletoimplementarrays, functionsandpointers.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

Control Statements:

1. Print 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 strings 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. Student's Mark statement

Pointers:

14. Arithmetic operations on pointers.

Files

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment for a new work)

- a) Book review and research paper review, syllabus and curriculum review.
- b) Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c) Workshops, preparing technical term dictionaries from text books and reference books.
- d) Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e) Forming digital library: collecting text and reference books, course material.

- f) Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g) Extracurricular and cultural activities may be framed through the syllabus content.
- h) Grouping students for self-discussion, self-learning process.
- i) Following institution and intellectual and writing reports in the course field.
- j) Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k) For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l) Extracurricular activities may be framed through their syllabus content.
- m) Bring the industries to the campus. Bring the students to the industry.
- n) Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Book:

1. Programming in ANSIC, E. Balagurusamy, Tata McGraw Hill Education, 6th Edition, 2013.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	M	M	S	S	M	S	S	S	S
CO4	S	M	M	S	M	M	S	S	S	S
CO5	S	M	M	S	S	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE– 632 115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:I **Papertype:Allied**

Papercode: **Name of the Paper :Mathematics–1** **Credit:3**

TotalHours perWeek:7Hrs.LectureHours:91 Hrs.TutorialHours:.....PracticalHours:.....

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Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

CourseOutcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:ALGEBRA**TeachingHours:19Hrs.**

PartialFractions-Binomial,ExponentialandlogarithmicSeries(withoutProof)-Summation-Simpleproblems

Unit-2:THEORYOFEQUATIONS**Teaching Hours: 18 Hrs.**

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-3:MATRICES**TeachingHours:18Hrs.**

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

Unit-4:TRIGONOMETRY**TeachingHours:18Hrs.**

Expansionsofsinⁿθ,cosⁿθ,sinnθ,cosnθ,tannθ-Expansionsofsinθ,cosθ,tanθinterms ofθ.

Unit-5:DIFFERENTIALCALCULUS**TeachingHours:18Hrs.**

Successivedifferentiationuptothirdorder, Jacobians-Conceptsofpolarco-ordinates-Curvature andradius ofcurvatureinCartesianco-ordinatesandinpolarco-ordinates.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentfor a network)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:bookslevel,fieldstudy level.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops,preparingtechnicalterm dictionariesfromtext booksand referencebooks.
- d. Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,trainingcanbegivenby theteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepacticesandreportcanbewrittenfordocumentation, further discussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselfdiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process withintheframeworkofquestionsettingpatternandinternalassessmentpattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adoptedby the departments of the colleges for practicing their theoretical study. Innovative methodsmay be implemented in the practices and report can be written for documentation, furtherdiscussionandresearch.
- l. Extracurricularactivitiesmaybeframedthroughtheirsyllabuscontent.
- m. Bringtheindustriestothecampus. Bringthestudentstotheindustry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of researchreportslike assignment,seminarpapers,casestudyreports,etc.

Textbook:

1. 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*, IIS. Chand & company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai.

Course Material: website links, e-Books and e-journals Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	S	S	S	S	S
CO2	S	M	M	S	S	M	S	S	S	S
CO3	S	S	S	M	M	M	S	S	S	S
CO4	S	M	M	S	S	S	S	S	M	S
CO5	S	M	M	S	S	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (maybe avoided)

THIRUVALLUVARUNIVERSITY, VELLORE– 632 115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:I **Papertype:Allied**

Papercode: **Name of the Paper :MathematicalFoundations–1** **Credit:**

3TotalHoursperWeek:7Hrs.LectureHours:91 Hrs.TutorialHours:.....PracticalHours:.....

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Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

CourseOutcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: SYMBOLIC LOGIC**Teaching Hours: 18**

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

Unit-2: SET THEORY**Teaching Hours: 18 Hrs.**

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

Unit-3: BINARY OPERATIONS**Teaching Hours: 18 Hrs.**

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

Unit-4: DIFFERENTIATION**Teaching Hours: 19 Hrs.**

Simple problems using standard limits,

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow 0} \frac{\tan x}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^{1/n}$$

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

Unit-5: TWO DIMENSIONAL ANALYTICAL GEOMETRY**Teaching Hours: 18 Hrs.**

Straight Lines - Pair of Straight Lines

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- Book review and research paper review, syllabus and curriculum review.
- Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development - exercise
- Workshops, preparing technical term dictionaries from text books and reference books.
- Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- Forming digital library: collecting text and reference books, course material.
- Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- Extracurricular and cultural activities may be framed through the syllabus content.
- Grouping students for self-discussion, self-learning process.
- Following institution and intellectual and writing reports in the course field.
- Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.

- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

- 1. 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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	S	S	S	M	S
CO2	S	S	M	M	S	S	M	M	S	S
CO3	S	M	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	M	M	S	S	S
CO5	S	S	S	S	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:II **Papertype:CoreTheory–Paper1**

Papercode: **Name of the Paper : C++ &DataStructures** **Credit:4**

TotalHoursperWeek:5Hrs.LectureHours:65 Hrs.TutorialHours:..... **PracticalHours:..**

Course Objectives

1. Tounderstandtheconceptsofobject-orientedprogrammingandmasterOOPusingC++.
2. Tounderstand theconceptsofInheritance,polymorphismand templates.
3. Tounderstand theconceptsofdifferentviewofdata,stack and queues.
4. TounderstandtheconceptsofProgrammingwithRecursion,BinarySearchTreeandgraphs.
5. TounderstandtheconceptsofSortingandSearchingAlgorithms

Course Outcomes

1. After studied unit-1, the student will be able to understand the concepts of object orientedprogrammingApplystructureandinlinefunctions.
2. After studied unit-2, the student will be able to understand the concepts of the types ofinheritances and Applying various levels of Inheritance for real time problems Apply theOOPsconceptsclassandobject.UnderstandExplainthefileconceptandexceptionhandlingsin C++
3. After studied unit-3, the studentwill be able to understand the concepts of Stacks andQueue usingarrayandpointers.
4. After studied unit-4, the student will be able to understand the concepts of Recursion,BinarySearchTreeandgraphs.
5. After studied unit-5, the student will be able to understand the concepts of Sorting andSearchingAlgorithms

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: INTRODUCTION**Teaching Hours:13 Hrs.**

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

Unit-2: CONCEPTS OF OOP**Teaching Hours:13 Hrs.**

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-3: DATA DESIGN & IMPLEMENTATIONS**Teaching Hours: 13****Hrs.** 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-4: PROGRAMMING WITH RECURSION**Teaching Hours:13 Hrs.**

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, 7.47.5, Chapter 8: Section 8.1, 8.4, Chapter 9: Section 9.3*)

Unit-5: SORTING AND SEARCHING ALGORITHMS**Teaching Hours:13 Hrs.**Sorting – Searching – Hashing (*Chapter 10: Section 10.1, 10.2, 10.3*)

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment for a week)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.

- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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)

Reference Books:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	S	S	S
CO2	S	M	M	S	S	M	S	M	S	S
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	S	M	S	M	S	S	S	M	S
CO5	S	S	S	M	S	S	S	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (maybe avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:II **Papertype:CorePractical– 2**

Papercode: **Name of the Paper : C++ &DatastructuresLab** **Credit:**

2TotalHoursperWeek:2Hrs.LectureHours:....TutorialHours:.....PracticalHours:26 Hrs.

.....
Course Objectives

1. TodevelopC++programmingskills indesign
2. Tounderstandthebasicconceptsofdifferentabstracttypesand structureofdata.
3. To understand theconceptsofFunctionOverloading
4. To understand the concepts of Stack, Queue, List, Doubly Linked List - using Pointers- usingArrays.
5. TounderstandtheconceptsofSearchingandSortingAlgorithms.

CourseOutcomes

1. UnderstandtheCreatingandDeletingtheObjectswiththeConceptsofConstructorsandDestructor s.
2. DemonstratethePolymorphismConceptsandOperator Overloading.
3. Understandbasic DataStructures such as Arrays,LinkedLists,Stacks,Queues,DoublyLinkedListandInfixtoPostfixConversion.
4. ApplyAlgorithmforsolvingproblemslikeSortingandSearching.
5. ApplyAlgorithmsanduseGraphsandTreesastoolsto visualizeand simplifyProblems

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL 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. FileStream 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 (Dijkstra's)

Reference Books:

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development - exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.

- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Book:

- 1. Programming in ANSIC, E. Balagurusamy, Tata McGraw Hill Education, 6th Edition, 2013.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	S	S	S
CO2	S	M	M	M	S	S	S	M	S	S
CO3	S	M	M	M	M	S	S	S	S	S
CO4	S	M	M	S	M	S	M	M	S	S
CO5	S	S	S	M	M	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (maybe avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:II

Papertype:Allied

Papercode:

Name of the Paper :Mathematics–2

Credit:5

TotalHoursperWeek:7Hrs.LectureHours:91Hrs.TutorialHours:.....

PracticalHours:..

Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

CourseOutcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

UNIT-1:Application ofIntegration

TeachingHours:18Hrs.

Evaluationofdouble,tripleintegrals-Simpleapplicationstoarea,volume-
 Fourierseriesforfunctionsin(0,2)and□□□□

UNIT-2:PartialDifferentialEquations

TeachingHours:18Hrs.

Formation,completeintegralsandgeneralintegrals-Fourstandardtypes,Lagrange'sequations.

UNIT-3:LaplaceTransforms**TeachingHours:19 Hrs.**

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

UNIT-4 :VectorAnalysis**TeachingHours:18Hrs.**

Scalar point functions - Vector point functions - Gradient, divergence, curl - Directionalderivatives -Unittonormaltoasurface.

UNIT-5:VectorAnalysis(continued)**TeachingHours:18Hrs.**

Line and surface integrals - Guass, Stoke's and Green's theorems (without proofs) - SimpleproblembasedontheseTheorems.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentfr amework)

- a. Bookreviewandresearchpaper review,syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:bookslevel,fieldstudy level.Usingthecoursestudyforsocietyandnaturedevelopment-exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,trainingcanbegivenby theteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepacticesandreportcanbewrittenfordocumentation,furtherdiscussionandresearch.
- g. Extracurricular andculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselfdiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process withintheframeworkofquestionsettingpatternandinternalassessmentpattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adoptedby the departments of the colleges for practicing their theoretical study. Innovative methodsmay be implemented in the practices and report can be written for documentation, furtherdiscussionandresearch.
- l. Extracurricularactivitiesmaybeframedthroughtheirsyllabuscontent.
- m. Bringtheindustriestothe-campus.Bringthestudentstotheindustry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of researchreportslike assignment,seminarpapers,casestudyreports,etc.

Textbook:

P.DuraipandianandS.Udayabaskaran,(1997)*AlliedMathematics*,Vol.I&II.MuhilPublish ers,Chennai

ReferenceBooks:

1. P.BalasubramanianandK.G.Subramanian,(1997)*AncillaryMathematics*.Vol. I&II.TataMcGrawHill,NewDelhi.
2. S.P.RajagopalanandR.Sattanathan,(2005)*AlliedMathematics*.Vol.I&II.Vikas

Publications, New Delhi.

