DEPARTMENT OF COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)
&
LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF)

BACHELOR OF COMPUTER SCIENCE
2024-2027 BATCH

Programmer Learning Outcomes

After completion of the programmer, the student will be able to

PLO1 : Demonstrate a solid foundation in the discipline of computer science and computer-based problem-solving skills

PLO2 : Formulate, model, design and solve real world problems by using software tools

PLO3 : Apply cognitive, design thinking and critical problem-solving skills to establish a productive career in industry, research and academia

PLO4 : Meet the demands of IT industry with hands-on experience on current technological tools, effective communication skills and team work

PLO5 : Pursue higher studies/ employ themselves either as software professionals or entrepreneurs through their technical competencies

Programmer Specific Outcomes

The students at the time of graduation will

PSO1 : Apply domain knowledge and problem-solving skills to solve real-time problems and to work independently on software projects as an effective team member

PSO2 : Design and develop applications in the areas like artificial intelligence and machine learning algorithms, networking, web design, cloud computing, IoT and data analytics

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2024 – 2027 BATCH
SEMESTER I

Semester	Part	Subject Code	Title of paper	Category	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
I	I	TAM2301A/ HIN2301A / FRE2301A	Language I - T / H / F	Lang	4	58	2	3	25	75	100	3
I	II	ENG2301A	English Paper I	English	4	58	2	3	25	75	100	3
I	III	CS23C01	Programming in C	CC	4	58	2	3	25	75	100	3
I	III	PP22C02	Computational and Algorithmic Thinking for Problem Solving	CC	3	45	-	-	100	-	100	3
I	III	CS24C03	Computer Organization and Architecture	CC	4	58	2	3	25	75	100	3
I	III	TH24A03	Numerical and Statistical Techniques	GE	6	88	2	3	25	75	100	5
I	III	CS23CP1	C Programming Lab	CC	3	45	-	3	15*	35*	50	2
Non-Tamil Students												2
I	IV	NME23B1 / NME23A1	Basic Tamil I / Advance Tamil I	AEC	2	28	2	-	100	-	100	
Students with Tamil as Language												
I	IV	NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I - V	VI	24BONL1 24BONL2 24BONL3	Online Course - I Online Course - II Online Course – III	-	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC Core Course
GE Generic Elective
AEC Ability Enhancement Course
CA Continuous Assessment
ESE End Semester Examination

Evaluation Pattern 24-25 Batch onwards

CA Question Paper Pattern and distribution of marks UGLanguage and English

Section A	5 x 1 (No choice)	:	5 Marks
Section B	4 x 5 (4 out of 6)	:	20 Marks (250 words)
Section C	2 x 10 (2 out of 3)	:	20 Marks (500 words)
	Total	**:**	**45**

Marks

UG & PG- Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks :2 x 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3 =15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3 =24

Total :45 Marks

ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4		:	16 Marks
Section B (Essay type) 1 out of 2		:	9 Marks
	Total	**:**	**25 Marks**

End Semester Examination – Question Paper Pattern and Distribution of M arksLanguage and English – UG

Section A	10 x 1 (10 out of 12)	:	10 Marks
Section B	5 x 5 (5 out of 7)	:	25 Marks (250 words)
Section A	4 x 10 (4 out of 6)	:	40 Marks (600 - 700 words)
	Total	**:**	**75 Marks**

UG & PG - Core and Allied courses:

ESE Question Paper Pattern: 5 x 15 = 75 Marks

Question from each unit comprising of

One question with a weightage of 2 Marks : 2 x 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

ESE Question Paper Pattern:(for Accounts Paper) 5 x 15 = 75 Marks

Question from each unit comprising of

One question with a weightage of 2 Marks: 2 x 5=10
One question with a weightage of 5 Marks: 5 x 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

End Semester for UG / PG - Advance Learner Courses

Section A 5 questions out of 8 - open choice 5x5:25 marks
Section B 5 questions out of 8-open choice 5x10:50 marks

Total :75 marks

Continuous Internal Assessment PatternTheory

I Year UG / PG (23 Batch)

CIA Test	:	5 marks **(conducted for 45 marks after 50 days)**
Model Exam	:	7 marks **(Conducted for 75 marks after 85 days (Each Unit 15 Marks))**
Seminar/Assignment/Quiz	:	5 marks Class
Participation	:	5 marks
Attendance	:	3 marks
Total	:	25 Marks

Practical

Lab Performance	:	7 marks
Regularity	:	5 marks
Model Exam	:	10 marks
Attendance	:	3 marks
Total	:	25 marks

ESE Practical Pattern

The End Semester Examination will be conducted for a maximum of 75 marksrespectively with a maximum 15 marks for the record and other submissions if any.

Project:

Evaluation of Individual / Group Project & Viva Voce for UG & PG

I Review	-	Selection of the field of study, Topic & literature collection	:	5 Marks
II Review	-	Research Design & Data Collection	:	10 Marks
III Review	-	Analysis & Conclusion Preparation of rough draft	:	10 Marks
		Total	**:**	**25 Marks**

End semester examination:

Evaluation of the project	:25 Marks
Viva Voce	:50 Marks
Total	: 75Marks

Part IV

Introduction to Entrepreneurship / Women Studies / Value education / Environmental Studies / Design Thinking

Quiz	:50 Marks
Assignment	:25 Marks
Project /Case Study	: 25 Marks
Total	: 100 Marks

Professional English

The course offered in alignment with TANSCHE norms with 2 credits.Quiz (5 x 20 Marks) : 100 Marks

Cyber Security I & II

Quiz	:	60 Marks
Case Study	:	20 Marks
Poster	:	20 Marks

Course Code	Course Title	Category	L	T	P	Credit
CS23C01	Programming in C	Theory	58	2	-	3

Preamble

This course introduces fundamental programming constructs in C. It covers the concepts such as arrays, functions, structures, pointers and file handling. It provides comprehensive coverage on industry 4.0.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the programming constructs and structure of C programming and Industry 4.0 technologies	K1
CLO2	Understand the purpose of arrays, strings, structures, pointers, and files to solve problems	K2
CLO3	Apply functions to solve problems using procedure-oriented approach	K3
CLO4	Analyze the problems and solve it by applying appropriate logic	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	M	S
CLO3	S	M	S	S	M
CLO4	S	S	S	S	S

S-Strong; M-Medium.

Programming in C - CS23C01 - (58 Hrs)

Unit I **12 Hrs**

Overview of C -Constants, Variables and Data Types - Operators and Expressions - Managing Input and Output Operations - Decision Making and Branching - Decision Making and Looping.

Unit II **12 Hrs**

Arrays: One-Dimensional - Two Dimensional - Multidimensional Arrays. Character Arrays and Strings: Declaring and Initializing String Variables - Reading Strings from Terminal - Writing Strings to Screen - String Handling Functions.

Unit III **12 Hrs**

User-Defined Functions: Need -Return Values and Types - Function Calls - Function Declaration - Category of Functions - No Arguments and No Return Values - Arguments but No Return Values - Arguments with Return Values - Recursion - Scope Visibility and Life Time of Variables. Structure Definition: Structure Initialization - Comparison of Structure Variables - Arrays of Structures - Arrays within Structures.

Unit IV **12 Hrs**

Pointers: Understanding Pointers - Accessing the Address of a Variable - Declaring and Initializing Pointers - Accessing a Variable through its Pointers - Pointers and Arrays - Pointers and Character Strings - Pointers and Functions.

File Management in C: Defining and Opening a File - Closing File - I/O Operations on Files - Error Handling during I/O Operations - Command Line Arguments.

Unit V **10 Hrs**

Introduction to Industry 4.0 - Need - Reasons for Adopting Industry 4.0 - Definition - Goals and Design Principles - Technologies of Industry 4.0- Skills required for Industry 4.0 - Advancements in Industry 4.0 - Impact of Industry 4.0 on Society, Business, Government and People - Introduction to 5.0.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	E. Balagurusamy	Programming In ANSI C	Tata Mc Graw Hill	2019, 8th Edition
2	P. Kaliraj, T. Devi	Higher Education for Industry 4.0 and Transformation to Education 5.0	CRC Press - Taylor & Francis Group	2021, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Byron Gottfried	Programming with C	Tata McGraw Hill	2018, 4th Edition
2	Yashwvant Kanetkar	Let Us C: Authentic Guide To C Programming Language	BPB Publications	2020, 17th Edition

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
PP22C02	Computational and Algorithmic Thinking for Problem Solving	Theory	45	-	-	3

Preamble

This course aims to kindle the young minds to think like a computer scientist, with the idea that Computing, and computers will enable the spread of computational thinking. Computational thinking is thinking recursively, reformulating a seemingly difficult problem into one which we know how to solve and taking an approach to solving problems, designing systems, and understanding human behaviour that draws on concepts fundamental to computer science.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Define the basic principles of logical reasoning, problem solving in computational thinking	K1
CLO2	Understanding the applications of propositional logic, problem representation and techniques	K2
CLO3	Apply algorithmic thinking to problem solving using tools	K3
CLO4	Apply and analyze to solve domain specific problems using computational thinking concepts	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	S	S	S	S
CLO2	S	S	S	M	S
CLO3	S	M	S	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium.

Computational and Algorithmic Thinking for Problem Solving - PP22C02 - (45 Hrs)

Unit I **7 Hrs**

Basics: Introduction to Computational Thinking - Data Logic - History of Computational Thinking-Applications of Computational Thinking.

Unit II **8 Hrs**

Data- Information and Data - Data Encoding - Logic - Boolean logic - Applications of simple Propositional Logic. Tool: Flowgorithm and Scratch.

Unit III **10 Hrs**

Problem Solving and Algorithmic Thinking: Problem definition- Logical reasoning- Problem decomposition- Abstraction- Problem representation via Algorithmic thinking:

Name binding- Selection-Repetition and Control Abstraction - Simple Algorithms - Comparison of performance of Algorithms.

Unit IV **8 Hrs**

Activities in Class: Sudoku-Towers of Hanoi- Graph Coloring-Geographical Map reading-Poem Reading-Novel reading- Data analysis on news.

Unit V **12 Hrs**

Problem Solving Techniques- Factoring and Recursion Techniques- Greedy Techniques-Divide and Conquer- Search and Sort Algorithms- Text Processing and Pattern matching. Tool: iPython

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	David Riley and Kenny Hunt	Computational Thinking for Modern Solver	Chapman & Hall/CRC	2014, 1st Edition
2	Paolo Ferragina, Fabrizio Luccio	Computational Thinking First Algorithms	Springer	2018, 1st Edition
3	Karl Beecher	Computational Thinking - A beginner's guide to problem solving	BSC publication	2017, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. S. Kavitha

Evaluation Pattern

Assessment	Number	Marks
Quiz (online or offline)	5	50
Class Activity	5	25
Group Project (Domain Specific)	1	25
Total		100

Course Code	Course Title	Category	L	T	P	Credit
CS23C03	**Computer Organization and Architecture**	**Theory**	**58**	**2**		3

Preamble

This course provides the principles and practices of digital electronics and computer system. It covers data transfer techniques, computer arithmetic operations, I/O and memory organization.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand number systems, conversions, boolean algebra and karnaugh map	K1
CLO2	Differentiate the functioning of flip-flops, multiplexer and decoder	K2
CLO3	Illustrate the concepts of register transfer, micro-operation, arithmetic operations, addressing modes and instruction format	K3
CLO4	Analyze various I/O and memory organizations	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	S	M
CLO3	S	M	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

Computer Organization and Architecture - CS23C03 - (58 Hrs)

Unit I **12 Hrs**

Data Representation: Data Types - Number Systems: Octal & Hexadecimal Numbers, Decimal Representation, Alphanumeric Representation. Logic Circuits: Gates - AND, OR, NOT, NAND, NOR Gates and Truth Tables - Boolean Algebra.

Unit II **12 Hrs**

Flip Flops: SR, JK, D, T Flip Flops. Karnaugh Maps - Product of Sums Method - Sum of Products Method- Don’t Care Condition - Decoders-Multiplexer -Demultiplexer.

Unit III **11Hrs**

Register Transfer and Micro Operations: Register Transfer Language - Register Transfer-Bus and Memory Transfers - Arithmetic Micro Operations-Logic Micro Operations - Shift Micro Operation. Instruction Format: Three Address Instruction-Two Address Instruction-One Address Instruction-Zero Address Instruction.

