



PSGR Krishnammal College for Women



DEPARTMENT OF COMPUTER SCIENCE

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

**BACHELOR OF COMPUTER SCIENCE
2021 - 2024 BATCH**



Programme Learning Outcomes

After completion of the programme, 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

Programme 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

		NME19A2/ NME19B2	** Advanced Tamil / Basic Tamil	AEC	-	-	-	-	-	-	-	Grade
II	V	21PEPS1	Professional English for Physical Sciences	AEC	3	40	5	2	50	50	100	2
II	VI	NM12GAW	General Awareness	AEC	Self- Study	-	-	OT	100	-	-	Grade
III	III	CS21C04	Core 4: Operating System	CC	5	71	4	3	50	50	100	4
III	III	CS21C05	Core 5: Data Structures	CC	5	71	4	3	50	50	100	4
III	III	PDB2103	Core 6: Database Management Systems	CC	5	71	4	3	50	50	100	4
III	III	CS21CP3	Programming Lab 3: DBMS Lab	CC	4	60	-	3	25	25	50	2
III	III	CS21SBP1 / CS21SBCE	SBS I - Robotic Process Automation Tools / Coursera - Data Visualization Tools	SEC	3	45	-	2	40	60	100	3
III	III	TH21A13	Allied A3: Optimization Techniques	GE	6	86	4	3	50	50	100	5
III	IV	NM21EVS	Foundation Course II: Environmental Studies	AECC	Self- Study	-	-	-	100	-	100	Grade
III	IV	NM21UHR	Foundation Course III: Universal Human Values and Human Rights	AECC	2	26	4	-	100	-	100	2
III & IV	IV		Job Oriented Course: Amazon Web Services	-	-	-	-	3	-	-	-	Grade
IV	III	CS21C07	Core 7: Data Mining	CC	5	71	4	3	50	50	100	4
IV	III	CS21C08	Core 8: Computer Networks	CC	5	71	4	3	50	50	100	4
IV	III	CS21C09	Core 9: Python Programming	CC	5	71	4	3	50	50	100	4
IV	III	CS21CP4	Programming Lab 4: Python Programming and Bioinformatics Lab	CC	4	60	-	3	25	25	50	3
IV	III	CS21SBP2 /CS20SBCE	SBS II- Data Mining Tools / Coursera- Data Visualization Tools	SEC	3	45	-	2	40	60	100	3

IV	III	BP21A05 PD21A01 PM21A02	Allied A4 Paper I: Business Accounting Paper II: Digital Marketing Paper III: M-Commerce	GE	6	86	4	3	50	50	100	5
IV	IV	NM21DTG	Design Thinking	FSPA	2	26	4	-	100	-	100	2
IV	V		NSS/NCC/YRC/Sports& Games		-	-	-	-	-	-	100	1
IV		COM15SER	Community Oriented Service		-	-	-	-	-	-	-	Grade
V	III	CS21C10	Core 10: Web Design and Development	CC	5	73	2	3	50	50	100	4
V	III	CS21C11	Core 11: Computer Graphics	CC	5	73	2	3	50	50	100	4
V	III	CS21C12	Core 12: Software Engineering	CC	5	73	2	3	50	50	100	4
V	III	CS21E01 CS21E02 CS21E03	Elective 1: Parallel Computing Elective 2: Big Data Analytics Elective 3: Virtualization and Cloud Services	DSE	5	73	2	3	50	50	100	5
V	III	CS21CP5	Programming Lab 5: Web Design and Development Lab	CC	5	75	-	3	25	25	50	3
V	III	CS20SBCE	Coursera - Data Visualization Tools	SEC	3	45	-	-	-	100	100	3
V	IV	NM21CS1	Cyber Security 1	AECC	2	30	-	-	100	-	100	Grade
V	III	CS20AC1 CS20AC2	Advance Learner Course 1 Paper 1: Multimedia Paper 2: Blockchain Technology		-	-	-	3	25	75	100*	5*
V	VI		Comprehensive Exam		-	-	-	1	-	100	100	Grade
V	IV	INST1	Field work / Institutional training		-	-	-	-	100	-	100	2
V			Personality Development		-	-	-	-	-	-	-	Grade

* 100 Marks Converted into 50 Marks

** Outside Regular Class Hours

CC : Core Course
GE : Generic Elective
AECC : Ability Enhancement Compulsory Course
CA : Continuous Assessment
ESE : End Semester Examination
DSE : Discipline Specific Elective