3. P.R.Vittal(2003).*AlliedMathematics*.MarghanPublications, Chennai.
4. P.Kandasamy,K.Thilagavathy(2003)*AlliedMathematicsVol-I,IIS.Chand&company Ltd.,NewDelhi-55.*
5. Isaac, *AlliedMathematics*. NewGammaPublishingHouse,Palayamkottai

Mappingwith ProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	S	S	M	S	M
CO2	S	S	S	M	M	S	S	S	S	S
CO3	M	M	M	S	S	M	M	S	M	S
CO4	M	S	M	S	S	M	M	M	M	M
CO5	M	M	S	S	S	S	S	S	M	S

PO–ProgrammeOutcome,CO – Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:II

Papertype:Allied-Paper2

Papercode:

Name of the Paper : MathematicalFoundations– 2

Credit:

5TotalHoursperWeek:7Hrs.LectureHours:91Hrs.TutorialHours:.....

PracticalHours:..

Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

UNIT-I:MATRICES

TeachingHours:18Hrs.

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

Teaching Hours: 18 Hrs.

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

Teaching Hours: 19 Hrs.

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

$$\frac{1}{a+b\cos x}, \frac{1}{a^2\sin^2x+b^2\cos^2x}$$

Integration by parts.

UNIT-IV

Teaching Hours: 18 Hrs.

Properties of definite integrals. Reduction formulae for

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

UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION

Teaching Hours: 18 Hrs.

Planes, straight lines.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development-exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.

- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	S	S	S	S
CO2	S	M	M	M	M	S	S	S	S	S
CO3	S	S	S	M	M	S	S	M	S	S
CO4	S	M	M	M	S	S	S	M	S	S
CO5	S	S	M	M	M	S	S	S	S	S

PO - Programme Outcome, CO - Course outcome
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THIRUVALLUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)–2022-2023onwards

Semester:III **Papertype:Core–Paper3**

Papercode: **Name of the Paper :ProgramminginJava** **Credit:**

3TotalHours perWeek:3Hrs.LectureHours: 39Hrs. TutorialHours:..PracticalHours:.....

.....
Course Objectives

1. To know about a General-purpose and Purely object-oriented programming language including data types.
2. To understand the concept of garbage collection and operators
3. To know about the concept of Array and string
4. To know about the concept of Files
5. To understand the concept of Applets

Course Outcomes

1. After studied unit-1, the student will be able to understand the concept of General-purpose and Purely object-oriented programming language including data types and classes
2. After studied unit-2, the student will be able to understand the concept of loops
3. After studied unit-3, the student will be able to understand the concept of Arrays
4. After studied unit-4, the student will be able to understand the concept of Files
5. After studied unit-5, the student will be able to understand the concept of internet programming using applets and GUI-based

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTION

TeachingHours:7Hrs.

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-

DeclaringInterfaceConstants.DeclareClassMembers:AccessModifiers
-NonaccessMemberModifiers-ConstructorDeclarations-VariableDeclarations. Declare
and Use enums:Declaring enums.Object Orientation:Encapsulation -
InheritanceandPolymorphism- Polymorphism - Overriding / Overloading: Overridden
Methods -OverloadedMethods.

Unit-2:CONCEPTS OF OOP

TeachingHours: 8Hrs.

ObjectOrientation:Casting- Implementingan Interface-Legal Return
Types:ReturnTypeDeclarations - 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 -
VariableInitialization - Passing Variables into Methods: Passing Object Reference Variables -
PassingPrimitiveVariables.GarbageCollection.Operators:JavaOperators-AssignmentOperators
- Relational Operators – instance of Comparison - Arithmetic Operators -
ConditionalOperator-LogicalOperators.

Unit-3:ARRAYS AND LOOPING

TeachingHours: 8Hrs.

Working with Strings, Arrays, and Array Lists: Using String and StringBuilder: The
StringClass - The StringBuilder Class - Important Methods in the StringBuilder Class. Using
Arrays:DeclaringanArray-ConstructinganArray-InitializinganArray.
UsingArrayList:ArrayListMethods>Action-ImportantMethodsintheArrayListClass.FlowControl
and Exceptions: Using if and switch Statements -CreatingLoopsConstructs -HandlingExceptions -
Catchingan Exception Using try and catch - Using finally. String Processing,
DataFormattingResourceBundles:String,StringBuilder,andStringBuffer-
Dates,Numbers,Currencies,andLocales.

Unit-4:FILES AND THREADS

TeachingHours: 8Hrs.

I/O and NIO: File Navigation and I/O: Creating Files Using the
FileClass-UsingFileWriterandFileReader.FileandDirectoryAttributes-DirectoryStream-
Serialization.GenericsandCollections:toString(),hashCode(),andequals():ThetoString()Method-
Generic Types-GenericMethods-GenericDeclarations.InnerClasses:Method-Local. InnerClasses -
Static NestedClasses -Threads:Defining, Instantiating,and StartingThreads-
ThreadStatesandTransitions-SynchronizingCode,ThreadProblems-
ThreadInteraction.Concurrency:Concurrency with thejava.util.concurrentPackage-
ApplyAtomicVariablesandLocks-Usejava.util.concurrentCollections-
UseExecutorsandThreadPools.

Unit5:APPLETS

TeachingHours:8Hrs.

Applets: Applet fundamentals - Applet class - Applet life cycle - Steps for developing an
appletprogram - Passing values through parameters - Graphics in an applet- Event-handling.
GUIApplications - Part 1: Graphical user interface - Creating windows - Dialog boxes -
Layoutmanagers -AWT componentclasses - Swing component classes.GUIApplications - Part
2:Event handling-OtherAWTcomponents-AWTgraphicsclasses-Otherswingcontrols.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- c. Workshops, preparing technical term dictionaries from textbooks and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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 Java 2, [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.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	S	M	S	S	S
CO2	S	S	M	M	M	S	S	S	S	S
CO3	S	M	M	M	M	S	S	S	M	S
CO4	S	M	M	M	M	S	S	S	S	S
CO5	S	S	M	M	M	S	S	S	M	S

PO–ProgrammeOutcome,CO – Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:III **Papertype:Core–Practical-3**

Papercode: **Name of the Paper :ProgramminginJavaLab** **Credit:**

3TotalHours perWeek:3Hrs.LectureHours: **TutorialHours:.. PracticalHours: 39Hrs.**

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Course Objectives

1. Tounderstand theconceptsofclassesand objects.
2. Toknowaboutlayoutmanagers.
3. Togainknowledgeofframesandmenus.
4. TounderstandtheconceptofRMI.
5. Tolearnhowtohandleexceptions.

Course Outcomes

1. Afterstudiedunit-1,thestudentwill beabletounderstandtheconceptofpurelyobject-orientedprogramminglanguageincludingdatatypesandclasses.
2. Afterstudiedunit-2,thestudent willbeabletoimplementlayoutmanagers.
3. Afterstudiedunit-3,thestudentwillbeabletodevelopanapplicationusingframes.
4. Afterstudiedunit-4,thestudentwillbeabletounderstandtheconceptsofRMI.
5. Afterstudiedunit-5,thestudentwillbeabletohandleexceptionsinprogram.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXCERCISES

1. ImplementationofClassesandObjects
2. ImplementationofInheritanceandPolymorphism
3. ImplementationofInterfaceandPackageconcepts

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	S	S	S
CO2	S	M	M	M	M	M	S	M	S	M
CO3	S	M	S	M	M	S	S	M	S	S
CO4	S	M	S	M	M	M	S	M	S	M
CO5	S	M	M	M	M	M	S	S	S	S

PO–ProgrammeOutcome,CO –Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)–2022-2023onwards

Semester:III

Papertype:AlliedII–Paper3

Papercode:

Name of the Paper :Physics - I

Credit:3

TotalHoursperWeek: 4Hrs. LectureHours:52Hrs. TutorialHours:..... PracticalHours:.....

.....

Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

CourseOutcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: Properties of Matter

Teaching Hours: 11 Hrs.

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

Teaching Hours: 10 Hrs.

Seebeck, 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 - thermoelectric power and thermoelectric diagrams.

Unit-3: Transient Current and Magnetism

Teaching Hours: 10 Hrs.

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

Teaching Hours: 10 Hrs.

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 - Piezoelectric effect - production by Piezoelectric method - properties - applications - Acoustics of buildings - reverberation time - derivation of Sabine's formula - determination of absorption coefficient - Acoustical aspects of halls and auditoria.

Unit-5: Lasers and Fibre Optics

Teaching Hours: 11 Hrs.

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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development-exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

Unit 1 and Unit 4

1. R. Murugesan and Kiruthiga Sivaprasath, 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, Brij Lal and M. N. Avadhanulu, A Text Book of Optics, S. Chand & Co. New Delhi, Revised Edition as per UGC model syllabus.

Reference Books:

1. Brij Lal 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. Brij Lal 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. AjayGhatakandK.Thyagarajan,FiberopticsandLasers-
Thetworevolutions,Macmillan,2006.
7. K.ThyagarajanandAjayGhatak,Lasers;Fundamentalsandapplications, Springer.
8. ModernPhysics–
R,Murugesan,KiruthigaSivaprasath,S.Chand&Co,NewDelhi,2016.

CourseMaterial:

E-MATERIALS

1. <https://courses.lumenlearning.com/physics/chapter/16-4-the-simple-pendulum/>
2. https://www.youtube.com/watch?v=aw0_seEt4v0
3. https://en.wikipedia.org/wiki/Thermoelectric_effect
4. https://www.youtube.com/watch?v=S0I37M2sx_0
5. <https://physicscatalyst.com/electromagnetism/growth-and-delay-charge-R-C-circuit.php>
6. <https://www.youtube.com/watch?v=PLQQPXot6vE>
7. 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/
10. <https://www.youtube.com/watch?v=auk1OS0SVWc> (Tamil video)

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	S	M	S
CO2	S	M	M	S	M	M	S	S	S	S
CO3	S	M	M	S	S	M	S	S	M	S
CO4	S	M	M	M	M	M	S	S	S	S
CO5	S	M	M	M	M	M	S	S	M	S

PO–ProgrammeOutcome,CO – Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)–2022-2023onwards

Semester:III **Papertype: AlliedII –Paper3**

Papercode: **Name of the Paper :StatisticalMethodsandtheirApplications-1** **Credit:**

3TotalHours perWeek: 4 Hrs. LectureHours:52 Hrs.TutorialHours:.....PracticalHours:.....

.....
Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:**TeachingHours:11Hrs.**

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

Unit-2:**TeachingHours: 10Hrs.**

Measuresoflocation:Arithmeticmean,median,mode,geometricmeanandHarmonicmeanandtheirproperties.

Unit-3:**TeachingHours: 10Hrs.**

Measuresofdispersion:Range,Quartiledeviation,meandeviation,Standarddeviation,combinedStandarddeviation,andtheirrelativemeasures.

Unit-4:**TeachingHours:10Hrs.**

Measures of Skewness: Karl Pearson's, Bowley's, and Kelly's and co-efficient of Skewness and kurtosisbasedonmoments.

Unit-5:**TeachingHours: 11Hrs.**

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

Note:Theproportionbetween theoryandproblemsshallbe20:80

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:bookslevel,fieldstudy level.Usingthecoursestudyforsocietyandnaturedevelopment-exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,trainingcanbegivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepacticesandreportcanbewrittenfordocumentation,furtherdiscussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselldiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process withintheframeworkofquestionsettingpatternandinternalassessmentpattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adoptedby the departments of the colleges for practicing their theoretical study. Innovative methodsmay be implemented in the practices and report can be written for documentation, furtherdiscussionandresearch.
- l. Extracurricularactivitiesmaybeframedthroughtheirsyllabuscontent.

- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Book:

1. Fundamental of Mathematical Statistics-S.C.Gupta&V.K.Kapoor-SultanChand
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-SultanChand&Sons

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	S	S	S	S	S
CO2	M	M	M	M	M	M	S	S	M	S
CO3	S	M	M	M	M	M	S	S	S	M
CO4	M	S	S	M	M	M	M	S	S	S
CO5	S	S	M	M	M	M	S	S	S	S

PO–Programme Outcome, CO – Course outcome
 S –Strong ,M–Medium,L– Low(may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE– 632115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: III Papertype: Skill based Subject– Paper 1

Paper code: Name of the Paper : Digital Logic Design and Computer Organization Credit: 2

Total Hours per Week: 3 Hrs. Lecture Hours: 39 Hrs. Tutorial Hours: Practical Hours:

Course Objectives

1. To understand the basics of Number System.
2. To understand the concept of Simplification of Boolean expressions using K-map and arithmetic circuits.
3. To understand the concept of Combinational Logic Circuits
4. To understand the concept of Basic Structure of Computers
5. To understand the basic concepts of Input Output and Memory Organization

Course Outcomes

1. After studied unit-1, the student will be able to understand Boolean algebra and basic gates.
2. After studied unit-2, the student will be able to understand how to simplify expression using K-Map.
3. After studied unit-3, the student will be able to understand how to build combinational circuits.
4. After studied unit-4, the student will be able to know about registers and addressing modes
5. After studied unit-5, the student will be able to understand types of memories.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: BINARY NUMBER SYSTEM**Teaching Hours: 8Hrs.**

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-2: SIMPLIFICATION**Teaching Hours: 8Hrs.**

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

Unit-3: COMBINATIONAL LOGIC CIRCUITS**Teaching Hours: 8Hrs.**

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-4: BASIC STRUCTURE OF COMPUTERS**Teaching Hours: 7Hrs.**

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

Unit-5: INPUT OUTPUT AND MEMORY ORGANIZATION**Teaching Hours: 8Hrs.**

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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment for a network)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development- exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods

maybe implemented in the practices and report can be written for documentation, further discussion and research.

- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	S	S	M	S
CO2	S	M	M	S	S	M	S	S	M	S
CO3	S	M	M	S	S	M	M	S	M	S
CO4	S	M	M	S	M	M	M	S	M	S
CO5	S	M	M	S	M	M	M	S	M	S

PO–Programme Outcome, CO – Course outcome
 S –Strong ,M–Medium,L– Low(maybe avoided)

THIRUVALLUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:III Papertype:NonMajorElective -Paper1

Papercode: Name of the Paper :IntroductiontoInformationTechnology Credit:

2TotalHoursperWeek: 2Hrs.LectureHours:26Hrs.TutorialHours:....PracticalHours:.....

.....

Course Objectives

The subject aims to build the concepts regarding:

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

Course Outcomes

1. After studied unit-1, the student will be able to understand the Major components of Computer System and its working principles.
2. After studied unit-2, the student will be able to know the Role of an Operating System and basic terminologies of networks.
3. After studied unit-3, the student will be able to know How the Information Technology aids for the Current Scenario.
4. After studied unit-4, the student will be able to understand the Computer Software
5. After studied unit-5, the student will be able to understand internet applications

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTION

TeachingHours:6Hrs.

CharacteristicsofComputers-TechnologicalEvolutionofComputers-TheComputerGenerations- Categories of Computer.**Data and Information:**Introduction-Typesof 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-2:DATA STORAGE

TeachingHours:5Hrs.

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-3:COMPUTER NETWORKS

TeachingHours:5Hrs.

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-4:COMPUTER SOFTWARE

TeachingHours:5Hrs.

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-5:SOME INTERNET APPLICATIONS

TeachingHours:5Hrs.

Introduction-E-mail-Information Browsing Service-The World Wide Web-Information Retrieval from the World Wide Web-Other Facilities Provided by Browsers -Audio on the Internet. **Societal Impacts of Information Technology:**Careers in Information Technology.

Internal Assessment Methods:(The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development–exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.

- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

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 Educations 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 TECH World, New Delhi.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	M	S
CO2	S	S	S	M	S	S	M	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience) –2022-

2023onwardsSemester:IV Paper type:CoreTheory-Paper 4

Papercode: Name of the Paper : RelationalDatabase ManagementSystems Credit:

3TotalHoursperWeek:3Hrs.LectureHours: 39Hrs.TutorialHours:.....PracticalHours:.....

Course Objectives

1. The students are able to understand database concepts and database management systemsoftware and have a high-level understanding of major DBMS components and theirfunction.
2. ThestudentsareabletounderstandtheERmodelandrelationalmodel.
3. The students are able to be able to write SQL commands to create tables and indexes,insert/update/delete data,andquerydata inarelationalDBMS.
4. ThestudentsareabletoUnderstandFunctionalDependencyandFunctionalDecomposition.
5. The students are able to understand the architecture of databasemanagementsystemand also understand the various different architecture such as server system architecture,parallelsystemsanddistributeddatabase systems.

Course Outcomes

1. Describe the database architecture and its applications Sketch the ER diagram for realworldapplicationsUsesvariousERdiagramforasimilarconceptsfromvariousources.
2. Discuss about the relational algebra and calculus Construct various queries in SQL andPL/SQLCompilesvariousqueriesinSQL,RelationalCalculusandAlgebra.
3. Describe the various normalization forms Apply the normalization concepts for a tableofdata Practicesatable andimplementthe normalizationconcepts.
4. Explainthe storageandaccessingofdata.
5. Illustrate the query processing in database management. Define the concurrency controlanddeadlockconcept

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: DATABASE ARCHITECTURE AND ER DIAGRAM**Teaching Hours: 8Hrs.**

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; superclasses, inheritance, specialization and generalization

Unit-2: RELATIONAL DATA MODEL**Teaching Hours: 8Hrs.**

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 Queries Modification Of Database- Joined Relations- DDL- Embedded SQL- Dynamic SQL- Other SQL Functions-- Integrity and Security.

Unit-3: DATA NORMALIZATION**Teaching Hours: 8Hrs.**

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-4: STORAGE AND FILE ORGANIZATION**Teaching Hours: 7Hrs.**

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

Unit-5: QUERY PROCESSING AND TRANSACTION MANAGEMENT**Teaching Hours: 8Hrs.**

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development- exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.

- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

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

Reference Books:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	S	S	S
CO2	S	S	M	M	M	S	S	S	S	S
CO3	S	S	S	S	M	M	S	S	M	S
CO4	S	M	M	M	S	M	S	S	S	S
CO5	S	S	M	M	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience) –2022-

2023onwardsSemester:IV Paper type:Core Practical-4

Papercode: Name of the Paper :RDBMSLab Credit:3

TotalHoursperWeek: 3Hrs. LectureHours:..... TutorialHours:..... PracticalHours:39 Hrs.

Course Objectives

1. To understand the concepts of DDL/DML/DCL/TCL commands.
2. To understand the concepts of Join queries.
3. To understand the concepts of exception handling.
4. To understand the concepts of cursors.
5. To understand the concepts of packages.

Course Outcomes

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

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL 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. Develop a PL/SQL procedure for an application using exception handling.
10. Develop a PL/SQL procedure for an application using cursors.
11. Develop a PL/SQL procedure for an application using functions
12. Develop a PL/SQL procedure for an application using package

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Book:

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

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	S	S	S
CO2	S	S	M	S	M	S	S	S	S	S
CO3	S	M	M	M	M	S	M	S	S	S
CO4	S	M	S	M	S	S	S	S	S	S
CO5	S	M	M	M	M	S	M	M	M	M

PO–ProgrammeOutcome,CO – Courseoutcome

S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:IV

Papertype:AlliedII–Paper4

Papercode:

Name of the Paper :Physics- II

Credit:3

TotalHoursperWeek:4Hrs.LectureHours:52Hrs.TutorialHours:.....PracticalHours:.....

.....
CourseObjectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:SpecialTheory ofRelativity**TeachingHours:11Hrs.**

Frames of reference-inertial frames and non-inertial frames -Galilean transformations -Michelson-Morley experiment-interpretation of results-postulates of special theory of relativity Lorentztransformation equations -length contraction - time dilation - transformation of velocities - variationofmass withvelocity-Mass-energyequation.

Unit-2:AtomicPhysics**TeachingHours:11Hrs.**

Bohr atom model – Critical Potentials - Experimental determination of critical potentials - Franckand Hertz’s experiment -Sommerfield’s Relativistic atom model The vector atom model – spatialquantization–spinning of an electron –quantum numbers associated with the vector atom model –couplingschemes–LSandjj coupling–the Pauli's exclusion principle–Stern andGerlachexperiment

Unit-3:NuclearPhysics**TeachingHours: 10Hrs.**

Bindingenergy-Bindingenergypernucleon-Packingfraction-Nuclearmodels–liquiddropmodel – semi empirical mass formula – merits and demerits -shell model -evidences for shell model – nuclear radiation detectors –ionization chamber – G.M Counter-Wilson cloud chamber- Particleaccelerators-Cyclotron-Betatron.

Unit-4:DigitalElectronics**TeachingHours:10Hrs.**

Number systems -Decimal, Binary, Octal and Hexadecimal system – Conversion from one numbersystem to another- Binary Arithmetic -Addition –Subtraction- 1’s and 2’s complement - Binarycodes- BCD code – Excess 3 code, Gray code. NAND, NOR and EXOR – functions and truthtables. NAND & NOR as universal gates-Half adder and Full adder - Half subtractor and FullsubtractorusingNANDgateonly.

Unit-5:Nanomaterial**TeachingHours:10Hrs.**

Introduction-Nanomaterial- Properties of nanomaterial (size dependent) -synthesis of nanomaterial-solgel-hydrothermalmethod-ScanningElectronMicroscope(SEM)-PrincipleandInstrumentation- Fullerenes- Carbon nanotubes- Fabrication and structure of carbon nanotubes - Propertiesofcarbonnanotubes(MechanicalandElectrical)-ApplicationsofCNT’s.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentfr amework)

- Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- Datacollectionandpaperwritingpractices:bookslevel,fieldstudylevel.Usingthecoursestudymaterialandsocietyandnaturedevelopment–exercise
- Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,trainingcanbegivenbytheteacher

- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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 Books:

1. Allied Physics – R. Murugesan S. Chand & Co. New Delhi, 2005.
2. A Textbook 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, *Materials science*, S. Chand & Company, New Delhi, 2014.
5. M. Arumugam, *Materials 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
2. 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
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

8. <https://www.youtube.com/watch?v=4ae9sJBBkvw>
9. <https://en.wikipedia.org/wiki/Nanomaterials>
10. <https://www.youtube.com/watch?v=mPx0Jz6treE>(Tamilvideo)

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	M	S	S	S	S
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	M	M	S	M	M	S	S	S	S
CO4	S	M	S	M	M	S	M	S	S	S
CO5	S	M	M	M	M	M	S	S	S	S

PO–ProgrammeOutcome,CO – Courseoutcome
 S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)–2022-2023onwards

Semester:IV **Papertype:AlliedII –Practical**

Papercode: **Name of the Paper : Physics** **Credit: 2**

TotalHoursperWeek: 3Hrs. LectureHours:.....TutorialHours:.....PracticalHours:39Hrs.