Unit IV **12Hrs**

Input / Output Organization: Input Output Interface - Asynchronous Data Transfer - DMA. Memory Organization: Memory Hierarchy - Main Memory - Cache Memory - Virtual Memory.

Unit V **11 Hrs**

Case study: 32bit /64bit processor architecture, Next generation computer architecture: Introduction to Graphics Processing Units (GPU) -CPU and GPU difference - Quantum Computers – Neuromorphic chips.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	M Morris Mano	Computer System Architecture	Pearson Education	2017, 3rd Edition
2	Jim Ledin	Modern Computer Architecture and Organization: Learn x86, ARM, and RISC-V architectures and the design of smartphones, PCs, and cloud servers	Packt Publishing Limited	2020, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Yale N. Patt& Sanjay Patel	Introduction to Computing Systems: From Bits and Gates to C and Beyond	McGraw-Hill Education	2019, 3rd Edition
2	John .L. Hennessy	Computer Architecture - A Quantitative approach	Elsevier	2018, 6thEdition
3	William Stallings	Computer Organization & Architecture	Pearson Education	2022, 11th Edition

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Mrs. M. Dhivya

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
TH24A03	ALLIED - NUMERICAL AND STATISTICAL TECHNIQUES	Theory	88	2	-	5

Preamble

- To present students the Basic concepts of Numerical Methods and Statistics.
- To enable the students to find the practical applications to the real-world problems.

Course Learning Outcomes

- Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall basic Mathematics and Statistical concepts	K1
CLO2	Understand results from the application of standard statistical and numerical methods.	K2
CLO3	Apply the concepts of Numerical differentiation and Theoretical distributions	K3
CLO4	Analyze numerical and statistical methods to solve complex problem.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	M	S
CLO4	S	S	S	S	M

S-Strong; M-Medium.

(Common to B.SC (CS), B.SC (CS with Cognitive Systems& CS with Cyber Security), BCA, B.SC (IT)

Syllabus Numerical and Statistical Techniques - TH24A03 88 Hours

Unit I 17Hrs

Solution of Linear Simultaneous Equations: Gauss elimination - Gauss Jordan - Gauss Seidel and Gauss Jacobi methods -simple problems. Interpolation: Newton Forward and Backward Interpolation Formulae.

Unit II 17Hrs

Numerical Differentiation, Formulae for Derivatives: Newton's Forward Difference - Newton's Backward Difference, Numerical Integration: Introduction, Newton-Cotes Quadrature formulas: trapezoidal rule, Simpson's 1/3 and 3/8 rules, Taylor's series method.

Unit III 18Hrs

Skewness - Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic

method - Karl Pearson's coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient - Features of Spearman's correlation coefficient, Regression analysis.

Unit IV **17 Hrs**

Probability: Introduction - probability defined - Importance of the concept of probability - Calculation of probability - Theorems of probability (statements only) – Mathematical Expectation-Simple problems.

Unit V **19 Hrs**

Theoretical Distributions: Binomial distribution - Poisson distribution and normal distribution (without derivations & proof).

Text Books

S. No	**Author**	**Title of the book**	**Publishers**	**Year & Edition**
1.	B.S. Grewal	Numerical Methods in Engineering and Science with Programs in C & C++	Khanna Publishers	2014 & 11th edition
	Unit I: Chapter III &VII: 3.3, 3.4, 3.5 &7.1-7.3 Unit II: Chapter VIII& X: 8.1, 8.2:(1,2),8.4, 8.5:(I, II, III),10.3			
2.	S.P.Gupta	Statistical methods	Sultan Chand & Sons Publications	2005 & 43rd Edition
	Unit III: Volume I: Chapter 9(till measures of skewness),10,11. (pg: 329-341, 377-412, 435-454) Unit IV: Volume-II Chapter 1(till Baye's theorem) (pg: 751-771) Unit V : Volume-II Chapter2 (pg:805-824, 826-834, 836-856)			

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	P.A.Navanitham	Business Mathematics and Statistics	Jai Publishing Company	2014
2.	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001 & 10th revised edition
3.	P.Kandasamy, K.Thilagavathy and K.Gunavathy	Numerical Methods	S.Chand and company LTD	Reprint 2007
4.	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2020 &12th revised edition

MOOC learning

https://nptel.ac.in/courses/111/107/111107105/
(Lectures by Prof.Ameeya Kumar Nayak and Prof. Sanjeev Kumar, Department of Mathematics, Indian Institution of Technology Roorkee)

Lecture 02 Gaussian elimination with partial pivoting Lecture 04 Jacobi and Gauss Seidel methods
Lecture 20 Newton's Forward Difference & Newton's Backward Difference Lecture 34 Simpsons 1/3rd rule and 3/8 rule https://nptel.ac.in/courses/111/106/111106112/
(6 Lectures by Prof.G.Srinivasan, Department of Management Studies, Indian Institution of

Technology Madras)
Lecture 12 Probability
Lecture 13 Rules of probability Lecture 19 Binomial distribution Lecture 20 Poisson distribution

Note

- Question paper setters to confine to the above text books only

Pedagogy

- Chalk and Talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Code	Course Title	Category	L	T	P	Credit
CS23CP1	C Programming Lab	Practical	-	-	45	2

Preamble

The lab course provides a way to explore the C programming constructs. It enables to experience pointers, structures and file handling techniques through simple programs.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic programming in C language	K1
CLO2	Differentiate built-in functions and apply user defined functions to solve problems	K2
CLO3	Demonstrate the concepts of arrays, strings, pointers, structures	K3
CLO4	Design and develop the programs to solve real-world problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	S	M
CLO4	S	S	M	M	S

S- Strong; M-Medium.

C Programming Lab -CS23CP1 - (45 Hrs)

List of Programs

- Exercise using different data types
- Exercise using different operators
- Exercise to implement control structures
- Exercise using loop statements
- Exercise using arrays
- Exercise to explore built-in functions
- Exercise to create user defined function
- Exercise using structures
- Exercise using pointers
- Exercise to work with files

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. K. Padmavathi

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LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2024 – 2027 BATCH
SEMESTER II

Semester	Part	Subject Code	Title of Paper	Course Type	Instruction Hours / Week	Contact Hours	Tutorial Hours	Duration of	Examination Marks			Credits
									CA	ESE	Total	
II	I	TAM2302A/ HIN2302A / FRE2302A	Tamil Paper II/ Hindi Paper II/ French Paper II	L	4	58	2	3	25	75	100	3
II	II	ENG2302A	English Paper II	E	4	58	2	3	25	75	100	3
II	III	CS24C04	Java Programming	CC	5	73	2	3	25	75	100	3
II	III	CS24C05	Data Structures	CC	4	58	2	3	25	75	100	3
II	III	TH24A11	Discrete Mathematics	GE	6	88	2	3	25	75	100	5
II	III	CS23CP2	Java Programming Lab	CC	5	75	-	3	15	35	50	3
II	IV	*NME23A2/ NME23B2	Advanced Tamil / Basic Tamil	AEC	-	-	-	-	-	-	-	Gr.
II	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
II	VI	NM23GAW	General Awareness	AEC	SS	-	-	-	100	-	100	Gr.
I-IV	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	

CC Core Course
GE Generic Elective
AEC Ability Enhancement Course
OT Online Test
CA Continuous Assessment
ESE End Semester Examination

Course Code	Course Title	Category	L	T	P	Credit
CS24C04	Java Programming	Theory	73	2	-	3

Preamble

The course introduces object-oriented programming concepts and it covers arrays, strings, threads, interfaces, files and exceptions. It introduces collection framework and database connectivity.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the object-oriented concepts, programming constructs in Java	K1
CLO2	Understand the usage of various packages, classes and collections in Java to solve problems	K2
CLO3	Apply Java APIs to solve problems using object-oriented approach	K3
CLO4	Analyze the problems and solve it by applying appropriate logic using Java language	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	M	S
CLO4	S	S	S	M	S

S- Strong; M-Medium.

Java Programming - CS24C04 – (73 Hrs)

Unit I **14 Hrs**

Introduction to Java - Naming conventions and data types - Literals - Operators in Java -Control statements in Java -Classes and objects- Instance variables, *set* Methods and *get* methods - Initializing objects with constructors.

Unit II **15 Hrs**

Arrays - String, StringBuffer and StringBuilder Class - Inheritance: Inheritance - super keyword - Protected Specifier - Types of Inheritance - Polymorphism - Type Casting - Abstract Classes.

Unit III **14 Hrs**

Interface: Interface -Multiple Inheritance using Interfaces - Abstract Classes Vs Interfaces. Packages: Package - Different Type of Package - JAR files -Creating Sub-Package - Exception Handling - Wrapper Classes- Streams and Files -Threads.

Unit IV **15 Hrs**

Collection Framework: Collection Objects -Retrieving Elements from Collections – Hash Set- Linked List- Array List- Vector –Hash Map-Hash table- Arrays - String Tokenizer - Calendar -Date Class.

Unit V **15 Hrs**

Java Database Connectivity: Database Server - Database Clients - JDBC - Working with Oracle DB - Registering the Driver - Connecting to a Database - Preparing SQL Statements - Using JDBC- ODBC Bridge Driver to Connect to Oracle Database - Types of ResultSets.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	R.Nageswara Rao	Core Java - An Integrated Approach	Dream Tech	2016
2	Paul Deitel and Harvey Deitel	Java How to Program	PHI Learning Pvt Ltd	2017

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Herbert Schildt	Java: The complete Reference	McGraw Hill Professional	2017
2	Robert Sedgewick & Kevin Wayne	Introduction to Programming in Java	Addison Wesley	2017
3	Y. Daniel Liang	Introduction to Java Programming	Pearson Education	2017

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. S. Karpagavalli
- Mrs. A. Priyadharsini

Course Code	Course Title	Category	L	T	P	Credit
CS23C04	Data Structures	Theory	58	2	-	3

Preamble

This course covers the basic concepts, terminologies in data structure. It provides knowledge on data representation, storage and retrieval in various data structures as well as sorting and searching techniques.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic data structures and data representations	K1
CLO2	Understand different data structures, operations and applications	K2
CLO3	Apply specific data structures like stack, queue, linked list, trees, and graph to solve problems	K3
CLO4	Analyze and evaluate the use of data structures in computerized problem solving	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	S	S	S	S
CLO2	S	S	S	M	S
CLO3	M	S	S	M	S
CLO4	S	M	S	M	M

S-Strong; M-Medium.

Data Structures- CS23C04 -(58 Hrs)

Unit I **12 Hrs**

Introduction and Overview: Introduction - Basic Terminology - Elementary Data Organization - Data structures - Data structure operations - Algorithms: Complexity, Time-Space Trade-off. Preliminaries: Algorithmic Notation - Control Structures- Variables, Data Types. Arrays, Records and Pointers: Introduction - Linear Arrays – Operations in Linear Arrays.

Unit II **12 Hrs**

Stack, Queues, Recursion: Introduction -Stacks - Array Representation of Stacks - Linked Representation of Stacks - Arithmetic Expressions - Polish Notation - Recursion- Towers of Hanoi - Implementation of Recursive Procedures by Stacks -Queues - Linked Representation of Queues – Circular Queue - Dequeue – Priority Queue.

Unit II **11 Hrs**

Linked Lists: Introduction - Linked Lists - Representation of Linked Lists in Memory- Traversing a Linked List - Memory Allocation-Garbage Collection–Insertion in Linked List- Deletion from a Linked List - Header LinkedLists– Circular Linked List.

Unit IV **12 Hrs**

Trees: Introduction - Binary Trees - Representing Binary Trees in Memory - traversing binary trees - AVL Tree - B Tree - Graphs: Terminology and Representations- Sequential Representation of Graphs- Adjacency Matrix, PathMatrix – Graph Traversal – Shortest Path Problems - Spanning Trees.