Mapping with Programme Learning Outcomes

Course 1 - PP21C01

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

Course 2 - CS21CP1

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

Course 3 - CS21C02

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

Course 4 - CS21C03

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

Course 5 - CS21CP2

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

Course 6 - 21PEPS1

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	M	S	S	M	S
CLO4	S	S	S	M	S
CLO5	S	M	M	S	S

Course 7 - CS21C04

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

Course 8 - CS21C05

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

Course 9 - PDB2103

CLOs	PLO1	PLO2	PO3	PO4	PO5
CLO1	M	S	M	S	M
CLO2	S	M	S	S	M
CLO3	M	S	S	M	S
CLO4	S	M	M	S	M

Course 10 - CS21CP3

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

Course 11 - CS21SBP1

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

Course 12 - CS21C07

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

Course 12 - CS21C08

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

Course 13 - CS21C09

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

Course 14 - CS21CP4

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

Course 15 - CS21SBP2

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

CLO3	S	S	S	S	M
CLO4	S	S	S	S	S

Course 16 - PD21A01

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

Course 17 - PM21A02

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

Course 18 - CS21C10

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

Course 19 - CS21C11

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

Course 20 - CS21C12

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

Course 21 - CS21E01

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

Course 22 - CS21E02

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

Course 23 - CS21E03

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

Course 24 - CS21CP5

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

Course 25 - CS21SBP2

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

Course 26 - CS20AC1

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

Course 27 - CS20AC2

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

Course Number	Course Name	Category	L	T	P	Credit
PP21C01	Programming in C	Theory	56	4	-	4

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	Know the programming constructs and structure of C programming	K1
CLO2	Differentiate arrays, strings and structures	K2
CLO3	Apply functions to solve problems using procedure oriented approach	K3
CLO4	Illustrate data handling through files and analyze various industry 4.0 technologies and automation processes in different domains	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; L - Low

Programming in C - PP21C01

(56 Hrs)

Syllabus

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

11 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**11 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 of Publication
1	E. Balagurusamy	Programming In ANSI C	Tata Mc Graw Hill	8 th Edition, 2019
2	P. Kaliraj, T. Devi	Higher Education for Industry 4.0 and Transformation to Education 5.0	CRC Press - Taylor & Francis Group	1 st Edition, 2021

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. C. Arunpriya
- Dr. R. Kavitha

Course Number	Course Name	Category	L	T	P	Credit
CS21CP1	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 fundamental programming concepts	K1
CLO2	Differentiate built-in functions and apply user defined functions to solve problems	K2
CLO3	Demonstrate the concepts of structures and pointers	K3
CLO4	Design and develop the programs using files	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; L - Low

C Programming Lab - CS21CP1

(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

- Dr. R. Vishnupriya

Course Number	Course Name	Category	L	T	P	Credit
CS21C02	Computer Organization and Architecture	Theory	41	4	-	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; L - Low

Computer Organization and Architecture - CS21C02

(41 Hrs)

Syllabus

Unit I

9 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

8 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

8 Hrs

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

8 Hrs

Addressing modes - Data Transfer and Manipulation - Program Control. Computer Arithmetic: Addition and Subtraction.

Unit V

8 Hrs

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

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	M Morris Mano	Computer System Architecture	Pearson Education	3 rd Edition, 2017

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Mrs. V. Deepa

Course Number	Course Name	Category	L	T	P	Credit
CS21C03	Java Programming	Theory	71	4	-	5

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	Understand object oriented concepts - classes, objects, inheritance, polymorphism	K1
CLO2	Illustrate exception handling and file handling in java	K2
CLO3	Apply collection framework classes to perform data manipulation operations	K3
CLO4	Demonstrate database connectivity using JDBC	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; L - Low

Java Programming - CS21C03

(71 Hrs)

Syllabus

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 - Hashset - Linked List - Array List - Vector - Hashmap – Hash Table - Arrays - String Tokenizer - Calendar - Date Class.