.....
CourseObjectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES (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 μ 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 optical fiber.
21. Fiber attenuation of a given optical fiber.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment for a network)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development-exercise
- c. Workshops, preparing technical term dictionaries from textbooks and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.

- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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, Apsara Publications, Tiruchirapalli, 2012.
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	S	S	S	S
CO2	S	S	M	M	M	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	S	M	M	M	M	M	S	S	S	S
CO5	S	M	M	S	M	S	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALUVARUNIVERSITY,VELLORE– 632115
(BachelorofComputerScience)–2022-2023onwards

Semester:IV Papertype:AlliedII–Paper4

Papercode:Name of the Paper :StatisticalMethodsandtheirApplications-II

Credit:3Total

HoursperWeek: 4Hrs.LectureHours:52Hrs.TutorialHours:.....PracticalHours:.....

.....
Course Objectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:

TeachingHours: 10Hrs.

Curvefittingbythethodsofleastsquares-

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

Unit-2:**TeachingHours:11Hrs.**

SampleSpace-events-probability-AdditionandMultiplicationTheorem-conditionalprobability - Baye's Theorem. Mathematical expectation Addition and Multiplication theorem,Chebychev's Inequality.

Unit-3:**TeachingHours: 10Hrs.**

Standarddistributions-Binomial, Poisson, Normaldistributionandfittingofthesedistributions.

Unit-4:**TeachingHours: 10Hrs.**

TestofSignificance-smallsampleandlargesampletestbasedonmean,S.D.correlationandproportion-confidenceinterval.

Unit-5:**TeachingHours: 11Hrs.**

Analysisofvariance-OneandTwowayclassifications-BasicprincipleofdesignofExperiments-Randomisation,Replicationand Localcontrol-C.R.D.,R.B.D.and L.S.D.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentfor amework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:bookslevel,fieldstudy level.Usingthecoursestudyforsocietyandnaturedevelopment-exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,trainingcanbegivenby theteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepacticesandreportcanbewrittenfordocumentation, further discussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselfdiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process withintheframeworkofquestionsettingpatternandinternalassessmentpattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adoptedby the departments of the colleges for practicing their theoretical study. Innovative methodsmay be implemented in the practices and report can be written for documentation, furtherdiscussionandresearch.
- l. Extracurricularactivitiesmaybeframedthroughtheirsyllabuscontent.
- m. Bringtheindustriestothecampus. Bringthestudentstotheindustry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of researchreportslike assignment,seminarpapers,casestudyreports,etc.

ReferenceBook:

1. FundamentalofMathematicalStatistics-S.C.Gupta&V.K.Kapoor-SultanChand
2. FundamentalofApplied Statistics-S.C.Gupta&V.K.Kapoor–SultanChand
3. StatisticalMethods-SnedecorG.W.&Cochran W.G.oxford &+DII
4. ElementsofStatistics -Mode.E.B.–Prentice Hall

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	S	S	S
CO2	S	S	S	M	M	M	S	S	S	S
CO3	S	M	M	S	M	S	S	S	S	S
CO4	S	M	S	M	M	M	S	S	S	S
CO5	S	M	M	M	M	S	M	S	S	S

PO–ProgrammeOutcome,CO – Courseoutcome

S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE-632 115
(BachelorofComputerScience)-2022-2023onwards

Semester:IV **Papertype:AlliedII-Practical**

Papercode: **Name of the Paper : StatisticalMethodsandtheirapplications** **Credit:**

2TotalHoursperWeek:3Hrs. LectureHours:.....TutorialHours:...PracticalHours:39Hrs.

.....
CourseObjectives

- 1.
- 2.
- 3.
- 4.
- 5.

Course Outcomes

- 1.
- 2.
- 3.
- 4.
- 5.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

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. Tests 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

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development - exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Books:

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

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	S	S	S	S	S
CO2	S	M	M	M	M	M	M	M	M	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	S	M	M	M	M	S	S	S	S	S
CO5	S	M	M	S	M	M	M	S	S	S

PO–ProgrammeOutcome,CO –Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

**THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(Bachelor of Computer Science)–2022-2023onwards**

Semester : IV Papertype:NonMajorElective – Paper2

Papercode: Name of the Paper :InternetTechnology

Credit: 2

TotalHours perWeek:2 Hrs. LectureHours: 26Hrs.TutorialHours:...PracticalHours:.....

.....

Course Objectives

1. Aims to build the concepts regarding Fundamentals of Internet, Connectivityandits ResourceRequirements.
2. TounderstandtheInternetTechnologyanditsapplications
3. ToUnderstandWWWandWebBrowsers.
4. ToUnderstandMailingsystemand applicationsofInternet.
5. ToUnderstandrelaychat

Course Outcomes

1. After studied unit-1, the student will be able to understand the Fundamentals of Internet,Connectivityandits Resource Requirements.
2. Afterstudiedunit-2,thestudentwillbeabletounderstandtheInternetTechnologyanditsapplications
3. Afterstudiedunit-3,thestudentwillbeabletounderstandthebasisofWWWandWebBrowsers.
4. After studied unit-4, the student will be able to learn how to Mailing system and applications ofInternet.
5. After studied unit-5, the student will be able to Understand relay chat that is how to read e-contents.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTION TO INTERNET:**TeachingHours: 5Hrs.**

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-2:INTERNET TECHNOLOGY AND PROTOCOL:**TeachingHours: 5Hrs.**

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-3:WWW AND WEB BROWSER:**TeachingHours: 5Hrs.**

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

Unit-4: EMAIL:**TeachingHours: 5Hrs.**

E-Mail Basics- E-Mail System-E-Mail Protocol-E-Mail Addresses-Structure of an E-Mail Message-E-Mail Clients & Servers-Mailing List-E-Mail Security.

Unit-5: USERNET AND INTERNET RELAY CHAT:**TeachingHours: 6Hrs.**

What is Usenet?-Newsgroup Hierarchies-What is a Newsreader?- How do you Read Newsgroups?- Who Administers Usenet?- Common Newsreading Tasks- How to Read Articles from Network News?- Relationship between Netnews and E-Mail-What is IRC?-Channels-Nicknames-Microsoft Net Meeting. **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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development-exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

1. ISRD Group. 2012. **Internet Technology and Web Design**. [Fourth reprint]. TataMcGraw-Hill Education Private Limited., New Delhi.

Reference Books:

1. Deitel, H.M. Dietel, 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.
2. Ramachandran, T.M. Nambissan. 2003. **An Overview of internet and web development**. [First Edition]. TM-Dhruv Publications.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	M	M	M	S	S	S	S	S
CO3	S	M	M	S	S	M	S	S	S	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	M	M	M	S	M	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)–2022-2023 onwards

Semester: V **Paper type: Core Theory –Paper 5**

Paper code: **Name of the Paper : Mobile Application Development** **Credit:**

4 Total Hours per Week: 6 Hrs. Lecture Hours: 7 Hrs. Tutorial Hours: Practical Hours:

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Course Objectives

1. To understand the basics of smartphones and android platforms.
2. To understand the basic concepts of user interface related to app development.
3. To understand the importance of data persistence in mobile environment.
4. To understand the various services and network facilities provided by android platform.
5. To understand the various apps deployed and developed on by mobile platform.

Course Outcomes

1. After studied unit-1, the student will be able to understand android basics.
2. After studied unit-2, the student will be able to gain knowledge of GUI for android.
3. After studied unit-3, the student will be able to understand SQLite database.
4. After studied unit-4, the student will be able to understand android services
5. After studied unit-5, the student will be able to develop simple mobile application using android

Matching Table

Unit	i.Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTOANDROIDPLATFORM**TeachingHours: 15Hrs.**

Introduction to Mobile Application Development – Various platforms – Smart phones – Androidplatform: features – Architecture – Versions – ART (Android Runtime) – ADB (Android DebugBridge) – Development environment/IDE: Android studio and its working environment – Emulatorsetup–Applicationframeworkbasics–XMLrepresentationandAndroidmanifestfile– Creatinga simpleapplication.

Unit-2:ANDROID UIDESIGN**TeachingHours:16Hrs.**

GUI for Android: activities lifecycle – Android v7 support library – Intent: Intent object – Intentfilters–Addingcategories–Linkingactivities–UserInterfacedesigncomponents –BasicViews – Picker Views – List View – Specialized Fragment – Gallery and Image View – Image Switcher – Grid View,OptionsMenu– ContextMenu – ClockView –Webview– RecyclerView

Unit-3:DATAPERSISTENCE**TeachingHours: 15Hrs.**

Different Data Persistence schemes: Shared preferences – File Handling – Managing data usingSQLitedatabase–Contentproviders:usercontentprovider–Androidinbuildcontentproviders.

Unit-4:ANDROIDSERVICES& NETWORKENVIRONMENT**TeachingHours:16Hrs.**

Services:Introduction toservices–Local service–Remote service–Binding the service– Communication between service and activity – IntentService – Multi–Threading: Handlers – AsyncTask– Android network programming: HttpURLConnection– Connecting to REST–based – SOAP based Web services – Broad cast receivers: LocalBroadcastManager– Dynamic broadcastreceiver– SystemBroadcast–TelephonyManager:Sending SMSandmaking calls.

Unit-5:ADVANCEDAPPLICATIONS**TeachingHours: 16Hrs.**

Location based services: Google maps V2 services using Google API – Animations and Graphics:PropertyAnimation–ViewAnimations–DrawableAnimations– MediaandCameraAPI:Working with video and audio inputs – camera API – Sensor programming: Motion sensors –Position sensors – Environmental sensors – Publishing Android Apps: Guide lines – policies andprocessofuploadingApps toGoogleplay.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	S	S	S
CO2	S	S	S	M	M	M	M	S	S	S
CO3	S	M	M	S	M	S	M	S	S	S
CO4	M	S	M	M	S	S	M	S	S	S
CO5	S	M	M	M	S	M	S	S	S	S

PO–Programme Outcome, CO –Course outcome
 S –Strong ,M–Medium,L– Low(may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: V **Paper type: Core Theory– Paper 6**

Paper code: **Name of the Paper : Operating System** **Credit: 4**

Total Hours per Week: 6 Hrs. Lecture Hours: 78 Hrs. Tutorial Hours: Practical Hours:

.....

Course Objectives

1. To understand the structure and functions of operating systems.
2. To understand the principles of scheduler, scheduler algorithms and Deadlock.
3. To learn various memory management schemes.
4. To study I/O management, File system and Mass Storage Structure.
5. To learn the basics of UNIX, LINUX systems and perform administrative tasks on LINUX servers.

Course Outcomes

1. After studied unit-1, the student will be able to learn operating system structure and services.
2. After studied unit-2, the student will be able to enrich the process scheduling skills.
3. After studied unit-3, the student will be able to know about memory allocation.
4. After studied unit-4, the student will be able to understand disk structure and allocation methods.
5. After studied unit-5, the student will be able to understand LINUX system.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: OPERATING SYSTEM BASICS**Teaching Hours: 16Hrs.**

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 – Operation on Process – Interprocess Communication – Communication in Client/Server Systems – Threads.