Unit V **11 Hrs**

Sorting and Searching: Introduction - Sorting - Insertion Sort - Selection Sort - Merging - Merge Sort - Radix Sort -Bubble Sort-Quick Sort. Searching and Data Modification – Hashing - Linear Search - BinarySearch.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Seymour Lipschutz	Data Structures	Tata Mc-Graw Hill	5th Edition, 2014

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Ellis Horowitz SartajSahni	Fundamentals of Data Structures	Galgotia Book House	2014
2	HarryHariom Choudhary	Data Structures	Create Space Independent Publishing Platform	2014
3	Rajdev Tiwari and Nagesh Sharma	Design and Analysis of Algorithms	Pearson Education	2014

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Dr. K. Padmavathi

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
TH24A11	ALLIED - DISCRETE MATHEMATICS	THEORY	88	2	-	5

Preamble

Principle of Mathematical Structures which are essential and related to the concepts of Computer Science. This helps the students to approach any Mathematical Problem which arise in the field of Computer Science

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify Mathematical logic and definitions and well-formed formula and Outline the understanding of Tautology and Equality relations thereby helps students to understand ambiguity and disagreement in real world problems	K1
CLO2	Lattices and Boolean algebras enable one to understand applications in logic, circuit theory, and probability	K2
CLO3	Demonstrate the importance of Graph Theory in Computer Science	K3
CLO4	Apply and demonstrate algebraic concepts in Coding theory using group codes enhances their ability to detect and correct errors	K4

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	S	S	S	S	M	S	S
CLO2	S	S	S	M	S	S	S
CLO3	S	S	S	S	S	S	S
CLO4	M	S	M	S	S	S	S

S- Strong; M-Medium.

Common to B.SC (CS), B.SC (CS with Cognitive Systems), BCA, B.SC (IT)

Syllabus ALLIED - DISCRETE MATHEMATICS - TH24A11 – 88 Hours

Unit I **18 Hrs**

Mathematical Logic: Connectives– Statement Formulas and Truth Tables - Conditional and Biconditional - Well-formed Formulas - Tautologies - Equivalence of Formulas -Duality law - Tautological implications -Normal forms –Theory of inference for the Statement Calculus - Predicate Calculus.

Unit II **17 Hrs**

Coding Theory: Introduction – Hamming distance – Encoding a message – Group codes – Procedure for generating Group Codes – Decoding and Error Correction – An example of a Simple error correcting code.

Unit III **18 Hrs**

Formal languages and Automata: Grammar and Languages -Phrase Structure grammar – Types of Phrase Structure Grammar – Backus-Naur form [BNF] - Finite State Acceptors and Regular Grammars : Deterministic finite automata-Non-Deterministic finite-State automata-Conversion of Non-Deterministic finite automata to finite state automata.

Unit IV **19 Hrs**

Lattice and Boolean Algebra: Lattices as Partial ordering set – Some Properties of Lattices-Distributive Lattices-Complemented Distributive Lattices-Boolean algebra – Boolean Function – Representation and Minimization of Boolean function using K-Map.

Unit V **16 Hrs**

Graph Theory: Basic Concepts of Graph Theory – Path, Reachability and Connectedness – Circuits-Hamiltonian Paths- Euler paths-Matrix representation-Incidence matrix-Adjacency matrix-Tree and Binary tree – Theorems-Statement only(No Proof).

Text Books

<table>
<tr><th>S. No</th><th>Author</th><th>Title of the book</th><th>Publishers</th><th>Year of Publication</th></tr>
<tr><td rowspan="2">1.</td><td>J.P.Tremblay and R.Manohar</td><td>Discrete Mathematical Structures with Applications to Computer Science</td><td>McGraw Hill Publishing Company</td><td>Edition 1997,
Reprint 2008</td></tr>
<tr><td colspan="4">Unit I : Section: 1.2.1 -1.2.4, 1.2.6 -1.2.11, 1.3.1 -1.3.4, 1.4.1 – 1.4.2, 1.5.1 -1.5.4
Unit III : Section: 3.3.1 -3.3.3, 6.1.1
Unit IV : Section: 4.1.1 -4.3.1 ,4.4.1, 4.4.2
Unit V : Section: 5.1.1 -5.2.2</td></tr>
<tr><td rowspan="2">2.</td><td>Dr. M.K. Venkataraman,Dr. N. Sridharan and N. Chandrasekaran</td><td>Discrete Mathematics</td><td>The National Publishing company, Chennai</td><td>First edition Reprint 2003,</td></tr>
<tr><td colspan="4">Unit II: Chapter 8 Sections 8.1 – 8.7</td></tr>
</table>

Reference Books

S.NO	Author	Title of the book	Publishers	Year of publication
1	T.Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	Tata Mcgraw-Hill publishing company Limited	2008
2	NarSinghDeo	Graph Theory with Applications to Engineering and Computer Science	PHI, India	2006
3	T. Santha and P. Radha	Discrete Mathematics for Computer Science and Applications	Kalaikathir Publications	2002

MOOC learning

https://nptel.ac.in/courses/111/107/111107058/

(Lectures by Dr.AditiGangopadhyay, Dr.SugataGangopadhyay and Dr.TanujaSrivastava, Department of Mathematics, IIT Roorkee)

- Lecture 06 Logical Inferences
- Lecture 32 Lattices
- Lecture 33 Boolean algebra
- Lecture 17 Basic definition
- Lecture 18 Isomorphism and sub graphs
- Lecture 19 Walks, paths and circuits operations on graphs
- Lecture 20 Euler graphs, Hamiltonian circuits

Note

- Question paper setters to confine to the above text books only

Pedagogy

- Chalk and talk, Powerpoint Presentation, E-Content, Group discussion, Seminar, Quiz, Assignment and Peer learning

Course Code	Course Title	Category	L	T	P	Credit
CS23CP2	Java Programming Lab	Practical	-	-	75	3

Preamble

The lab course is intended to explore object-oriented concepts through Java programming language. Make the students to perform data manipulation operations, database connectivity and to analyze the biological sequence database using tools.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the object-oriented concepts through java programming constructs	K2
CLO2	Demonstrate principle of inheritance, interface, file and exception handling	K3
CLO3	Implement data structures using Java collection framework	K3
CLO4	Construct database connectivity applications	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	M	S
CLO4	S	S	S	M	S

S- Strong; M-Medium.

Java Programming Lab - CS23CP2 - (75 Hrs)

List of Programs

- Exercises using classes and objects
- Exercises using a string
- Exercises using inheritance
- Exercises using interfaces
- Exercises using packages
- Exercises to implement built-in and user defined exception handling
- Exercises using streams and files
- Exercises using collection framework - Stack class
- Exercises using collection framework – Linked List and Array List
- Exercises using collection framework - HashMap and Hashtable
- Exercises using collection framework - Date and Calendar class
- Exercises using JDBC

Pedagogy

- Demonstration of working environment / Tools / Software / Programs

Course Designers

- Dr. S. Karpagavalli
- Mrs.A. Priyadharsini

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2024 – 2027 BATCH
Semester III

Semester	Part	Course Code	Title of Course	Course Type	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
III	I	TAM2303A/ HIN2303A / FRE2303A	Tamil Paper III/ Hindi Paper III/ French Paper III	L	4	58	2	3	25	75	100	3
III	II	ENG2403A	English Paper III	E	4	58	2	3	25	75	100	3
III	III	CS24C06	Operating System	CC	4	58	2	3	25	75	100	3
III	III	CS23C07	Computer Networks	CC	4	58	2	3	25	75	100	3
III	III	CS23SBGP	Gen - AI	SEC	3	44	1	-	100	-	100	3
III	III	TH24A20	Optimization Techniques	GE	4	58	2	3	25	75	100	3
III	III	CS23CP3	DBMS Lab	CC	5	75	-	3	15*	35*	50	4
III	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
I-III	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I -V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC : Core Course
GE : Generic Elective
AEC : Ability Enhancement Course
CA : Continuous Assessment
ESE : End Semester Examination
ACC : Additional Credit Course
SEC : Skill Enhancement Course
L : Language
E : English

Course Code	Course Title	Category	L	T	P	Credit
CS24C06	Operating System	Theory	58	2	-	3

Preamble

This course provides the basic operating system functionalities. The course covers deadlock, storage management, file system, and I/O systems. It also introduces Linux commands and shell programming.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental operating system abstractions such as processes, resources, threads, semaphores, memory files and Linux operating system	K1
CLO2	Understand the basic functionality of operating system like process, resource, memory, disk management	K2
CLO3	Apply the various operating system algorithms and techniques in solving problems	K3
CLO4	Analyse the abstractions of operating system in solving problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S- Strong; M-Medium.

Operating System- CS24C06 - (58 Hrs)

Unit I **12 Hrs**

Introduction: Operating Systems - Operating-System Structure -Operating System operations. Operating System Structures: Operating System Services - User and Operating System Interface - System Calls - System Programs - Operating System Design and Implementation - Operating System Generation.

Unit II **12 Hrs**

Process Management: Process Concept - Process Scheduling - Operations on Processes. Threads: Overview - Multicore Programming - Multithreading Models. Process Synchronization: Synchronization Hardware - Mutex Locks - Semaphores. CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms.

Unit III **12 Hrs**

Deadlock: System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock. Storage Management: Overview of Mass Storage Structure -Disk Structure - Disk Attachment - Disk Scheduling - Disk Management.

Unit IV **12 Hrs**

File System Interface: File Concept- Access Methods -Directory and Disk Structure- File-System Mounting - File Sharing - Protection. I/O Systems: Overview- I/O Hardware - Application I/O Interface- Kernel I/O Subsystem.

Unit V **10 Hrs**

Linux System: Introduction - Programming Linux. Shell Programming: Shell Introduction - Pipes and Redirection – The Shell as a Programming Languages- Shell Syntax - Working with Files: Linux File Structure -The Standard i/o Library - Formatted Input Output - File and Directory Maintenance.

Case Study: Mac operating system and Android operating system.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Abraham G Silberschatz	Operating System	Wiley Publisher	2017, 10th Edition
2	Richard Stones, Neil Matthew	Beginning: Linux Programming	Wiley Publisher	2007, 4th Edition
3	Guy Hart-Davis	Mac OS Sequoia for dummies	Wiley Publisher	2025

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Andrew.S. Tannenbaum	Modern operating System	Pearson Education	2014, 1st Edition
2	Abraham Silberschatz, Peter B. Galvin, Greg Gane	Operating System Concepts	Wiley Global Education	2012, 9th Edition
3	Mark G. Sobell	A Practical Guide to Linux commands, Editors, and Shell Programming	Addison Wesley	2011, 2nd Edition
4	William Stallings	Operating System Internals and Design Principles	Pearson Education	2018, 9th Edition

Note

- Blended mode topics are highlighted. Links will be provided.

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Dr. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
CS23C07	Computer Networks	Theory	58	2	-	3

Preamble

The course is designed to provide in depth knowledge of the various network types, protocols, components, security and basics of data communication.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic network terminologies, hardware, architectures and security	K1
CLO2	Understand various reference models, protocols, functioning of layers and cryptography algorithms	K2
CLO3	Apply the network concepts in problem solving	K3
CLO4	Analyze the characteristics of networks, routing protocols and security techniques	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	M
CLO2	S	S	M	M	S
CLO3	S	S	M	M	S
CLO4	S	S	M	M	S

S- Strong; M-Medium.

Computer Networks -CS23C07 -(58 Hrs)

Unit I **12 Hrs**

Data Communications: Components- data representation- Dataflow Networks: Distributed processing-network criteria -physical structures -network models-categories of networks- Interconnection of Networks: Internetwork- Protocols and Standards: protocols – standards -internet standards the OSI model- layers in the OSI model-TCP/IP protocol suite.

Unit II **12 Hrs**

Guided Media: Twisted-pair cable-coaxial cable - fibre-optic cable- unguided media: - Telephone Network: Major components - Latas -signalling services provided by telephone

networks dial-up modems: Modem standards digital subscriber line- cable TV networks. Wireless LANS: Bluetooth- connecting devices.

Unit III **11 Hrs**

Data Link Layer: Introduction- block coding-framing- flow and error control- protocols-noiseless channels- noisy channels. Network Layer: IPV4 addresses- IPV6 addresses-delivery-forwarding- unicast routing protocols.

Unit IV **11 Hrs**

Transport layer: Process-to-Process delivery- user datagram protocol - TCP- congestion control and quality a TCP connection- congestion control - quality of service.

Unit V **12 Hrs**

Application Layer: Name space- domain name space- distribution of name space- DNS in the internet- resolution- remote logging - cryptography: Introduction- symmetric-key cryptography- asymmetric-key cryptography.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Behrouz A Forouzan	Data communications and networking	Tata McGraw Hill	2017, 4th Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Robert Orfali, Dan Harkey, Jerry Edwards	Client/Server Survival Guide	John Wiley & sons	2008, 3rd Edition
2	Larry L Peterson, Bruce S Davie	Computer Networks - A Systems Approach	Elsevier Press	2012, 5th Edition
3	Andrew S Tanenbaum	Computer Networks	Pearson Education	2011, 5th Edition
4	William Stallings	Data and Computer Communications	Prentice Hall of India Private Limited	2011, 8th Edition

Pedagogy

- Lecture, Demonstration, Case Studies

Course Designer

- Mrs. S. Kavitha

Course Code	Course Title	Category	L	T	P	Credit
CS23SBGP	Gen-AI	Theory	44	1	-	3

Preamble

The object of this course is to understand the breadth and depth of Generative Artificial intelligence

(GEN AI) and to impart knowledge on its ethical implication's practical applications and emerging

trends.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and ethical considerations of Generative AI.	K2
CLO2	Apply AI principles in practical settings using basic AI tools and platforms	K3
CLO3	Develop advanced skills in specialized AI applications such as text analysis, natural language processing, and image recognition.	K3
CLO4	Explore emerging trends in AI, integrating advanced AI tools into diverse professional practices.	K4

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5
CLO1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	M	S	M	S

S- Strong; M-Medium.

Gen-AI - CS23SBP – (45 Hrs)

Unit 1: Introduction to Gen AI (9 hours)

Understanding Gen AI: Definition and scope of Gen AI - Overview of its applications in various fields - Introduction to essential skills needed for Gen AI. Ethical Considerations: Discussion on ethical guidelines and responsible use of AI - Understanding the impact of AI on society and individuals.

Hands-on Activity: Exploring AI Tools

- Working with appropriate content creation Gen-AI tools to engage with ChatGPT to explore various subjects, simulate interviews, or create imaginative written content.

- Working with appropriate writing and rephrasing Gen-AI tools to drafting essays on designated topics and refining the content with improved clarity, coherence, and correctness.

Unit 2: Basic AI Concepts **(8 hours)**

Introduction to AI: Basic concepts and terminology of artificial intelligence - Examples of AI in everyday life - Real-world examples of AI applications in different domains. Machine Learning Basics: Understanding the principles of machine learning - Overview of supervised and unsupervised learning.

Hands-on Activity: Simple AI Projects

- Working with appropriate educational content creation Gen-AI tools to generate quizzes and flashcards based on classroom material.
- Working with appropriate language learning Gen-AI tools to practice and enhance language skills through interactive exercises and games across multiple languages.

Unit 3: AI in Practice **(9 hours)**

Text Analysis and Natural Language Processing (NLP): Introduction to NLP concepts and techniques - Hands-on exercises analyzing text data and extracting insights. Image Recognition and Processing: Basics of image recognition algorithms and techniques - AI Tools for Text and Image Processing

Hands-on Activity: Text and Image Projects

- Working with appropriate image processing Gen-AI tools to experiment with AI-generated images.
- Working with appropriate object recognition Gen-AI tools to identify various objects such as text, images, products, plants, animals, artworks, barcodes, and QR codes.

Unit 4: AI for Productivity and Creativity **(9 hours)**

AI-enhanced Productivity and creativity Tools: Overview of productivity and creativity tools enhanced with AI capabilities - Tips for integrating AI into daily tasks and workflows. AI and Jobs: Exploring how AI impacts jobs and industries - Discussion on opportunities and challenges - Exploration of AI-powered creative tools and applications.

Hands-on Activity: Productivity and Creativity

- Working with appropriate content creation Gen-AI tools to generate interactive videos / blog posts / art / drawing / music and storytelling experience.
- Working with appropriate resume generation Gen-AI tools to create professional resumes efficiently.

Unit 5: Future of Gen AI and Final Project **(9 hours)**

Emerging Trends in Gen AI - Applications of Generative AI - Ethical and Societal Impact of Gen AI - Future Directions and Challenges - Case Studies in Generative AI.

Hands-on Activity: Trends in Gen AI

- Working with appropriate speech generation Gen-AI tools to customize synthetic speech for virtual assistance across different applications.
- Working with appropriate data analysis Gen-AI tools to perform data analysis, visualization, and predictive modeling tasks.

- Working with appropriate Gen-AI design tools to simplify the creation of visually appealing presentations.
- Working with appropriate website builder Gen-AI tools to develop professional websites with AI assistance.

Pedagogy

Demonstration of AI Tools, Lectures and Case studies.

Course Designer

Mrs. S. Ponmalar

Evaluation pattern for Gen-AI

Quiz	: 50 Marks (5 quizzes with each 10 marks)
Case study	: 25 Marks
Online Exam	: 25 Marks (Departments to plan and conduct the exam)
Total	: **100 Marks**

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
TH24A20	OPTIMIZATION TECHNIQUES	Theory	58	2	-	3

Preamble

- To present the basic concepts of Mathematics to the students.
- To enable the students to find the practical applications to the real-world problems.

Course Learning Outcomes

Upon the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts and application of operation research in Various fields.	K1
CLO2	Understanding various concepts such as LPP, assignment, transportation, travelling salesman, networking etc through Algorithms and problems.	K2
CLO3	Applying the importance, value of Operations Research and its mathematical modeling for solving practical problems occurring in real world	K3
CLO4	Analyzing different situations in the industrial/business scenario involving limited resources and finding the optimal solution within constraints.	K4

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	S

S-Strong; M-Medium.

COMMON TO B.Sc (CS/IT), B.Sc (CS with Cognitive Systems &CS with Cyber Security, Data Science) & BCA

Syllabus OPTIMIZATION TECHNIQUES - TH24A20 – 58 hours

UNIT I **12 hrs**

Linear programming: Introduction-Mathematical formulation of the problem-Graphical solution – General LPP – Canonical & standard forms of LPP - Simplex method.

UNIT II **12 hrs**

Transportation problem: Mathematical formulation of a transportation problem-Initial Basic feasible solution Matrix Minima Method - North – West Corner rule and VAM – Moving towards optimality (Balanced problems only). Assignment problem.

UNIT III **11 hrs**

Game theory: Concept of pure and mixed strategies - Solving 2 x 2 matrix with and without saddle point- Graphical method for 2x n – m x 2 games - Dominance property.

UNIT IV **11 hrs**

Queuing theory: Problems from single server,finite and infinite population. (Derivations not included). Sequencing Problems: Problems with N Jobs through 2 Machines - Problems with N Jobs through 3Machines.

UNIT V **12 hrs**

Network scheduling by CPM: Introduction – basic terminologies - rules for constructing a project network- Critical path method–floats.

Text Book

S.No	Author	Title of the book	Publishers	Year & Edition
1.	V.Sunderesan, K.S.GanapathySubramaniam, K.Ganesan	Operations research	A.R.Pub lications	2005 & 3rd Edition
	UNIT I: Chapter2section2.1-2.8, Chapter-3: section:3.1.1 -3.1.4. UNIT II: Chapter5 section5.1-5.3, Chapter-6: section 6.1-6.6 UNIT III: Chapter13section13.1-13.4,13.6-13.7. UNIT IV: Chapter 11 section11.1– 11.6(exclude 11.5) Chapter 9 section9.1-9.5 UNIT V: Chapter8section8.1 -8.5			

Reference Books

S. No	Author	Title of the book	Publishers	Year & Edition
1.	BillyE.Gillett	Introduction to Operations Research	Tata McGraw -Hill	2001
2	Kalavathy.S	Operations Research	Vikas publishing house	2013 & 4th Edition
3	KantiSwarup Etal	Operations Research	Sultan Chand &Sons	2022 & 1st Edition

4	Manmohanand Gupta PK	Operations Research	Sultan Chand &Sons	2014 & 17th Edition
5	D.S.Cheema	Operations Research	Laxmi Publicatons	2010

MOOC learning

https://nptel.ac.in/courses/111/107/111107128/

(Lectures by Prof.KusumDeep,IITRoorkee)

- Graphical Method for LPP
- Simplex Method
- Transportation Problem
- Assignment Problem
- Processing n Jobs on Two Machines
- Two Person Zero-Sum Game
- Solution of Mixed Strategy Games

E - Content

- Standard and Canonical form:https://www.youtube.com/watch?v=-1jpfY0zA7s
- Transportation problems:https://www.youtube.com/watch?v=ItOuvM2KmD4
- Game theory:https://www.youtube.com/watch?v=fSuqTgnCVRg
- Queuing theory:https://www.youtube.com/watch?v=xGkpXk-AnWU
- Networking:https://www.youtube.com/watch?v=KG5b0xZ_Ba8

Pedagogy

- Chalk and talk,PPT,Group discussion,Seminar,Quiz,Assignment

Course Code	Course Title	Category	L	T	P	Credit
CS23CP3	DBMS Lab	Practical	-	-	75	4

Preamble

The lab course provides a way to explore storing and accessing data in database through query languages and PL/SQL programming language. It enables to give systematic database design approaches and project-oriented learning through real time applications.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand basic SQL query statements	K2
CLO2	Gain knowledge on various constraints	K2
CLO3	Apply functions, packages, views, joins and Exception handling on data	K3
CLO4	Demonstrate PL/SQL programming on real time applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	M

S - Strong; M - Medium.

DBMS Lab - CS23CP3 –(75Hrs)

List of Programs

- Exercise using different data types and operators
- Exercise to implement database schema using constraints
- Exercise to implement queries using DDL and DML
- Exercise to implement built-in functions
- Exercise to implement views
- Exercise to implement PL/SQL basics
- Exercise to implement PL/SQL table and record
- Exercise to implement joins
- Exercise using Functions
- Exercise using Packages

- Exercise using Cursors
- Exercise using Triggers
- Exercise using Exception Handling

Pedagogy

- Demonstration of working environment/Tools/Software/Program

Course Designer

- Mrs. J. Gayathri
- Mrs. M. Dhivya

JOB ORIENTED COURSE

Title : Amazon Web Services

Duration : 60 Hrs

Introduction to Cloud Computing: Overview of Cloud Computing - Types of Cloud Computing - Advantages of Cloud Computing - Characteristics of Cloud Computing – Cloud Computing Terminology - Overview of Amazon Web Services (AWS) AWS Architecture Fundamentals - AWS Global Infrastructure - AWS Regions and Availability Zones – AWS Services Overview -AWS Management Console

Compute Services: Amazon Elastic Compute Cloud (EC2)-Amazon Elastic Container Service (ECS) - Amazon Elastic Load Balancing (ELB) -Auto Scaling Amazon Lightsail -AWS Lambda **Storage Services**: Amazon Simple Storage Service (S3) – Amazon Elastic Block Storage (EBS) - Amazon Glacier - Amazon Elastic File System (EFS) – Amazon Storage Gateway

Networking Services: Amazon Virtual Private Cloud (VPC)- Amazon Direct Connect-AWS Elastic Load Balancing (ELB)-Amazon Route53- Amazon Cloud Front- AWS Web Application Firewall (WAF) **Database Services:** Amazon Relational Database Service (RDS) –Amazon DynamoDB -Amazon Redshift –Amazon Aurora

Security & Identity Services: Amazon Identity and Access Management (IAM) -Amazon Cognito -AWS Certificate Manager -AWS Key Management Service (KMS) – Amazon Cloud HSM AWS Shield Management & Developer Tools- AWS Cloud Formation – AWS Cloud Trail-AWS Command Line Interface (CLI)-AWS Systems Manager-AWS Code Commit - AWS Code Build - AWS Code Deploy - AWS Code Pipeline Amazon Kinesis –Amazon EMR – Amazon Athena -Amazon Redshift- Amazon Quick Sight

Analytics Services: Application Services: Amazon Simple Queue Service (SQS) –Amazon Simple Notification Service (SNS)-Amazon Simple Workflow Service (SWF)-Amazon API Gateway - Amazon MQ - Amazon AppStream 2.0 **AWS Best Practices:** Cost Optimization - Security - Performance & Scalability - High Availability & Disaster Recovery –Operational Excellence -Automation & Continuous Delivery-Monitoring& Logging.

Title : Cisco Certified Network Associate
Duration : 60 Hrs

Network Devices - Routers - Layer 2 and Layer 3 switches - Next-generation firewalls and IPS - Access points - Controllers (Cisco DNA Center and WLC) – Endpoints –Servers – PoE - Network Topologies – Cablings – Connections and it types – Communication Protocols – Casting – Wireless Principles – Frames and Switching – MAC Tables.