Unit-2: CPU SCHEDULING ALGORITHM AND PREVENTION**Teaching Hours: 16Hrs.**

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-3: STORAGE MANAGEMENT**Teaching Hours: 15Hrs.**

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-4: I/O SYSTEMS**Teaching Hours: 16Hrs.**

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-5: CASE STUDIES**Teaching Hours: 15Hrs.**

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from textbooks and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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.

Reference Books:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	M	M	M	S
CO2	S	M	M	M	S	M	M	S	M	S
CO3	S	M	M	S	M	S	S	S	S	S
CO4	S	M	M	S	M	S	M	M	S	S
CO5	S	S	M	M	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester:III **Paper type:Core Theory – Paper7**

Paper code: **Name of the Paper :Design and Analysis of Algorithm** **Credit:**

3 Total Hours per Week:4 Hrs. Lecture Hours:52 Hrs.Tutorial Hours:....Practical Hours:.....

.....

Course Objectives

1. To understand various algorithm design techniques
2. This technique is the basis of efficient algorithms for all kinds of problems.
3. This is a simple approach which tries to find the best solution at every step.
4. Providing a general insight into the dynamic programming approach.
5. Algorithm design paradigm for discrete and combinatorial optimization problems.

Course Outcomes

1. After studied unit-1, the student will be able to gain experience with space and time complexity
2. After studied unit-2, the student will be able to understand the concepts of divide and conquer
3. After studied unit-3, the student will be able to understand the concepts of greedy method
4. After studied unit-4, the student will be able to understand the concepts of multi-stage graph
5. After studied unit-5, the student will be able to understand the concepts of backtracking

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:ALGORITHMANDANALYSIS**TeachingHours:10Hrs.**

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-2:DIVIDEAND CONQUER**TeachingHours:10Hrs.**

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-3:THEGREEDY METHOD**TeachingHours:11Hrs.**

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-4:DYNAMICPROGRAMMING, TRAVERSAL& SEARCHING**TeachingHours:11Hrs.**

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-5:BACKTRACKING&BRANCHANDBOUND**TeachingHours:10Hrs.**

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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.

- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

1. “Introduction to the Design and Analysis of Algorithms”, Anany Levitin, 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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	M	M	S	M	M	S	M	S	S
CO4	S	S	M	S	M	M	M	S	S	S
CO5	S	S	M	M	M	S	M	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: V Papertype: Core Practical–5

Papercode: Name of the Paper : Mobile Applications Development Lab Credit:

3 Total Hours per Week: 4 Hrs. Lecture Hours: Tutorial Hours: Practical Hours: 52 Hrs.

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Course Objectives

1. To understand how to change fonts.
2. To understand how to change colors.
3. To know about layout managers.
4. To understand drawing methods.
5. To understand database connectivity.

Course Outcomes

1. After studied unit-1, the student will be able to build application to change fonts and colors.
2. After studied unit-2, the student will be able to implement multi-threading.
3. After studied unit-3, the student will be able to develop GUI application with drawing methods.
4. After studied unit-4, the student will be able to build application to create alarm clock.
5. After studied unit-5, the student will be able to implement layout managers.

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

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 creates an 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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development–exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.

- m. Bring the industry to the campus. Bring the student to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	M	S	S	S	S
CO2	S	M	S	S	M	M	M	M	S	S
CO3	S	M	M	S	S	M	M	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	M	S	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVAR UNIVERSITY, VELLORE-632 115
(Bachelor of Computer Science)- 2022-2023 onwards

Semester: V Papertype: Core Practical-6

Papercode: Name of the Paper : Operating System Lab Credit: 3

Total Hours per Week: 4 Hrs. Lecture Hours: Tutorial Hours: Practical Hours: 52 Hrs.

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Course Objectives

1. To know about UNIX commands.
2. To understand the concept of shell programming.
3. To learn how to use vi editor.
4. To understand the concepts of semaphores.
5. To understand the concepts of synchronization.

Course Outcomes (five outcomes for each unit should be mentioned)

1. After studying unit-1, the student will be able to understand UNIX commands.
2. After studying unit-2, the student will be able to write a program using shell commands.
3. After studying unit-3, the student will be able to build an application for semaphores.
4. After studying unit-4, the student will be able to implement synchronization applications.
5. After studying unit-5, the student will be able to develop a program for file allocation strategies.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

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 Banker's Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement 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 Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- o. Book review and research paper review, syllabus and curriculum review.
- p. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- q. Workshops, preparing technical term dictionaries from text books and reference books.
- r. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- s. Forming digital library: collecting text and reference books, course material.
- t. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- u. Extracurricular and cultural activities may be framed through the syllabus content.
- v. Grouping students for self-discussion, self-learning process.
- w. Following institution and intellectual and writing reports in the course field.
- x. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.

- y. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- z. Extracurricular activities may be framed through their syllabus content.
 - aa. Bring the industries to the campus. Bring the students to the industry.
 - bb. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	M	M	S	S	S
CO2	S	S	M	S	M	S	S	S	S	S
CO3	S	S	M	M	M	M	M	S	S	M
CO4	S	S	M	M	M	S	M	S	S	M
CO5	S	S	M	M	M	M	S	S	S	M

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)–2022-2023onwards

Semester:V **Papertype:Internal Elective – Paper1**

Papercode: **Name of the Paper :DataMining** **Credit:3**

TotalHours perWeek:3 Hrs.LectureHours:39 Hrs.TutorialHours:.....PracticalHours:.....

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Course Objectives

1. Tounderstand aboutthebasicsofDataMining andData
2. TounderstandaboutthethodsofDataWarehousing
3. Tounderstand aboutthetechniquesofDataMining
4. TounderstandabouttheimportanceofClusterandoutlierdetection
5. Toimprovethestudent’sknowledgewithrecenttrendsandtools

Course Outcomes

1. Afterstudiedunit-1,thestudentwillbeabletoUnderstandthefunctionalityofvariousdataminingcomponents.
2. Afterstudiedunit-2,thestudentwillbeabletoDescribethedifferentmethodologiesusedindata
3. After studiedunit-3,thestudentwillbeabletoCharacterizethekindsofpatterns
4. Afterstudiedunit-4,thestudentwillbeabletoenrichtheconceptofclustering
5. Afterstudiedunit-5,thestudentwillbeabletoDiscussandcomparevariousapproacheswithothertechniquesindataminin g.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:DATA MININGBASICS**TeachingHours:8Hrs.**

What is Data Mining– Kinds of Data – Kinds of patterns – Technologies used for Data Mining– MajorIssuesinData Mining–Data–DataObjectsandAttribute types–DataVisualization–Measuring Data Similarity and Dissimilarity–Data Preprocessing– overview– Data Cleaning– DataIntegration–Data Reduction–Data TransformationandDataDiscretization.

Unit-2:DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING**TeachingHours:8Hrs.**

Data Warehouse–Basicconcepts–Data Warehouse Modeling:Data CubeandOLAP– Data Warehouse DesignandUsage–Data Warehouse Implementation–Data GeneralizationbyAttribute– OrientedInduction–Data Cube Technology–Data Cube Computation Methods–Exploring Cube Technology–Multidimensional Data Analysisincube space.

Unit-3:PATTERNS AND CLASSIFICATION**TeachingHours:8Hrs.**

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

Unit-4:CLUSTERING AND OUTLIER DETECTION**TeachingHours:8Hrs.**

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– OutliersandOutliers Analysis–Outlier Detection Methods–Outlier Approaches–Statistical–Proximity– Based–Clustering–Based–Classification Based–High–Dimensional Data.

Unit-5:RECENT TRENDS IN DATA MINING AND TOOLS**TeachingHours:7Hrs.**

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

1. “Data Warehousing Fundamentals”, Paulraj Ponnaiah, Wiley Publishers, 2001.
2. “Data Mining: Concepts and Techniques”, Jiawei Han, Micheline Kamber, Morgan Kaufman Publishers, 2006.
3. “Introduction to Data Mining with case studies”, G.K. Gupta, PHI Private Limited, New Delhi, 2008. 2nd Edition, PHI, 2011

Reference Books:

1. “Advances in Knowledge Discovery and Data Mining”, Usama M. Fayyad, Gregory Piatetsky Shapiro, Padhraic Smyth, Ramasamy Uthrusamy, 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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	M	S	S	S
CO2	S	M	M	S	M	S	S	M	S	S
CO3	S	M	S	S	S	M	S	S	S	S
CO4	S	S	S	S	M	M	S	S	M	S
CO5	S	M	M	S	M	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (maybe avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: V **Paper type: Internal Elective –Paper 1**

Paper code: **Name of the Paper : Information Security** **Credit: 3**

Total Hours per Week: 3 Hrs. Lecture Hours: 39 Hrs. Tutorial Hours: Practical Hours:

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Course Objectives

1. To understand the basic concepts of Information Security
2. To understand the legal, ethical and professional issues in Information Security
3. To know about risk management
4. To understand the technological aspects of Information Security
5. To understand the concepts of Cryptography and Hacking methods

Course Outcomes

1. After studied unit-1, the student will be able to define and relate the concepts and terms of security
2. After studied unit-2, the student will be able to classify and outline existing attacks and security measures
3. After studied unit-3, the student will be able to understand risk management
4. After studied unit-4, the student will be able to build security models
5. After studied unit-5, the student will be able to criticize and propose solutions for protecting the system from hacking

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INFORMATIONSECURITYBASICS**TeachingHours:7Hrs.**

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

Unit-2:SECURITYINVESTIGATION**TeachingHours:8Hrs.**

Objective: Security– Business Needs– Threats– Attacks– Legal– Ethical and Professional Issues–
Relevant U.S. Laws – International Laws and Legal Bodies – Ethics and Information Security –
CodesofEthics andProfessionalOrganizations

Unit-3:SECURITYANALYSIS**TeachingHours:8Hrs.**

Risk Management – Introduction – An Overview of Risk Management – Risk Identification –
RiskAssessment – Risk Control Strategies – Selecting a Risk Control Strategy – Quantitative
versusQualitative RiskControlPractices–RiskManagementDiscussionPoints

Unit-4:SECURITY MODELS**TeachingHours: 8Hrs.**

LOGICALDESIGN–BlueprintforSecurity–InformationSecurityPolicy–StandardsandPractices–
ISO 17799/BS 7799– NIST Models– VISA International Security Model– Design ofSecurity
Architecture– Planning for Continuity – Security Physical Design –Firewalls –
SecurityTechnology– IDS–IPS–Honey Pots– Honey Nets–Padded cell Systems Scanning and
AnalysisTools–AccessControlDevices.

Unit-5:CRYPTOGRAPHY ANDETHICALHACKING**TeachingHours:8Hrs.**

Ciphermethods–CryptographicAlgorithmsandTools–AttacksonCryptosystems–Hacking–
EffectsofHacking–Hacker–TypesofHacker–EthicalHacker–Hacktivism–
Networking&ComputerAttacks–MaliciousSoftware(Malware)–ProtectionAgainstMalware–
IntruderAttacks on Networks and Computers – Wireless Hacking– Windows Hacking– Linux
HackingSession.

InternalAssessmentMethods:(Thefollowing
itemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books
level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can
begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

1. “Principles of Information Security”, Michael E. Whitman and Herbert J. Mattord, 5th Edition, Vikas Publishing House, New Delhi, 2003.
2. “Fundamentals of Information Systems Security”, David Kim, Michael G. Solomon, 3rd Edition, Jones & Bartlett Learning, October 2016.
3. “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Patrick Enebreton, 2nd 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.