Configuring VLAN – CDP and LLDP – LACP – Rapid PVST – Spanning Tree protocols – Port Forward and Block – Wireless Architectures and AP Modes - WLC, access/trunk ports, and LAG - Telnet, SSH, HTTP, HTTPS, console, and TACACS+/RADIUS –IP Connectivity - Components of routing table - Routing protocol metric - Configure

IPv4 and IPv6 static routing - Configure single area OSPFv2 - Concepts of first hop redundancy protocols -NAT using static and pools - NTP operating in a client and server mode – Configure DHCP & DNS - SNMP - Syslog - Configure and verify DHCP client and relay - per-hop behavior (PHB) - Remote access using SSH - TFTP/FTP in the network

Concepts of Security threats, vulnerabilities, exploits, and mitigation - security program elements - Configure and verify device access control using local passwords - security password policies elements - IPsec remote access and site-to-site VPNs - Configure and verify access control lists - Configure and verify Layer 2 security features DHCP snooping, dynamic ARP inspection, and port security - wireless security protocols WPA, WPA2, and WPA3 - Configure and verify WLAN within the GUI using WPA2 PSK

Automation and Programmability - Control plane and Data plane - Northbound and Southbound APIs - REST-based APIs (CRUD, HTTP verbs, and data encoding) - Puppet, Chef, and Ansible - Recognize components of JSON-encoded data

Title : Microsoft Windows Server Administration

Duration : 60 Hours

Manage Microsoft Entra users and groups - Create users and groups -Manage user and group properties -Manage licenses in Microsoft Entra ID -Manage external users -Configure self-service password reset (SSPR) -Manage access to Azure resources -Manage built-in Azure roles -Assign roles at different scopes - Interpret access assignments

Manage Azure subscriptions and governance: Implement and manage Azure Policy -Configure resource locks - Apply and manage tags on resources -Manage resource groups -Manage subscriptions -Manage costs by using alerts, budgets, and Azure Advisor recommendations - Configure management groups -Implement and manage storage (15–20%) -Configure access to storage -Configure Azure Storage firewalls and virtual networks - Create and use shared access signature (SAS) tokens -Configure stored access policies -Manage access keys -Configure identity-based access for Azure Files

Configure and manage storage accounts: Create and configure storage accounts -Configure Azure Storage redundancy -Configure object replication -Configure storage account encryption - Manage data by using Azure Storage Explorer and AzCopy - Configure Azure Files and Azure Blob Storage -Create and configure a file share in Azure Storage -Create and configure a container in Blob – Storage - Configure storage tiers - Configure snapshots and soft delete for Azure Files - Configure blob lifecycle management - Configure blob versioning

Automate deployment of resources by using Azure Resource Manager (ARM) templates or Bicep files: Interpret an Azure Resource Manager template or a Bicep file - Modify an existing Azure Resource Manager template - Modify an existing Bicep file - Deploy resources by using an Azure Resource Manager template or a Bicep file - Export a deployment as an Azure Resource Manager template or convert an Azure Resource Manager template to a Bicep file

Create and configure virtual machines: Create a virtual machine - Configure Azure Disk Encryption - Move a virtual machine to another resource group, subscription, or region - Manage virtual machine sizes - Manage virtual machine disks - Deploy virtual machines to availability zones and availability sets - Deploy and configure an Azure Virtual Machine Scale Sets

Provision and manage containers in the Azure portal: Create and manage an Azure container registry - Provision a container by using Azure Container Instances - Provision a container by using Azure Container Apps - Manage sizing and scaling for containers, including Azure Container Instances and Azure Container Apps

Create and configure Azure App Service: Provision an App Service plan - Configure scaling for an App Service plan - Create an App Service - Configure certificates and Transport Layer Security (TLS) for an App Service - Map an existing custom DNS name to an App Service - Configure backup for an App Service - Configure networking settings for an App Service - Configure deployment slots for an App Service - Implement and manage virtual networking (15–20%)

Configure and manage virtual networks in Azure: Create and configure virtual networks and subnets - Create and configure virtual network peering - Configure public IP addresses - Configure user-defined network routes - Troubleshoot network connectivity

Configure secure access to virtual networks: Create and configure network security groups (NSGs) and application security groups - Evaluate effective security rules in NSGs - Implement Azure Bastion - Configure service endpoints for Azure platform as a service (PaaS) - Configure private endpoints for Azure PaaS

Configure name resolution and load balancing: Configure Azure DNS - Configure an internal or public load balancer - Troubleshoot load balancing - Monitor and maintain Azure resources (10–15%)

Monitor resources in Azure: Interpret metrics in Azure Monitor - Configure log settings in Azure Monitor - Query and analyze logs in Azure Monitor - Set up alert rules, action groups, and alert processing rules in Azure Monitor -Configure and interpret monitoring of virtual machines, storage accounts, and networks by using Azure Monitor Insights - Use Azure Network Watcher and Connection Monitor

Implement backup and recovery: Create a Recovery Services vault -Create an Azure Backup vault -Create and configure a backup policy -Perform backup and restore operations by using Azure Backup - Configure Azure Site Recovery for Azure resources - Perform a failover to a secondary region by using Site Recovery - Configure and interpret reports and alerts for backups

Provision and manage containers in the Azure portal: Create and manage an Azure container registry - Provision a container by using Azure Container Instances - Provision a container by using Azure Container Apps -Manage sizing and scaling for containers, including Azure Container Instances and Azure Container Apps

Create and configure Azure App Service: Provision an App Service plan -Configure scaling for an App Service plan -Create an App Service -Configure certificates and Transport Layer Security (TLS) for an App Service -Map an existing custom DNS name to an App Service - Configure backup for an App Service - Configure networking settings for an App Service - Configure deployment slots for an App Service

Monitor resources in Azure: Interpret metrics in Azure Monitor - Configure log settings in Azure Monitor -Query and analyze logs in Azure Monitor -Set up alert rules, action groups, and alert processing rules in Azure Monitor - Configure and interpret monitoring of virtual machines, storage accounts, and networks by using Azure Monitor Insights -Use Azure Network Watcher and Connection Monitor

Configure and manage virtual networks in Azure: Create and configure virtual networks and subnets - Create and configure virtual network peering -Configure public IP addresses -Configure user-defined network routes -Troubleshoot network connectivity

Implement backup and recovery: Create a Recovery Services vault -Create an Azure Backup vault -Create and configure a backup policy -Perform backup and restore operations by using Azure Backup -Configure Azure Site Recovery for Azure resources -Perform a failover to a secondary region by using Site Recovery -Configure and interpret reports and alerts for backups

Title : Microsoft Power BI

Duration : 60 Hrs

Introduction to Power BI and Data Analysis: Introduction to Power BI: Overview of Power BI features and capabilities- Importance of data visualization in decision-making - Fundamentals of Data Analysis - Roles in Data Analysis - Tasks of a Data Analyst: Data collection, cleaning, and transformation - Creation of meaningful visualizations and reports - Extracting actionable insights from data. CRISP DM FRAMEWORK. Using Power BI - Building Blocks of Power BI- Understanding Power BI Desktop and Power BI Service - Differentiating between datasets, reports, and dashboards Collaborative aspects of Power BI, including sharing and collaboration.

Data Cleaning and Transformation in Power BI : Data Acquisition in Power BI - Importing data from various sources - Data transformation and cleaning techniques - Connecting Power BI to relational databases - Importing and querying data from SQL Server and other relational databases.

Data Modelling and DAX Functions: Creating Calculated Columns - Understanding the need for calculated columns - Hands-on exercises on creating and using calculated columns - Exploring Time-Based Data - Handling date and time data in Power BI - Time-based calculations and analysis. DAX Calculations in Data Analysis - Guidelines for choosing and implementing DAX calculations - Practical applications and examples. Star Schema Design - Understanding star schema and its advantages - Implementing star schema in Power BI data models.

Data Visualization in Power BI: Writing DAX Formulas - In-depth exploration of DAX syntax and functions - Advanced DAX calculations for complex data analysis. Designing Detailed Reports - Advanced report design techniques - Utilizing features like tooltips and drill-throughs. Statistical Analysis in Power BI- Advanced statistical functions in DAX - Use of advanced visuals for statistical insights. Creating Dashboards in Power BI - Detailed steps for creating interactive dashboards.

Power BI Services vs Desktop: Configuring Row-Level Security - Implementing security measures at the row level - Best practices for securing sensitive data. Setting Up Data Alerts - Configuring alerts for monitoring changes - Troubleshooting common alert issues. Preparing for PL-300 - Model the Data - Overview of PL-300 exam and key concepts - Practical exercises and scenarios for data modelling.

PSGR Krishnammal College for Women

Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2024 – 2027 BATCH
SEMESTER IV

Semester	Part	Course Code	Title of the Course	Course type	Instruction Hours / Week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
IV	I	TAM2304A/ HIN2304A / FRE2304A	Tamil Paper IV/ Hindi Paper IV/ French Paper IV	L	4	58	2	3	25	75	100	3
IV	II	ENG2404A	English Paper IV	E	4	58	2	3	25	75	100	3
IV	III	CS23C08	Data Mining	CC	4	58	2	3	25	75	100	4
IV	III	CS23C09	Principles of Compiler Design	CC	4	58	2	3	25	75	100	3
IV	III	CS23SCE1	Robotics Process Automation	SEC	3	45	-	-	100	-	100	3
IV	III	BP23A05 AP23A01 CS23A02	Business Accounting Digital Marketing M-Commerce	GE	4	58	2	3	25	75	100	3
IV	III	CS24CP4	Python Programming Lab	CC	5	75	-	3	*15	*35	50	4
IV	IV	NM23EII	Entrepreneurship and Innovation (Ignite X)	AECC	2	30	-	-	100	-	100	2
IV	IV	NM24EVS	Environmental Studies	AECC	SS	-	-	-	100	-	100	Gr.
IV	V	COCOACT	Co-Curricular Activities	GC	-	-	-	-	100	-	100	1
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

AECC	Ability Enhancement Core Course	L	Language
SEC	Skill Enhancement Course	E	English
ACC	Additional Credit Course	CC	Core Course
CA	Continuous Assessment	GC	General Courses
ESE	End Semester	Gr.	Grade
GE	Generic Elective		

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23C08	DATA MINING	THEORY	58	2	-	4

Preamble

This course covers the basic concepts of data mining principles and methods. It provides insight on classification, and clustering techniques and focuses on applications like web mining, text mining and biological data mining.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts of data mining and applications	K1
CLO2	Understand the algorithms and techniques in data mining	K2
CLO3	Apply data mining algorithms in solving real world problems	K3
CLO4	Analyze various data mining concepts to work with different kind of data	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	M
CLO2	S	M	S	S	M
CLO3	M	M	S	M	M
CLO4	S	S	M	S	S

S- Strong; M-Medium.

DATA MINING - CS23C08 -58 HRS

Unit I **(11 Hrs)**

Introduction: Data Mining - KDD vs Data mining-DBMS vs Data Mining-Other Areas-Data mining techniques-Issues and challenges-Application areas.

Unit II **(12 Hrs)**

Association Rule: Introduction-Methods in association rule- Apriori algorithm. Clustering: Introduction- Clustering paradigms -K-medoid algorithms- CLARA- CLARANS - Hierarchical clustering-DBSCAN.

Unit III

(12 Hrs)

Decision Tree: Introduction-Tree construction principles- Best split-splitting indices- splitting criteria- Tree construction algorithms: CART-ID3-C4.5.

Unit IV **(12 Hrs)**

Other Techniques: Introduction-Neural Networks-Learning in NN-Unsupervised Learning-Genetic Algorithm-Support Vector Machine

Unit V **(11 Hrs)**

Data Mining for Bioinformatics: Introduction-Biomedical data analysis. Web Mining: Introduction-Web mining-content mining- structure mining-usage mining-Text mining-unstructured text-Episode rule discovery for texts- hierarchy of categories-Text clustering.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Arun K Pujari	Data Mining Techniques	University Press	2016 and 4th Edn.

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Yi Ping Phoebe Chen	Bio Informatics Technologies	Springer	2014 and 2nd reprint.
2	Pang-Ning Tan, Michael Steinbach and Vipin Kumar.	Introduction to Data Mining	Pearson Education	2016
3	Max Barmer	Principles of Data Mining	Springer	2016 and 3rd Edn.

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Mrs. J. Gayathri

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23C09	PRINCIPLES OF COMPILER DESIGN	THEORY	58	2	-	3

Preamble

The main objectives of this course are to understand the use of translators and compilers. It covers the concept of the phases of a compiler and is familiar with context-free grammars, regular expressions and parsing techniques, intermediate codes, and code generations.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the use of translators and compilers, structure of a compiler and lexical analyzer	K1
CLO2	Understand and apply the context free grammars and parsing Techniques	K2
CLO3	Apply knowledge of syntax-directed translations, intermediate codes, run-time storage schemes, error detection, and recovery.	K3
CLO4	Analyze the problems and apply knowledge on code optimization and code generator	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	M	S
CLO3	S	M	S	S	M
CLO4	S	S	S	S	S

S-Strong; M-Medium.

PRINCIPLES OF COMPILER DESIGN - CS23C09 - 58 HRS

UNIT I (12 Hrs)

Introduction to Compiling: Complier- Analysis of the source program- the phase of a compiler- Th e grouping of phases- Compiler construction tools-A compiler one-pass Compiler: syntax definition-Syntax Translation-Parsing – A translator for simple expressions-Lexical Analysis-Incorporate a symbol table.

UNIT II (11 Hrs)

Lexical Analysis: The role of the lexical analyzer-input buffering -Specification of tokens-Recognition of tokens -A language for specifying lexical analyzers-Finite automata -From a regular expression to an NFA -Design of a lexical analyzer generator-Optimization of DFA based patter matches.

UNIT III **(11 Hrs)**

Syntax Analysis: The role of a parser- Content free grammars-Writing a grammar-top-down parsing -bottom-up parsing -Operator-precedence parsing -LR parsing -using ambiguous grammars-parser generators.

UNIT IV **(12 Hrs)**

Syntax-Directed Translation: Syntax-directed definition -Constructures of Syntax trees-L-attributed definition-Top-down translation-Bottom-up evaluation of inherited attributes. Runtime Environments: Storage organization- storage allocation strategies-parameter passing -symbol table- dynamic storage allocation techniques.

UNIT V **(12 Hrs)**

Intermediate Code Generation: Intermediate languages -Declarations – Assignment statement-Boolean expressions – case statements. Code Generation: The target machine-Runtime storage management-basic blocks and flow graphs- A simple code generator -The DAG representation of basic blocks-Generation code from DAGs. Code Optimization: The principal sources of optimization-optimization-loop in flow graphs-introduction to global data flow analysis-code improving transformations.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Aho Lam Sethi Ullman	Compilers, Principles, Techniques and Tools	Pearson Education Limited	2014 and 2nd Edn.

References Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Randy Allen, Ken Kennedy	Optimizing Compilers for Modern Architectures: A Dependence-based Approach	Morgan Kaufmar Publishers	2002
2	Steven S. Muchnick	Advanced Compiler Design and Implementation	Morgan Kaufmann Publishers Elsevier Science	2003
3	Keith D Cooper and Linda Torczon	Engineering a Compiler	Morgan Kaufmann Publishers Elsevier Science	2004
4	Charles N. Fischer, Richard. J. LeBlanc	Crafting a Compiler with C	Pearson Education	2008

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Dr. K. Sathiyakumari

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
BP23A05	BUSINESS ACCOUNTING	THEORY	58	2	-	3

Preamble

- To impart the knowledge of basic accounting methods
- To enhance the students' knowledge on treatment of accounts practically
- To gain few aspects on the terms of cost and management accounting

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO STATEMENT	Knowledge Level
CLO1	Examine the system of accounting and its applications	K1
CLO2	Infer on practical skills in recording financial transactions	K2
CLO3	Interpret on financial statements for decision making	K3
CLO4	Analyze the financial health and performance of a business	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	L
CLO2	M	M	L	S	M
CLO3	S	M	S	M	M
CLO4	S	S	M	S	M

S- Strong; M-Medium; L-Low.

BUSINESS ACCOUNTING- BP23A05 - 58 Hrs

UNIT I **(12 Hrs)**

Accounting: Definition & Functions - Accounting Concepts & Conventions - Journal - Ledger - Trial Balance**.**

UNIT II **(11Hrs**

Subsidiary Books –Purchase Book – Sales Book – Purchase Return Book – Sales Return Book -Cash Book – Single, Double, Three Column & Petty Cash Book. Depreciation - Methods of Depreciation **–** Straight Line Method and Diminishing Balance Method

UNIT III **(11 Hrs)**

Final accounts – Manufacturing, Trading**,** Profit and Loss Accounts and Balance Sheet with Simple Adjustments.

UNIT IV **(12 Hrs)**

Cost accounting – Elements of Costing – Preparation of Simple Cost Sheet - Pricing of Material Issues – FIFO, LIFO– Labour Cost Accounting – Types of Labour- Labour Cost -Control over Labour Cost- Labour Turnover: Separation, Flux, Replacement Methods

UNIT V **(12 Hrs)**

Management Accounting- Meaning - Objectives & Scope – Need and Significance - Relationship between Management Accounting, Cost Accounting & Financial Accounting. Financial Statement and the importance - Comparative statement – Ratio Analysis (Liquidity Ratios)

Distribution of marks – Theory 40% Problems 60%

Text book:

S.No	Author Name	Book Name	Publisher	Year and edition
1.	Reddy T S & A Murthy	Financial Accounting	Margham Publications	Reprint 2021
2.	Jain S.P & Narang K.L	Cost Accounting	Kalyani Publishers	Reprint 2019
3.	Sharma R.K Sashi, K.Gupta, Neeti Gupta	Management Accounting	Kalyani Publishers	Reprint 2017, Fourth Edition

Books for Reference:

S.No	Author Name	Book Name	Publisher	Year and edition
1.	R LGupta & Radhasamy	Advanced Accountancy (Vol I)	Sultan Chand & Sons	13th Edition,2018

2.	Pillai R.S.N and Bagawathi	Cost Accounting	S Chand &Co	Revised Edition 2019
3.	Dr. Maheswari S.N & Dr.S.N.Mittal	Management Accounting	Sultan Chand & Sons	Reprint 2020

Skill Component

- Prepare detailed report explaining the financial health of the business
- Discussion on the practical implications of subsidiary books, cash management and depreciation in real world accounting
- Prepare a simple cost sheet for a specific product in the business scenario
- Case Study to identify areas where management accounting can be applied
- Analyze liquidity ratios using the provided financial data

Reference Links

UNIT	REFERENCE LINK
I	**https://dl.icdst.org/pdfs/files4/0f26612348bde3539aa50c63b3813f3d.pdf** **https://www.youtube.com/watch?v=-gGO1ZJNmhg**
	https://nios.ac.in/media/documents/SrSec320NEW/320_Accountancy_Eng/320_Accountancy_Eng_Lesson9.pdf **https://betalc.in/wp-content/uploads/2020/10/54996bosfndnov19-p1-cp2-u3.pdf** **https://www.youtube.com/watch?v=w3hhhQxHiwo**
II	**https://mlz.innovasphere.com/SchoolDocuments/REGUGA1164/Works/2275280.pdf** **https://www.nios.ac.in/media/documents/Seccour224New/ch_9.pdf**
	https://www.vedantu.com/commerce/methods-of-depreciation **https://www.youtube.com/watch?v=lCsZfzUwQqk** **https://www.youtube.com/watch?v=v2x9hQNQZyA**
III	**https://egyankosh.ac.in/bitstream/123456789/15449/1/Unit-15.pdf** **https://www.youtube.com/watch?v=BcMyQHz7i5o** **https://www.youtube.com/watch?v=k3S1N8u-Qtc** **https://faculty.ksu.edu.sa/sites/default/files/chapter_5_17.pdf** **https://www.youtube.com/watch?v=4dG7JXdkQ34**
IV	**https://www.economicsdiscussion.net/cost-accounting/elements-of-cost-in-cost-accounting/31700** **https://accountlearning.com/elements-cost-cost-accounting-example/**
	https://khatabook.com/blog/cost-of-labour/ **https://www.youtube.com/watch?app=desktop&v=Pa7AuAN6P_0** **https://www.slideshare.net/bloodysaurabh/labour-cost-accountingafm**
V	**https://commercemates.com/importance-management-accounting/** **https://www.slideshare.net/tangiralasruthi/management-accounting-44401238** **https://datatrained.com/dt-finance/importance-of-management-accounting/**
	https://byjus.com/commerce/uses-and-importance-of-financial-statements/ **https://www.slideshare.net/padumchetry3/financial-statement-40864460**

Pedagogy

Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
AP23A01	DIGITAL MARKETING	THEORY	58	2	-	3

Preamble

This course provides an overall understanding of the various digital marketing platforms and tools available for creating an effective digital marketing strategy. It provides technical skills to design and develop an integrated digital marketing plan for an organization.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the role of digital marketing in marketing strategy	K1
CLO2	Understand the key elements of a digital marketing strategy	K2
CLO3	Apply the role that social marketing plays in the digital marketing	K3
CLO4	Analyze common digital marketing tools such as SEO and social media and apply conceptual frame works of digital marketing	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	S	S	S	M	M
CLO4	S	S	S	M	S

S- Strong; M-Medium.

DIGITAL MARKETING - AP23A01 -58 HRS

Unit I (12 Hrs)

Introduction to Digital Marketing: Introduction - Original and Development of Digital Marketing - Internet Users: Penetration and Kind of Internet Use - Digital Marketing strategy - Digital Advertising Marketing Plan - Ethical and legal of framework of Digital Marketing - Skills Required in Digital Marketing - Digital Advertising: Introduction - Concept of display advertising - Digital Metrics - Types of Digital Ad - Targeting in digital marketing - Challenges faced by display marketing.

Unit II (11 Hrs)

Search Engine Advertising: Introduction - Why pay for search advertising? - Understanding Ad Placement - Understanding Ad Ranks - Why is the Ad rank important? - Create your first Ad Campaign - Google Ads Account - Best practices for creating effective Ads - Enhance your Ad Campaign - Performance Reports - E-Commerce.

Unit III **(12 Hrs)**

Facebook Marketing: Introduction - Organic Marketing - Paid Marketing - Facebook Insights LinkedIn: Introduction - LinkedIn Strategy - Content Strategy - LinkedIn Native Videos - LinkedIn Analytics - Asset Copying - LinkedIn Sales Navigator - Emerging Platforms: Instagram.

Unit IV **(12 Hrs)**

Search Engine Optimization: Introduction - Search Engine - The Concept of SEO - SEO Phases - Website Audit - Content - Social Media Reach – Maintenance - Local Search SEO - SEO Visual Search - Voice Change will change the SEO Industry - Subdomains vs Subfolders - SEO - Website Navigation - External Links - Pop-ups - Advanced Website Features.

Unit V **(11 Hrs)**

Mobile Marketing: Introduction - Mobile Advertising - Mobile Marketing Toolkit - Mobile Marketing Features - Mobile Analytics. Digital Analytics: Introduction - Data Collection - Key Metrics - Experience Analysis - Making Web Analytics Actionable - Types of Tracking Code - Competitive Intelligence.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Seema Gupta	Digital Marketing	McGraw Hill Education	2018 and 2nd Edn.

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Simon Kingsnorth	Digital Marketing Strategy: An Integrated Approach to Online Marketing	Kogan Page	2019 and 2nd Edn.
2	Dave Chaffey	Digital Marketing	Pearson	2019 and 7th Edn.
3	Stephanie Diamond	Digital Marketing All-in-One for Dummies	For Dummies	2019 and 1st Edn.
4	Kevin Hartman	Digital Marketing Analytics: In Theory and In Practice	Ostmen Bennett Bridge Publishing Services	2020 and 2nd Edn.

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. S. Kavitha

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23A02	M-COMMERCE	THEORY	58	2	-	3

Preamble

This course provides an insight on M-Commerce principles and business models. It also explores the concept of mobile commerce technologies, applications, mobile payment methods, security, and ethics.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental concept of E- commerce and process of business models	K1
CLO2	Understand the architecture and applications of M- Commerce	K2
CLO3	Illustrate the risks, issues, legal and security aspects in M- Commerce	K3
CLO4	Analyze the infrastructure, fraud prevention and payment methodologies and examine the legal and ethical issues in mobile commerce	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	S	S	S	S	M
CLO4	S	S	S	M	S

S-Strong; M-Medium.