Reference Books:

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, 2nd Edition, Pearson/PHI, 2002.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	S	M	M	M	S	S	S	S	S
CO3	S	M	M	S	M	M	M	S	S	S
CO4	S	M	S	M	S	M	M	S	S	S
CO5	S	M	M	M	M	M	S	S	S	S

PO–ProgrammeOutcome,CO –Courseoutcome

S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)–2022-2023 onwards

Semester: V

Paper type: Internal Elective –Paper 1

Paper code:

Name of the Paper : Software Testing

Credit:

3 Total Hours per Week: 3 Hrs. Lecture Hours: 39 Hrs. Tutorial Hours: Practical Hours:

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Course Objectives

1. To understand the concept of software testing, and software quality
2. To learn to inspect and detect errors by going through each and every code segment
3. To gain knowledge of various functional and structural testing techniques
4. To understand basic concept of Software Management tools and object oriented testing
5. To understand basic concept of Software quality and software quality assurance

Course Outcomes

1. After studied unit-1, the student will be able to understand the knowledge and comparison of various testing strategies.
2. After studied unit-2, the student will be able to analyze various testing methods
3. After studied unit-3, the student will be able to Apply the software testing techniques in commercial environments
4. After studied unit-4, the student will be able to Build the role of management in a software development..
5. After studied unit-5, the student will be able to attain the attributes and assessment of quality, reliability.

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTOSOFTWARETESTING**TeachingHours:7Hrs.**

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

Unit-2:SOFTWAREDEVELOPMENTMODELANDTESTING**TeachingHours:8Hrs.**

Water fall model– V–model– Spiral model– Agile model – Life cycle of testing– Static Testing – dynamic testing–Whiteboxtesting–Blockboxtesting–Regressiontesting–IntegrationTesting – SystemandPerformanceTesting–UsabilityTesting

Unit-3:FUNCTIONALANDSTRUCTURALTESTING**TeachingHours:8Hrs.**

Boundary Value Analysis – Equivalence Class Testing – Decision Table – Based Testing – CauseEffect Graphing Technique – Path testing –Cyclomatic Complexity –Graph Metrics – Data FlowTesting–Slicebasedtesting

Unit-4:TESTMANAGEMENTANDTOOLS**TeachingHours:8Hrs.**

Test planning – cost–benefit analysis of testing – monitoring and control–Test reporting – Testcontrol – Specialized testing – Object Oriented Testing – Automated Tools for Testing – ToolSelectionandImplementation–Challengesintestautomation –GUITesting

Unit-5:SOFTWAREQUALITYANDSOFTWAREQUALITYASSURANCE**TeachingHours: 8Hrs.**

Introductiontosoftwarequalityandsoftwarequalityassurance–basicprinciplesaboutthesoftware quality and software quality assurance – Planning for SQA – various models for softwareproductqualityandprocess quality–SCM–RAD–SystemDocumentation

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparingquestionpaperbythecandidates:objectivetype,descriptivetype,training canbegivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepracticesandreportcanbewrittenfordocumentation, further discussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.

- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

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”– Srinivasan Desikan and Gopalaswamy Ramesh, Pearson Education, 2006.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	M	M	M	S	S	S	M	M	S
CO5	S	S	M	M	M	S	S	S	S	S

PO–Programme Outcome, CO –Course outcome
 S –Strong ,M–Medium, L– Low(may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: V

Paper type: Skill Based Subject – Paper 3

Paper code:

Name of the Paper : Software Engineering

Credit:

2 Total Hours per Week: 3 Hrs. Lecture Hours: 39 Hrs. Tutorial Hours: Practical Hours:

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Course Objectives

1. Introduce the concepts and methods required for the construction of large software intensive systems.
2. Get the idea of choosing the Requirements in Software Engineering.
3. Give an understanding the concept of Data Engineering.
4. To impart knowledge on Testing and Debugging.
5. To enable the student to learn the basic of Project Management & Scheduling.

Course Outcomes

1. After studied unit-1, the student will be able to recall the various techniques of software process models
2. After studied unit-2, the student will be able to understand the requirements for a software project
3. After studied unit-3, the student will be able to create architectural design
4. After studied unit-4, the student will be able to understand testing strategies
5. After studied unit-5, the student will be able to understand software project management

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTOEVOLVINGSOFTWARE**TeachingHours:8Hrs.**

EvolvingRoleof Software–Nature of Software–SoftwareEngineering–TheSoftwareProcess–SoftwareEngineeringPractices–SoftwareMyths–AGenericViewofProcessModel
– Process Assessmentand Improvement– Process Models : Waterfall Model – IncrementalProcessModels–EvolutionaryProcessModels–ConcurrentModels.

Unit-2:REQUIREMENTSENGINEERING**TeachingHours:8Hrs.**

RequirementsEngineering:EstablishingtheGroundwork–InitiatingtheRequirementsEngineering Process – Eliciting Requirements – Collaborative Requirements Gathering – QualityFunction Deployment – Usage Scenarios – Elicitation work Products – Building the RequirementsModel – Elements of Requirements Model – Analysis Pattern – Requirements Analysis – DataModelingConcepts.

Unit-3:DATAENGINEERING**TeachingHours:7Hrs.**

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 MappingUsingData Flow–PerformingUserInterfaceDesign–GoldenRules.

Unit-4:TESTINGSTRATEGIES**Teaching Hours: 8**

Hrs.TestingStrategies:StrategicApproachtoSoftwareTesting–StrategicIssues–TestStrategiesforConventionalandObjectOrientedSoftware–ValidationTesting–SystemTesting–ArtofDebugging.Software Testing Fundamentals– White Box Testing– Basis Path Testing– ControlStructureTesting–BlackBoxTesting–ModelBasedTesting.

Unit-5:PROJECT MANAGEMENT**TeachingHours:8Hrs.**

Project Management: Management Spectrum – People – Product – Process – Project – CriticalPractices –Estimation: Project Planning Process – Software Scope and Feasibility – Resources –SoftwareProjectEstimation–ProjectScheduling–QualityConcepts–SoftwareQualityAssurance–ElementsofSoftware QualityAssurance–FormalTechnicalReviews.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

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, 3rd Edition.

Reference Book:

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", Pfleger and Lawrence, Pearson Education, 2001, Second Edition.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	M	S	S	M	S
CO2	S	S	S	M	M	S	M	S	S	S
CO3	S	M	M	S	M	M	M	S	S	S
CO4	S	S	M	M	S	S	S	M	M	M
CO5	S	M	M	S	M	M	M	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: VI **Paper type: Core Theory – Paper 8**

Paper code: **Name of the Paper : Open Source Software**

Credit: 4 Total Hours per Week: 4 Hrs. Lecture Hours: 52

Hrs. Tutorial Hours: Practical Hours:

.....
Course Objectives

1. To understand the concept of HTML, HTML5 and CSS.
2. To learn to inspect and detect errors by going through each and every code segment.
3. To understand basic concept of JavaScript and MySQL.
4. To understand basic concept of PHP
5. To understand basic concept of PERL

Course Outcomes

1. After studied unit-1, the student will be able to build static web pages using HTML and CSS.
2. After studied unit-2, the student will be able to understand Linux Filesystem.
3. After studied unit-3, the student will be able to build validation coding using Javascript.
4. After studied unit-4, the student will be able to build dynamic pages using PHP.
5. After studied unit-5, the student will be able to understand PERL basics.

Matching Table (Put Yes/No in the appropriate box)

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: INTRODUCTION TO HTML, CSS

Teaching Hours: 11 Hrs.

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-2:LINUX

TeachingHours: 10Hrs.

Introduction:LinuxEssentialCommands–KernelModeandusermode–FilesystemConcept–StandardFiles–TheLinuxSecurity Model–ViEditor–PartitionsCreation–ShellIntroduction–StringProcessing–InvestigationandManagingProcesses–NetworkClients–InstallingApplication.

Unit-3:JAVA SCRIPT AND MYSQL

TeachingHours:10Hrs.

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

Unit-4:PHP

TeachingHours:11Hrs.

PHPIntroduction–General SyntacticCharacteristics–PHPScripting–Commentingyourcode–Primitives,OperationsandExpressions–PHPVariables–OperationsandExpressionsControlStatement–Array–Functions–BasicFormProcessing–FileandFolderAccess–Cooking–Sessions–DatabaseAccesswithPHO.

Unit-5:PERL

TeachingHours:10Hrs.

PERL : Perl backgrounder – Perl overview – Perl parsing rules – Variables and Data – StatementsandControlstructures–Subroutines,Packages,andModules–WorkingwithFiles–DataManipulation.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepracticesandreportcanbewrittenfordocumentation, further discussionandresearch.
- g. Extracurricularandculturalactivities maybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselldiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. BloomTaxonomymaybeintroducedforteaching,learningandevaluationprocesswithinthe frameworkofquestionsettingpatternandinternalassessmentpattern.
- k. Forapplicationorientedstudy:Villages,Institutions,variouspeoplegroupsmaybeadoptedbythe departmentsofthecollegesforpracticingtheirtheoreticalstudy.Innovative

methods may be implemented in the practices and report can be written for documentation, further discussion and research.

- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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”, Vikram Vaswani, 2nd Edition, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009
4. “PHP: The Complete Reference”, Steven Holzner, 2nd Edition, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009.
5. “Complete Reference HTML”, T.A. Powell, 3rd Edition, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2002.
6. “Mastering Javascript”–J. Jaworski, BPB Publications, 1999

Reference Books:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	S	S	S	S
CO2	S	S	M	S	S	M	S	S	S	S
CO3	S	M	M	S	S	M	S	M	S	S
CO4	S	S	M	S	M	M	S	M	S	S
CO5	S	M	M	S	M	M	S	S	S	S

PO–Programme Outcome, CO –Course outcome
 S –Strong ,M–Medium,L– Low(may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: VI **Paper type: Core Theory– Paper 9**

Paper code: **Name of the Paper : Python Programming** **Credit: 4**

Total Hours per Week: 4 Hrs. Lecture Hours: 52 Hrs. Tutorial Hours: Practical Hours:

.....

Course Objectives

1. To understand the tokens of Python.
2. To learn control statements in Python.
3. To know about built-in functions.
4. To learn about the concept of List.
5. To understand how to handle exception.

Course Outcomes

1. After studying unit-1, the student will be able to write simple Python programs giving basic knowledge.
2. After studying unit-2, the student will be able to understand control structures.
3. After studying unit-3, the student will be able to create functions.
4. After studying unit-4, the student will be able to arrange elements through sorting.
5. After studying unit-5, the student will be able to handle exception.

Matching Table

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: INTRODUCTION

Teaching Hours: 11 Hrs.

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 – TypeConversions – int function – float function – str() function – chr() function – complex() function –ord() function – hex() function – oct() function -type() function and Is operator – Dynamic andStronglytypedlanguage.

Unit-2: STATEMENTS EXCEPTION AND STRING OPERATIONS

|

TeachingHours: 10Hrs.

Control Flow Statements – If statement – If else statement – If elif else statement – nested ifstatement - while loop – for loop – continue and break statements – catching exceptions using tryand except statement – syntax errors – exceptions – exception handling – Strings – str() function-Basicstringoperations–Stringcomparison–Builtinfunctionsusingstrings– Accessingcharactersinstring–String slicing–Stringjoining– split()method– stringtraversing.