M-COMMERCE - CS23A02-58 HRS

Unit I (12 Hrs)

Introduction to E- commerce: Introduction - E-commerce - E-business - Categories of E-commerce applications - Traditional and Electronic commerce - Advantages and disadvantages of E-commerce. Business Models of E-commerce: Introduction - Business models of E-commerce- Business to Consumer (B2C) - Business to Business (B2B) - Difference between B2C and B2B - C2C: Definition - Characteristics and Applications of C2C EC

Unit II (11 Hrs)

Mobile commerce and WAP: Introduction to Mobile commerce - Application - Advantages of M-commerce - Wireless Application Protocol - WAP Browser - Features of WAP 2.0 - Technologies of M- commerce

Unit III (12 Hrs)

Mobile commerce Risk, Security and Payment Methods: Introduction - Security and Payment Methods - Mobile Commerce Security - Security Mechanism - Mobile Security - Network

Infrastructure and Security- WLAN and Security - WAP and Security - Mobile commerce payment methods - Mobile payment operations

Unit IV **(12 Hrs)**

Mobile Money Infrastructure and Fraud Prevention for M- Payment: Introduction - Requirement for authentication infrastructure for M-commerce - Trust relationship - Requirement for Mobile commerce - Password based authentication for mobile users with support for public key technology - M - payment value chain - Life cycle - Operational Issues in M-Commerce payment - Mobile payment systems - General analysis of the payment solutions

Unit V **(11 Hrs)**

Legal and Ethical Issues: Introduction - Issues related to E- commerce - Legal issues - Taxation and E-commerce - Cyber Laws: Introduction - Cyber laws in India - Salient Provisions of Cyber Law - Contracting and contract Enforcement - IT act 2000

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Dr. U.S. Pandey & Er. Saurabh Shukla	E- Commerce and Mobile Commerce Technologies	S. Chand & Company Pvt. Ltd	2014 and 2nd Revised Edn.

Reference Books

S.No	Author	Title of the Book	Publisher	Year and Edition
1	Karabi Bandyopadhyay	Mobile Commerce	Prentice Hall India Learning Private Limited	2013
2	Paul May	Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business	Cambridge University Press	2001 and 1st Edn.
3	Norman Sadeh	M-Commerce: Technologies, Services, and Business Models	John Wiley & Sons	2003

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Dr. Rajeswari

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23SCE1	ROBOTIC PROCESS AUTOMATION	THEORY	-	-	-	3

Course Contents **(45Hrs)**

- RPA Basics and Introduction to UiPath (6 Hrs)
- Data Manipulation in RPA (9 Hrs)
- UI Automation and Selectors(8Hrs)
- Control Flow in RPA (7Hrs)
- Automation Techniques in RPA (9Hrs)
- UiPath Orchestrator and Capstone Projects (6Hrs)

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS24CP4	PYTHON PROGRAMMING LAB	PRACTICAL	-	-	75	4

Preamble

This course provides skills in basic programming constructs in Python. It enables to develop skills in implementation of data structures, data analysis and data visualization in Python.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand python programming structure	K1
CLO2	Classify various functions, classes, regular expression in python programming	K2
CLO3	Apply python libraries to implement various data structures	K3
CLO4	Illustrate data analysis and data visualization libraries in python	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	M
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S- Strong; M-Medium.

PYTHON PROGRAMMING LAB - CS24CP4 -75 HRS

List of Programs

- Exercises using conditionals and loops.
- Exercises for implementing functions.
- Exercises using list and their built-in functions.
- Exercises by implementing tuples.
- Exercises by implementing dictionary.
- Exercises using apply (), filter (), map () and reduce () functions.
- Exercises by implementing Modules.
- Exercises by implementing classes and instances.
- Exercises by illustrating regular expression.
- Exercises for implementing files concept.
- Exercises using strings and their built-in functions.
- Exercises for implementing database concepts.

- Exercises Stack and Queue using List
- Exercises Singly Linked List and Hash table
- Exercises to perform data handling using data frames (Creation, inspection, sorting, filtering, merging and grouping)
- Exercises to perform data cleaning (same format of date and categorial data, outlier, normalization, duplicate values and missing values) operations using data frames.
- Exercises to visualize the data using line plot, box plot and histogram.
- Exercises to visualize the data using scatter plot and heat map.

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. J. Gayathri

PSGR
Krishnammal College for Women

Bachelor of Computer Science
Choice Based Credit System (CBCS)
Learning Outcomes Based Curriculum Framework (LOCF)
Syllabus & Scheme of Examination
2024 - 2027 Batch
Semester V

Semester	Part	Course Code	Title of Course	Course Type	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
V	III	CS23C10	Web Design and Development	CC	5	73	2	3	25	75	100	4
V	III	CS23C11	Computer Graphics	CC	5	73	2	3	25	75	100	4
V	III	CS23C12	Software Engineering	CC	5	73	2	3	25	75	100	4
V	III	CS23E01 CS23E02 CS23E03	Parallel Computing Big Data Analytics Virtualization and Cloud Services	DSE	5	73	2	3	25	75	100	5
V	III	CS23CP5	Web Design and Development Lab	CC	5	75	-	3	15#	35#	50	3
V	III	CS24SBP1	DevOps Tools	SEC	3	41	4	-	100	-	100	3
V	III	CS20AC1 CS20AC2	Multimedia Blockchain Technology	ACC	SS	-	-	3	25	75	100	5*
V	IV	NM21CS1	Cyber Security I	GC	2	30	-	-	100	-	100	Gr.
V	VI	CS24COM	Comprehensive Examination	GC	-	-	-	-	100	-	100	Gr.
V	IV	CS23INST	Field work / Institutional Training	GC	-	-	-	-	100	-	100	2
I - V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

*The credit is applicable to candidates who take up the advance learner course exam- additional credits
#CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC : Core Course
CA : Continuous Assessment
ESE : End Semester Examination
SEC : Skill Enhancement Course
ACC : Additional Credit Course
SS : Self-Study
GC : General Courses
Gr. : Grade

Course Code	Course Title	Category	L	T	P	Credit
CS23C10	Web Design and Development	Theory	73	2	-	4

Preamble

This course provides the basics of web page design using PHP / MySQL. It focuses on architecture and built-in components for design and development of dynamic websites.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic constructs of PHP Scripting Language and MySQL	K1
CLO2	Understand the web design elements, functions, Advanced array, error handling, files, data connections and MVC architecture	K2
CLO3	Apply web design methods to solve problems	K3
CLO4	Analyze the web page design requirements and design web pages using PHP / MySQL	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	M
CLO3	S	S	M	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

WEB DESIGN AND DEVELOPMENT - CS23C10 (73 HRS)

Unit I **(14 Hrs)**

Introduction: Basics of HTML, CSS, Server - Side Web Scripting - Syntax and Variables - Control and Functions. Passing Information between Pages: GET Arguments - POST Arguments - Formatting Form Variables - String: Strings in PHP - String Functions.

Unit II **(15 Hrs)**

Arrays and Array Functions: Creating Arrays - Retrieving Values - Multidimensional Arrays - Inspecting Arrays - Deleting from Arrays - Iteration. Advanced Array Functions: Transformations of Arrays- Stacks and Queues. Number Handling: Numerical Types - Mathematical Operators - Simple Mathematical Functions - Randomness - Regular Expressions: Tokenizing and parsing Functions. Handing Exceptions with PHP: Error Handling in PHP.

Unit III **(15 Hrs)**

Working with the File system: PHP File Permissions - File Reading and Writing Functions - File system and Directory Functions - Network Functions - Date and time Functions - Calendar Conversion Functions. Working with Sessions and Cookies: Sessions work in PHP - Session Functions - Configuration Issues - Cookies - Sending HTTP Headers.

Unit IV **(15 Hrs)**

Structured Query Language (SQL): Relational Database and SQL-SQL standards - The Workhorses of SQL-Database Design-Privileges and Security. PHP and MYSQL: Connecting to MySQL - Making MySQL Queries - Fetching Data Sets - Multiple Connections - Error Checking - Creating MySQL Databases with PHP - MySQL Functions.

Unit V **(14 Hrs)**

Understanding the core concepts of Laravel 5 - Setting up the environment - Basic Architecture of Laravel Applications - Laravel Application Life cycle - Artisan command-line interface - MVC and routes - Connecting with a database.

Text Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Steve Suehring Tim Converse and Joyce Park	PHP 6.0 and MySQL Bible	Wiley	2009, 1st Edition
2	Fernando Monteiro	Hands-On Full-Stack Web Development with Angular 6 and Laravel 5	Packt Publisher	2018, 1st Edition

Reference Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Jon Ducket	PHP & MySQL	Wiley	2014, 1st Edition
2	Luke Welling and Laura Thomson	PHP and MySQL Web Development	Pearson Education	2016, 5th Edition
3	Martin Bean	Laravel 5 Essentials	Packt Publishing Limited	2015, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. K. Sathiyakumari

Course Code	Course Title	Category	L	T	P	Credit
CS23C11	Computer Graphics	Theory	73	2	-	4

Preamble

This course provides the fundamentals of computer graphics and Augmented Reality (AR). It also focuses on 2D & 3D transformations & viewing and applications of AR Technology.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamentals of computer graphics and augmented reality	K1
CLO2	Understand the working principle of display devices, 2D & 3D transformations & viewing and AR technology	K2
CLO3	Apply computer graphic algorithms to solve problems	K3
CLO4	Illustrate the steps to perform 2D & 3D graphic representation in applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	M	S

S-Strong; M-Medium.

COMPUTER GRAPHICS - CS23C11 (73 HRS)

Unit I **(14 Hrs)**

Basic Concepts: Uses of computer graphics - Display devices - Color CRT Monitors - Direct view storage tube - Flat panel displays - Raster scan systems - Random scan system - Input and Hard copy Devices.

Unit II **(15 Hrs)**

Line drawing algorithms: DDA Algorithm - Bresenham's Line Drawing Algorithm - Circle Generating Algorithms: Properties of circles - Midpoint circle algorithm. Two dimensional transformations: Basic transformations - Composite transformation of translation - Rotation - Scaling - Other transformations: Reflection - Shear.

Unit III **(15 Hrs)**

Two-dimensional viewing: Clipping Operations - Point clipping - Line clipping: Cohen Sutherland line clipping - Curve clipping - Text clipping - Exterior clipping. Three dimensional concepts: Three-dimensional display methods - Three dimensional geometric and modeling transformations: Translation, Rotation and Scaling.

Unit IV **(15 Hrs)**

Augmented Reality: Definition - Components of Augmented Reality - History of Augmented Reality - Augmented Reality - Differences between Augmented Reality and Virtual Reality - Difference between AR and QR Codes - Challenges with AR - Opportunities for Augmented Reality

- Types of Augmented Reality - Augmented Reality Working - Augmented Reality Methods - AR Display Technology - Interaction in AR Applications.

Unit V **(14 Hrs)**

Value of Augmented Reality: Next User Interface - Uses of Augmented Reality: Sports, Gaming, and Entertainment, Education - Maintenance and Repair - Medicine - Business and Commerce - AR Tools: Unity - Vuforia - Introduction - Big Trends - Technical Trends - Future Concepts for Augmented Reality - AR Contact Lenses.

Text Books

S. No	Author	Title of the Book	Publishers	Year and Edition
1	Donald Hearn, M. Pauline	Computer Graphics	Pearson	2012, 2nd Edition
2	Gregory Kipper, Joseph Rampolla	Augmented Reality	O'Reilley	2012, 1st Edition

Reference Books

S. No	Author	Title of the book	Publisher	Year and Edition
1	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	Taylor & Francis Group	2021, 5th Edition
2	Jay David Bolter, Morya Engberg, Blair Maclntyre	Reality Media Augmented & Virtual Reality	The MIT Press, Cambridge	2021, 1st Edition
3	Jonathan Linowes	Augmented Reality with Unity AR Foundations	Packt Publishing	2021, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. S. Karpagavalli

Course Code	Course Title	Category	L	T	P	Credit
CS23C12	Software Engineering	Theory	73	2	-	4

Preamble

This course provides the fundamentals of software engineering process in software development It also covers software process models, requirement analysis, design, testing and quality assurance.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts of software engineering in software development life cycle	K1
CLO2	Understand common lifecycle processes to plan and deliver an effective Software engineering Process	K2
CLO3	Apply software engineering principles to develop software systems	K3
CLO4	Demonstrate the concepts of software engineering by solving software design-based problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	M	S

S-Strong; M-Medium.

SOFTWARE ENGINEERING - CS23C12 (73 HRS)

Unit I **(14 Hrs)**

Software and Software Engineering: Nature of software - Software myths Process Models: Generic process model - Process assessment and improvement - Prescriptive process models-Specialized process models - Unified process - Personal and team process models - Process technology - Product and process.

Unit II **(15 Hrs)**

Agile Development: Agility - Agility and the cost of change - Agile process - Extreme programming (XP) - Agile process models -Tool set for the agile process. DevOps: Introduction to DevOps - Getting started with DevOps - Continuous Integration and Continuous Delivery - The CI/CD principles - Using a package manager - Using Jenkins.

Unit III **(15 Hrs)**

Understanding Requirements: Requirement's engineering- Establishing the groundwork - Eliciting requirements - Developing use cases - Building the requirements model - Negotiating requirements

- Validating requirements. Requirements modeling: Scenarios, Information and Analysis Classes Requirements analysis - Scenario - based modeling.

Unit IV **(15 Hrs)**

Design Concepts: Design within the context of software engineering - Design process - Design concepts - Design model Architectural design: Software architecture - Architectural genres - Architectural styles.

Unit V **(14 Hrs)**

Software Quality Assurance: Background issues - Elements of software quality assurance - SQA tasks, goals and metrics - Formal approaches to SQA - Statistical software quality assurance - Software reliability - The ISO 9000 quality standards - SQA plan. Software Testing Strategies: Strategic Approach to software testing - Verification and validation - Organizing for software testing - Software testing strategy - Criteria for completion of testing. Software Process Improvement: SPI - SPI process - CMMI - People CMM.

Text Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Roger S. Pressman, Bruce R Maxin	Software Engineering - A Practitioner's Approach	Mc-Graw Hill Education	2023, 9th Edition
2	Mikael Krief	Learning DevOps (Unit II)	Packt Publishing Ltd.	2019, 1st Edition

Reference Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Ian Sommerville	Software Engineering	Pearson Education	2017, 10th Edition
2	Richard Fairley	Software Engineering Concepts	Mc-Graw Hill Education	2024, 9th Edition
3	Rajib Mall	Fundamentals of Software Engineering	Prentice Hall India Learning Private Limited	2014, 4th Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Mrs. J. Gayathri

Course Code	Course Title	Category	L	T	P	Credit
CS23E01	Parallel Computing	Theory	73	2	-	5

Preamble

This course provides knowledge on hardware and the software work, starting from simple systems to complex shared resource architectures and shared memory programming paradigm.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the concepts of parallel computing and architectures	K1
CLO2	Understand the architecture of future multi- and many-core processor systems	K2
CLO3	Apply serial programs and algorithms to solve problems	K3
CLO4	Illustrate the pragmatic approach of parallel computing	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	M
CLO2	S	M	S	S	M
CLO3	M	M	S	M	M
CLO4	S	S	M	S	S

S- Strong; M-Medium.

PARALLEL COMPUTING - CS23E01 (73 HRS)

Unit I (15 Hrs)

Introduction: Why do we need High speed computing? - How do we increase the speed of computers? - History of parallel computers - Some interesting features of parallel computers. Instruction Level parallel processing: some example commercial processors - multithreaded processors - Proposed future processor architectures

Unit II (14 Hrs)

Structure of parallel computers: A generalized structure of a parallel computer - Shared memory parallel computers - interconnection networks - Distributed shared memory parallel computers

Unit III (15 Hrs)

Introduction: Computational demands of modern science - Advent of practical parallel processing - Parallel processing terminology - The sieve of Eratosthenes. PRAM Algorithms: A model of serial computation - The PRAM model of parallel computation. PRAM algorithms: Parallel reduction - merging two sorted lists

Unit IV **(15 Hrs)**

Processor Arrays, Multiprocessors and Multicomputer: Processor organizations - Processor arrays - Multiprocessors - multicomputer - Flynn's taxonomy - speedup, scaled speedup and parallelizability

Unit V **(14 Hrs)**

Parallel programming languages & algorithms: Parallel language & algorithm design for the array processor - other von Neumann - type languages - C, C++ & parallel C++ - Non-von Neumann - type languages

Text Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Michael J Quinn	Parallel Computing	Tata Mc-Graw Hill	2008, 2nd Edition
2	V. Rajaraman, C. Siva Ram Murthy	Parallel Computers Architecture and Programming	Prentice Hall of India Pvt. Ltd	2008, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Micheal McCool, Arch D. Robinson, James Reindres	Structured Parallel Programming	Morgan Kaufmann Publishers	2012, 1st Edition
2	Wilkinson Barry, Michael Allen	Parallel and Concurrent Programming	Pearson Education	2012, 1st Edition
3	Peter Pacheco	Introduction to Parallel Programming	Morgan Kaufmann Publishers	2011, 1st Edition

Pedagogy

- Lecture, Group Discussion, Case Studies

Course Designer

- Dr. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
CS23E02	Big Data Analytics	Theory	73	2	-	5

Preamble

The course provides an introduction to big data analytics, tools and techniques. It introduces Hadoop architecture and map reduce programming model. It also provides knowledge on NoSQL databases, querying model and applications in big data.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basics of big data, tools and techniques in big data analytics	K1
CLO2	Understand the programming models, data storage and querying models and data visualization in big data analytics	K2
CLO3	Apply the big data analytics methods and tools for solving real-world problems	K3
CLO4	Analyze the specific business case and apply appropriate data analytic tools and methods	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

BIG DATA ANALYTICS - CS23E02 (73 HRS)

Unit I **(15 Hrs)**

Overview of Big Data: Defining Big Data - Big Data Types - Big Data Analytics - Industry Examples of Big Data - Big Data and Data Risk - Big Data Technologies - Benefits of Big Data - Basics of Hadoop: Big Data and Hadoop - Hadoop Architecture -Main Components of Hadoop Framework – Analyzing Big Data with Hadoop - Benefits of Distributed Applications - Hadoop Distributed File System - Advantages of Hadoop - Ten Big Hadoop Platforms

Unit II **(15 Hrs)**

Hadoop Distributed File System: Architecture of APACHE Hadoop HDFS - File Systems - HDFS File Blocks - HDFS File Commands. Map Reduce: Introduction to Map Reduce - Working of Map Reduce - Map operations - Map Reduce Program - Map Reduce User Interfaces.

Unit III **(15 Hrs)**

NoSQL Databases: NoSQL Data Management - Types of NoSQL Databases - Query Model for Big Data - Benefits of NoSQL. HBase, CASSENDRA and JAQL: Introduction to HBase - Row-oriented and Column-oriented Data Stores - HDFS Vs HBase - HBase Architecture - HBase Data Model - Understanding HBase Data Model - Introduction to Cassandra - Features - Data Replication - Components - Cassandra Query Language - Data Model - Data models of Cassandra and RDBMS. Introduction to JAQL - JSON - Components of JAQL.

Unit IV **(14 Hrs)**

HIVE: Introduction to Hive - Data Models - Building Blocks - Data file formats - Hive for Data warehousing - HiveQL - Data Manipulation - Queries - Hive - Built in Functions. PIG: Introduction - Components - PIG Program Execution Modes - Data formats and Models - Pig vs SQL - Pig Vs Map Reduce - Difference between Hive and Pig - Apache Pig history

Unit V **(14 Hrs)**

Data Visualization Tools: Tableau - Advantages - Creating Visualization - Text Table - Heat Maps - Maps with calculated Colours - Creating Maps - Dashboard. Applications: WALMART: How Big Data is used to Drive Supermarket Performance - NETFLIX: How Netflix Used Big Data to Give Us the Programmes We Want - FACEBOOK: How Facebook Use Big Data to Understand Customers

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	V.K. Jain	Big Data and Hadoop	Khanna Book Publishing	2017, 1st Edition
2	Chandraish Sinha	Tableau 10 for Beginners	Createspace Independent Pub	2018, 1st Edition
3	Bernard Marr	Big Data in Practice	Wiley Publications	2016, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	G. Sudha Sadasivam and R. Thirumahal	Big Data Analytics	Oxford University Press	2020, 1st Edition
2	Arshdeep Bahga and Vijay Madisetti	Big Data Analytics: A Hands-On Approach	VPT	2018, 1st Edition
3	Paul Zikopoulos and Chris Eaton	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	Tata McGraw Hill	2011, 1st Edition

Pedagogy

- Lecture, Demonstration, Group Discussion

Course Designer

- Dr. S. Karpagavalli

Course Code	Course Title	Category	L	T	P	Credit
CS23E03	Virtualization and Cloud Services	Theory	73	2	-	5

Preamble

This course provides an insight on virtualization, cloud services and data centers. It also emphasizes on various cloud service providers, cloud deployment models and hypervisors.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamentals of cloud, essentials of virtualization and datacenters	K1
CLO2	Understand the cloud services, service models and virtualization types	K2
CLO3	Apply cloud services and virtualization for effective use of resources	K3
CLO4	Analyze different cloud services, security threats, virtualization and data centers for various business categories	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	M	S
CLO3	M	S	S	S	S
CLO4	S	M	S	S	S

S-Strong; M-Medium.

VIRTUALIZATION AND CLOUD SERVICES - CS23E03 (73 HRS)

Unit I **(15 Hrs)**

Computing Paradigms - Cloud Computing Fundamentals: Motivation for Cloud Computing- Defining Cloud Computing - Principles of Cloud computing- Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks. Cloud Computing Architecture and Management: Introduction - Cloud Architecture -Core components and service layers- Anatomy of the Cloud - Managing the Cloud - Migrating Application to Cloud.

Unit II **(15 Hrs)**

Cloud Deployment Models: Introduction - Private Cloud - Public Cloud - Community Cloud - Hybrid Cloud -Comparative analysis and real-world applications. Cloud Service Models: Introduction - Infrastructure as a Service - Platform as a Service - Software as a Service - Web2.0 and Cloud Computing - Components of Web 3. 0 - Emerging Cloud service models and industry trends.

Unit III **(15 Hrs)**

Virtualization: Introduction - Approaches to virtualization: Hardware, OS, and application-level – Hypervisors: Types and functionalities - multi-core and parallel processing in virtualization-Memory

and Storage Technology in virtualized environments. Security in Cloud: Introduction- key security challenges and mitigation strategies- Platform-Related Security - Audit, compliance, and regulatory considerations.

Unit IV **(14 Hrs)**

Cloud Service Providers: Introduction - EMC - Google - Sales force - Amazon Web Services: S3 - EBS - EC2 -Dynamo DB - Microsoft - IBM

Unit V **(14 Hrs)**

Data Centers: Overview, purpose, and classification– Data center goals – Data center facilities - Role of data centers in the enterprise - Role of data centers in the service provider environment - Application architecture models - Cloud-based data center architectures - Essential data center services and operational best practices.

Text Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	K. Chandrasekaran	Essentials of Cloud Computing (Unit I, II, III & IV)	CRC Press	2025, Reprint
2	Mauricio Arregoces, Maurizio Portolani	Data Center Fundamentals (Unit V)	Cisco press	2021, 2st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Ray Rafaels	Cloud Computing	Create Space Independent Publishing Platform	2018, 2nd Edition
2	Curtis Franklin Jr. and Brian Chee	Securing the Cloud: Security Strategies for the Ubiquitous Data Center	Auerbach Publications	2019, 1st Edition
3	Dinseh G. Dutt	Cloud Native Data Center Networking: Architecture, Protocols, and Tools	O'Reilly Media	2019, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designers

- Mrs. S. Kavitha

Course Code	Course Title	Category	L	T	P	Credit
CS23CP5	Web Design and Development Lab	Practical	-	-	75	3

Preamble

This course provides a hands-on training in web page design using PHP / MySQL. It focuses on Architecture and built-in components of PHP / MySQL for design and development of dynamic websites.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the installation of PHP / MySQL	K2
CLO2	Apply PHP / MySQL, MVC architecture in web development	K3
CLO3	Apply the components of PHP / MySQL for web development	K3
CLO4	Demonstrate the steps in building dynamic website using PHP / MySQL	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	M	S
CLO3	S	S	S	S	S
CLO4	S	M	S	S	S

S- Strong; M-Medium.

WEB DESIGNING AND DEVELOPMENT LAB - CS23CP5 (75 HRS)

List of Exercises

- Simple web page using html
- Design web page using CSS
- Control Structure & Loops in PHP
- String Functions in PHP
- Array and function in PHP
- Form handling in PHP
- Advanced array in PHP
- Exception handling in PHP
- Server-Side Validation and Page Redirection in PHP
- Cookies and Sessions in PHP
- File / Image Uploading in PHP
- PHP Data Base Connectivity with MYSQL
- MySQL functions
- Develop a web application using Laravel framework

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. S. Ponmalar