Unit-3:FUCTIONS

TeachingHours: 11Hrs.

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 –Traversingofsets–setmethods –frozenset.

Unit-4: LISTS

TeachingHours: 10Hrs.

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- RandomlyPermutingaList-ReversingaList.

Unit-5:OBJECTS

TeachingHours: 10Hrs.

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

InternalAssessmentMethods:(Thefollowingitemsmaybroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books
level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops,preparingtechnicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can
begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

1. Core Python Programming, 2nd Edition, Wesley J. Chun, Prentice Hall.
2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for working with Data", 1st edition, O'Reilly Media, 2016.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	S	S	S
CO2	S	M	M	M	M	M	S	M	M	S
CO3	S	M	S	S	S	S	S	M	S	S
CO4	S	M	M	S	M	S	M	M	M	S
CO5	S	S	S	S	M	M	M	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE-632 115
(Bachelor of Computer Science)-2022-2023 onwards

Semester: VI

Paper type: Core-Practical-7

Paper code:

Name of the Paper : Python Programming Lab

Credit:

3 Total Hours per Week: 4 Hrs. Lecture Hours: .. Tutorial Hours: Practical Hours: 52 Hrs.

.....
Course Objectives

1. To know about basic data types, operators in Python.
2. To understand Loops in Python.
3. To understand the concepts of Arrays.
4. To understand how to handle string.
5. To know about functions.

Course Outcomes (five outcomes for each unit should be mentioned)

1. After studied unit-1, the student will be able to write a program using operators.
2. After studied unit-2, the student will be able to develop a program using loops.
3. After studied unit-3, the student will be able to implement a program using Arrays.
4. After studied unit-4, the student will be able to implement the concept of String functions.
5. After studied unit-5, the student will be able to build an application with basic expressions.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

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

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	S	S
CO2	S	S	M	M	S	M	S	M	S	S
CO3	S	M	M	M	S	M	S	M	S	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	M	S	S	S	S	S	S	M	S

PO–ProgrammeOutcome,CO –Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)

THIRUVALLUVARUNIVERSITY,VELLORE-632 115
(BachelorofComputerScience)-2022-2023onwards

Semester:VI **Papertype:Core -Practical-8**

Papercode: **Name of the Paper : OpenSourceProgrammingLab** **Credit:**

2TotalHoursperWeek: 4Hrs. LectureHours:.....TutorialHours:..PracticalHours:52Hrs.

.....
CourseObjectives

1. TounderstandthebasicHTMLTags.
2. Tounderstand thetypesofCSS.
3. TolearnJavascriptfunctions.
4. ToknowaboutPHPformelements.
5. TolearnPHPwithMYSQLdatabaseconnectivity.

Course Outcomes

1. Afterstudiedunit-1,thestudentwillbeabletodesignstaticwebpages.
2. After studiedunit-2,thestudentwillbeabletolinkcommonstyletothewebpagesusingCSS.
3. Afterstudiedunit-3,thestudentwillbeabletovalidateformcontrolsusingjavascript.
4. Afterstudiedunit-4,thestudentwillbeabletodesigndynamicwebpagesusingPHP.
5. Afterstudiedunit-5,thestudentwillbeabletodevelopPHPprogramwithMYSQLdatabaseconnection.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

1. Create a web page with Frames and Tables.
2. Create a web page incorporating CSS (Cascading Style Sheets).
3. Develop a shell program to find the factorial of an integer positive number.
4. Develop a shell program to find the details of a user session.
5. Create a simple calculator in JavaScript.
6. Develop 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 Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.

- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	S	S	S	S
CO2	S	S	M	S	S	S	M	M	S	S
CO3	S	M	M	S	M	M	S	M	M	S
CO4	S	S	M	M	M	S	S	S	S	S
CO5	S	S	S	S	M	M	S	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (maybe avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115
(BachelorofComputerScience)– 2022-2023 onwards

Semester:VI Papertype:Internal Elective–Paper2

Papercode: Name of the Paper :BigDataAnalytics Credit:3

TotalHoursperWeek: 3 Hrs.LectureHours: 39Hrs.TutorialHours:.....PracticalHours:.....

.....
Course Objectives

1. Toexplorethefundamentalconceptsofbigdataanalytics.
2. Tolearntousevarioustechniquesforminingdatastream.
3. TolearntheBigdataBusinessPerspective
4. TounderstandtheapplicationsusingMapReduceConcepts.
5. TointroduceprogrammingtoolsHIVEinHadooecosystem.

Course Outcomes

1. Afterstudiedunit-1,thestudentwillbeabletounderstandthekeyissuesinbigdatamanagement.
2. Afterstudiedunit-2,thestudentwillbeabletooutlinebigdatapanning, processing.
3. Afterstudied unit-3,the student willbe able toAcquirefundamental enabling techniques andscalable.
4. Afterstudiedunit-4,thestudentwillbeabletoexaminevariousbigdatatoolsandtechniques.
5. Afterstudiedunit-5,thestudentwillbeabletoachieveadequateperspectivesofBigDataAnalytics invariousApplicationslikerecommender system,SocialMediaApplicationsandetc.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTO BIGDATA

TeachingHours:7Hrs.

Introductiontobigdata:IntroductiontoBigDataPlatform–ChallengesofConventionalSystems

– Intelligent data analysis – Nature of Data – Characteristics of Data – Evolution of Big Data – DefinitionofBigData–ChallengeswithBigData–Volume,Velocity,Variety– OtherCharacteristicsofData–NeedforBigData–AnalyticProcessesandTools–Analysisvs.Reporting.

Unit-2:MININGDATA STREAMS

TeachingHours:8Hrs.

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

Unit-3:BIGDATAFROMDIFFERENTPERSPECTIVES

TeachingHours:8Hrs.

BigdatafrombusinessPerspective:Introductionofbigdata–Characteristicsof bigdata–Datainthe warehouse and data in Hadoop– Importance of Big data– Big data Use cases– Patterns for Bigdata deployment. Big data from Technology Perspective– Application Development in Hadoop– GettingyourdatainHadoop.

Unit-4:HADOOP ANDMAPREDUCE

TeachingHours:8Hrs.

Hadoop: The Hadoop Distributed File System – Components of HadoopAnalysing the Data withHadoop– 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 Jobrun–Failures–JobScheduling–ShuffleandSort–Taskexecution–MapReduceTypesandFormats– MapReduceFeatures–Hadoopenvironment.

Unit-5:FRAMEWORKS

TeachingHours:8Hrs.

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– IBMInfoSphereBigInsightsandStreams.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaper review, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops,preparingtechnicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

1. “Big Data and Analytics” Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. “Mining of Massive Datasets”, Anand Rajaraman 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, McGraw Hill 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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	S	M	S	S	S
CO2	S	S	S	S	M	S	M	M	S	S
CO3	S	S	S	S	S	S	M	M	S	S
CO4	S	M	M	S	M	S	M	M	S	S
CO5	S	M	M	M	M	S	M	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE–632 115

(BachelorofComputerScience)–2022-2023onwards

Semester:VI

Papertype:Internal Elective– Paper2

Papercode:

Name of the Paper :Cryptography

Credit: 3

TotalHoursperWeek: 3Hrs. LectureHours:39Hrs. TutorialHours:..... PracticalHours:.....

.....
Course Objectives

1. UnderstandOSIsecurityarchitectureandclassicalencryptiontechniques.
2. Understandthedifferentcryptographicoperationsofsymmetriccryptographicalgorithms.
3. UnderstandthedifferentcryptographicoperationsofPublickeycryptographicalgorithms.
4. Tomakeuseofapplicationprotocolstodesignandmanageasecuresystem.
5. TolearntheconfigurationandmanageE–mailandWLANSecurity.

Course Outcomes

1. Afterstudiedunit-1,thestudentwillbeabletoknowthesecurityattacksandservices.
2. Afterstudiedunit-2,thestudentwillbeabletounderstandtheconceptofEncryptionStandards.
3. Afterstudiedunit-3,thestudentwillbeabletounderstandpublickeycryptographicalgorithms.
4. Afterstudiedunit-4,thestudentwillbeabletolearntheconceptofhashfunctions.
5. Afterstudiedunit-5,thestudentwillbeabletounderstandtheEmailsecurity.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:COMPUTERANDNETWORKSECURITY**TeachingHours:7Hrs.**

Computer Security Concepts – OSI security architecture –Security trends – Security attacks – Security Services – Security Mechanisms – Fundamental Security Design Principles– AttackSurfacesandAttackTrees–ModelforNetworkSecurity–NetworkStandards.

Unit-2:SYMMETRICCRYPTOGRAPHYTeachingHours:8Hrs.

Symmetric Cipher– Classical Encryption Technique – Symmetric Cipher Model – SubstitutionTechniques, Transposition Technique – Steganography – Block Cipher and the Data EncryptionStandard – The Data Encryption Standard – Differential and Linear Cryptanalysis – Block CipherPrinciples.AdvancedEncryptionStandard– AESStructure – AESTransformationFunction.

Unit-3:PUBLICKEYCRYPTOGRAPHY**TeachingHours:8Hrs.**

Public Key Cryptography and RSA Principles– RSA Algorithm, Key ManagementandotherPublicKeyCryptosystemsKeyManagement,Diffie– HellmanKeyExchange,EllipticCurveArithmetic–EllipticCurve Cryptography– PseudorandomNumberGeneration.

Unit-4:HASHFUNCTIONSANDDIGITALSIGNATURES**TeachingHours:8Hrs.**

CryptographicHashFunctions – ApplicationofHashFunctions –TwoSimpleHashFunctions –Secure Hash Algorithm(SHA) –Message Authentication Codes –Authentication requirement – Authentication function – MAC – HMAC – CMAC – Digital signature and authenticationprotocols – Digital Signature Standards –Digital Signatures Schemes– Digital Certificate – KeyManagementandDistribution.

Unit-5:SECURITYAPPLICATIONS**Teaching Hours: 8**

Hrs.IntrusionDetectionSystem–PasswordManagement–IntroductiontoFirewall– FirewallGenerations– Web Security – Wireless network Security – Electronic Mail Security– Internet MailArchitecture–S/MIME–PrettyGoodPrivacy(PGP).

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops, preparing technicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepracticesandreportcanbewrittenfordocumentation, further discussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselldiscussion,selflearningprocess.

- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

1. “Cryptography and Network Security Principles and Practices”, William Stallings, Pearson/PHI, 8th Edition, 2017.
2. “CRYPTOGRAPHY & NETWORK SECURITY” – Principles and Practices, William Stallings, Pearson Education, Third Edition.

Reference Books:

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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	M	S	S	S
CO2	S	S	S	M	M	M	M	S	M	S
CO3	S	M	M	M	M	M	M	S	S	S
CO4	S	S	M	M	M	S	S	S	M	S
CO5	S	S	S	M	M	M	M	M	S	M

PO–Programme Outcome, CO –Course outcome
 S –Strong ,M–Medium,L– Low(may be avoided)

THIRUVALLUVAR UNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)–2022-2023 onwards

Semester: VI **Paper type: Internal Elective– Paper 2**

Paper code: **Name of the Paper : Digital Image Processing**

Credit: 3 Total Hours per Week: 3 Hrs. Lecture Hours: 39

Hrs. Tutorial Hours: .. Practical Hours:

Course Objectives

1. To know the basics of Digital image and techniques.
2. To understand various Image enhancement ideas.
3. To understand Image restoration techniques.
4. To understand degrees of image resolution and compression methods.
5. To understand concepts of image representation and recognition.

Course Outcomes

1. After studied unit-1, the student will be able to understand the concepts like MatLab, DIP, electromagnetic spectrum and etc.
2. After studied unit-2, the student will be able to analyze smoothing and sharpening techniques.
3. After studied unit-3, the student will be able to know about image filters.
4. After studied unit-4, the student will be able to gain knowledge about compression techniques.
5. After studied unit-5, the student will be able to know about image representation.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:FUNDAMENTALS**TeachingHours:7Hrs.**

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-2:IMAGE ENHANCEMENT**TeachingHours:8Hrs.**

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-3:IMAGERESTORATION AND SEGMENTATION**TeachingHours:8Hrs.**

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-4:WAVELETS AND IMAGE COMPRESSION**TeachingHours:8Hrs.**

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-5:IMAGEREPRESENTATION AND RECOGNITION**TeachingHours:8Hrs.**

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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.

- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

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.

Reference Book:

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	M	M	M	S	S
CO2	S	S	M	M	M	M	S	M	S	S
CO3	S	S	M	M	M	S	S	S	M	S
CO4	S	M	S	M	S	M	M	S	S	S
CO5	S	M	M	M	S	M	M	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester:VI **Papertype:Internal Elective– Paper3**

Papercode: **Name of the Paper :ArtificialIntelligence** **Credit:3**

TotalHoursperWeek: 3Hrs. LectureHours:39Hrs. TutorialHours:..... PracticalHours:.....

.....

Course Objectives

1. To know the basics of Artificial Intelligence.
2. To Understand the Methods and algorithms in AI.
3. To learn to represent knowledge in solving AI problems.
4. To Understand Statistical logics and know about Software agents.
5. To learn how Machine learning is related to AI.

Course Outcomes

1. After studied unit-1, the student will be able to recall the fundamentals of artificial intelligence
2. After studied unit-2, the student will be able to understand the techniques used for AI
3. After studied unit-3, the student will be able to know about knowledge representation.
4. After studied unit-4, the student will be able to gain knowledge about fuzzy logic.
5. After studied unit-5, the student will be able to evaluate the design of new artificial intelligence and machine learning applications

Matching Table (Put Yes/No in the appropriate box)

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTOARTIFICIALINTELLIGENCE TeachingHours:7Hrs.

History of AI – Artificial Narrow Intelligence (ANI) – Artificial General Intelligence (AGI) – Artificial Super Intelligence (ASI) – Characteristics – Types of AI – Domains – ProgrammingLanguagesofAI–Applications ofAI–FutureofAI.

Unit-2:AI–PROBLEM SOLVINGMETHODS TeachingHours:8Hrs.

Problem solving Methods – Search Strategies: Uninformed – Informed – Heuristics – Generate andtest–hill climbing–Bestfirstsearch –problem reduction –Local SearchAlgorithms andOptimization – Game Playing mini–max procedure – Optimal Decisions in Games – Alpha – BetaPruning–StochasticGames

Unit-3:AI–KNOWLEDGEREPRESENTATION TeachingHours:8Hrs.

ProceduralVersusdeclarativeknowledge–logicprogramming–ForwardVersusbackwardreasoning – Matching – Control knowledge – Ontological Engineering– Categories and Objects –Events – Mental Events and Mental Objects – Reasoning Systems for Categories –Reasoning withDefaultInformation.

Unit-4:STATISTICALREASONINGANDAGENTS TeachingHours:8Hrs.

Probability and Bayes Theorem – Certainty factors – Probabilistic Graphical Models – BayesianNetworks–MarkovNetworks–FuzzyLogic.ArchitectureforIntelligentAgents– Agentcommunication–NegotiationandBargaining–ArgumentationamongAgents– TrustandReputationinMulti–agentsystems.

Unit-5:MACHINELEARNING ANDAPPLICATIONS TeachingHours:8Hrs.

Types of Machine Learning – Neural Networks – Deep Learning – Natural Language Processing – MachineTranslation–SpeechRecognition–Robot–Hardware–Perception–Planning–Moving.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentframework)

- a. Bookreviewandresearchpaperreview, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops,preparingtechnicaltermdictionariesfromtextbooksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher

- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self-discussion, self-learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbook:

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.

Reference Book:

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

Course Material: website links, e-Books and e-journals Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	S	S
CO2	S	M	S	S	M	M	S	M	S	S
CO3	S	S	M	M	S	M	M	S	S	S
CO4	S	M	S	M	M	M	M	S	S	S
CO5	S	S	M	M	S	S	M	M	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY,VELLORE-632 115

(BachelorofComputerScience)- 2022-2023 onwards

Semester:VI Papertype:Internal Elective-Paper3

Papercode: Name of the Paper :SystemSoftware Credit:3

TotalHoursperWeek: 3Hrs. LectureHours:39Hrs. TutorialHours:..... PracticalHours:.....

.....

Course Objectives

1. To understand the basicconceptsofsystemsoftware
2. Abilityto tracethepathofasourcecodetoobjectcodeand toexecutablefile
3. Todesignandimplementationofloadersandlinkers
4. Tounderstandtheconceptsofmacroprocessor
5. Abilitytoanalyzethefunctionsofcompilers

Course Outcomes(fiveoutcomesforeachunitsshould bementioned)

1. Afterstudiedunit-1,thestudentwillbeabletoanalyzeCISCandRISCmachines.
2. Afterstudiedunit-2,thestudentwillbeabletoknowhowassemblersareworking.
3. Afterstudiedunit-3,thestudentwillbeabletodistinguishLinkerandLoader.
4. Afterstudiedunit-4,thestudentwillbeabletolearnmacroprocessor.
5. Afterstudiedunit-5,thestudentwillbeabletounderstandthefunctionsofcompilers.

MatchingTable

Unit	i.Remembering	ii.Understanding	iii.Applying	iv.Analyzing	v.Evaluating	vi.Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1:INTRODUCTIONTOSYSTEMSOFTWARE

TeachingHours:7Hrs.

System software vs. Application software – Different types of system software – SIC& SIC/XEArchitecture–traditional(CISC)machines–RISCmachines.

Unit-2:ASSEMBLERS

TeachingHours:8Hrs.

Basic assembler functions– Machine dependent and independent assembler features– Assemblerdesignoptions–One pass assemblers–Multipassassemblers–MASMassembler.

Unit-3:LOADERSAND

LINKERS

TeachingHours:8Hrs.Ba

asic loader functions–Simple bootstrap loaders – Machine dependent and independent loaderfeatures–Linkage editors–Dynamiclinking.

Unit-4:MACROPROCESSOR

TeachingHours:8Hrs.Ba

asic macro processor functions–Machine dependent and independent macro processor features– Macroprocessordesignoptions.

Unit-5:COMPILERS

TeachingHours:8Hrs.Ba

asic compiler functions–Machine dependent compiler features–Machine independent compilerfeatures–CompilerdesignoptionstheYACC compiler–Compiler.

InternalAssessmentMethods:(Thefollowingitemsmaybebroughtundertest,seminarandassignmentf ramework)

- a. Bookreviewandresearchpaper review, syllabusandcurriculumreview.
- b. Datacollectionandpaperwritingpractices:books level,fieldstudylevel.Usingthecoursestudyforsocietyandnaturedevelopment–exercise
- c. Workshops,preparing technicaltermdictionariesfromtext booksandreferencebooks.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can begivenbytheteacher
- e. Formingdigitallibrary:collectingtextandreferencebooks,coursematerial.
- f. Villages, institutions, various people groups may be adopted by the departments of thecolleges for practicing their theoretical study. Innovative methods may be implemented inthepracticesandreportcanbewrittenfordocumentation, furtherdiscussionandresearch.
- g. Extracurricularandculturalactivitiesmaybeframedthroughthesyllabuscontent.
- h. Groupingstudentsforselldiscussion,selflearningprocess.
- i. Followinginstitutionandintellectualandwritingreportsinthecoursefield.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process withintheframeworkofquestionsettingpatternandinternalassessmentpattern.
- k. Forapplicationorientedstudy:Villages,Institutions,variouspeoplegroupsmaybeadopted by the departments of the colleges for practicing their theoretical study. Innovativemethods may be implemented in the practices and report can be written for documentation,furtherdiscussionandresearch.
- l. Extracurricularactivitiesmaybeframedthroughtheirsyllabuscontent.

m. Bringtheindustriestothecampus. Bringthestudentstotheindustry.

- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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, 2nd Edition, Pearson Education, 2011.

Reference Books:

1. “Systems Programming and Operating Systems”, D. M. Dhamdhere, 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.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	S	M	M	S
CO2	S	S	M	M	S	M	S	M	S	S
CO3	S	M	M	S	M	S	M	M	S	S
CO4	S	M	S	S	M	S	M	S	S	S
CO5	S	M	M	M	M	M	M	S	S	S

PO – Programme Outcome, CO – Course outcome
 S – Strong, M – Medium, L – Low (may be avoided)

THIRUVALLUVARUNIVERSITY, VELLORE–632 115
(Bachelor of Computer Science)– 2022-2023 onwards

Semester: VI **Paper type: Internal Elective– Paper 3**

Paper code: **Name of the Paper : Cloud Computing** **Credit: 3**

Total Hours per Week: 3 Hrs. Lecture Hours: 39 Hrs. Tutorial Hours: Practical Hours:

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Course Objectives

1. To understand the concepts in Cloud Computing.
2. To understand the concepts of Cloud Computing Services.
3. To enable the students to learn Programming Models in Cloud Computing and its Environments.
4. The students should be made to learn the basics of Software Development in Cloud.
5. At the end of the course, the student should be able to learn Security Aspects of Cloud Computing.

Course Outcomes

1. After studied unit-1, the student will be able to recall the fundamental concepts of cloud computing technology.
2. After studied unit-2, the student will be able to compare and interpret the various cloud services.
3. After studied unit-3, the student will be able to analyze cloud architecture and examine the applications.
4. After studied unit-4, the student will be able to understand networking for cloud computing.
5. After studied unit-5, the student will be able to assess and elaborate the cloud security considerations and models.

Matching Table (Put Yes/No in the appropriate box)

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: UNDERSTANDING CLOUD COMPUTING**Teaching Hours: 7Hrs.**

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-2: DEVELOPING CLOUD SERVICES**Teaching Hours: 8Hrs.**

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-3: PROGRAMMING MODELS FOR CLOUD COMPUTING Teaching Hours: 8Hrs.

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 – Salesforce – VMware.

Unit-4: SOFTWARE DEVELOPMENT IN CLOUD**Teaching Hours: 8Hrs.**

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-5: SECURITY IN CLOUD COMPUTING**Teaching Hours: 8Hrs.**

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.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development—exercise
- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
- f. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

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

Reference Books:

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.

**CourseMaterial:websitelinks,e-Booksande-
journalsMappingwithProgrammeOutcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	M	S	S	S
CO2	S	S	M	S	S	M	S	S	S	S
CO3	S	S	M	S	M	S	M	S	S	S
CO4	S	S	S	M	M	S	M	S	S	S
CO5	S	S	M	M	S	M	M	M	S	S

PO–ProgrammeOutcome,CO–Courseoutcome
S –Strong ,M–Medium,L– Low(maybeavoided)