Unit V**13 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
- Dr. R. Vishnupriya

Course Number	Course Name	Category	L	T	P	Credit
CS21CP2	Java Programming and Bio Informatics 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	K1
CLO2	Demonstrate principle of inheritance, interface, file and exception handling	K2
CLO3	Implement data structures using java collection framework	K3
CLO4	Design and build database connectivity applications and analyze biological data	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; L - Low

Java Programming and Bio Informatics Lab - CS21CP2

(75 Hrs)

List of Programs

- Exercises using classes and objects
- Exercises using a string
- Exercises using inheritance
- Exercises using interfaces
- Exercises to implement exception handling
- Exercises using streams and files
- Exercises using collection framework - Stack class
- Exercises using collection framework - HashMap and Hash Table

- Exercises using collection framework - Date and Calendar class
- Exercises using JDBC
- Explore the sitemap of NCBI and PUBMED and find the official gene symbol, alias name, chromosome number and ID for a particular sequence
- Retrieve the Genbank entry with an accession number AF375082 and save the sequence in FASTA format
- Retrieve protein sequences from Protein Data Bank (PDB) and analyze the primary, secondary and tertiary protein structure using tools
- Retrieve nucleotide sequences and perform local alignment and global alignment using EMBOSS

Pedagogy

- Demonstration of working environment / Tools / Software / Programs

Course Designer

- Dr. S. Karpagavalli
- Dr. R. Vishnupriya

Course Number	Course Name	Category	L	T	P	Credit
21PEPS1	Professional English for Physical Sciences	Theory	40	5	-	2

Preamble

1. To develop the language skills of students by offering adequate practice in professional contexts.
2. To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
3. To focus on developing students' knowledge of domain specific registers and the required language skills.
4. To develop strategic competence that will help in efficient communication
5. To sharpen students' critical thinking skills and make students culturally aware of the target situation.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recognize their own ability to improve their own competence in using the language	K1
CLO2	Use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	Read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	Understand the importance of writing in academic life	K3
CLO5	Write simple sentences without committing error of spelling or grammar	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	M	S	S	M	S
CLO4	S	S	S	M	S
CLO5	S	M	M	S	S

S - Strong; M - Medium; L - Low

Unit I - Communication

8 Hrs

- Listening** : Listening to audio text and answering question - Listening to instructions
- Speaking** : Pair work and small group work
- Reading** : Comprehension passages - Differentiate between facts and opinion
- Writing** : Developing a story with pictures
- Vocabulary** : Register specific - Incorporated into the LSRW tasks

Unit II - Description **8 Hrs**
Listening : Listening to process description - Drawing a flow chart
Speaking : Role play (formal context)
Reading : Skimming / Scanning- Reading passages on products, equipment and gadgets
Writing : Process description - Compare and contrast paragraph - Sentence definition and Extended definition - Free writing.
Vocabulary : Register specific - Incorporated into the LSRW tasks

Unit III - Negotiation Strategies **8 Hrs**
Listening : Listening to interviews of specialists / Inventors in fields (Subject specific)
Speaking : Brainstorming (Mind mapping) - Small group discussions (Subject- Specific)
Reading : Longer Reading text.
Writing : Essay Writing (250 words)
Vocabulary : Register specific - Incorporated into the LSRW tasks

Unit IV - Presentation Skills **8 Hrs**
Listening : Listening to lectures
Speaking : Short talks
Reading : Reading Comprehension passages
Writing : Writing Recommendations - Interpreting Visuals inputs
Vocabulary : Register specific - Incorporated into the LSRW tasks

Unit V - Critical Thinking Skills **8 Hrs**
Listening : Listening comprehension - Listening for information.
Speaking : Making presentations (with PPT- practice)
Reading : Comprehension passages - Note making. Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)
Writing : Problem and Solution essay - Creative writing - Summary writing
Vocabulary : Register specific - Incorporated into the LSRW tasks

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Tamil Nadu State Council for Higher Education (TANSCHE)	English for Physical Sciences Semester II	-	-

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

Course Number	Course Name	Category	L	T	P	Credit
CS21C04	Operating System	Theory	71	4	-	4

Preamble

This course provides the basic operating system fundamentals and Linux operating system. The course covers deadlock, storage management, file system, I/O systems, virtual machines and distributed systems.

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 virtualization 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; L-Low

Operating System- CS21C04

(71Hrs)

Syllabus

Unit I

14 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 Debugging- Operating System Generation** - **Types of SystemCalls**.

Unit II

15 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**- Thread Scheduling.

Unit III**14 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- Swap Space Management -**RAID Structure**.

Unit IV**14 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**14 Hrs**

Virtual Machines: Overview - Benefits and Features- Building Blocks -Types of Virtual Machines and their implementations - **Virtualization and Operating System Components** - Examples Distributed Systems: Advantages of Distributed Systems - Types of Network based Operating Systems. **Linux System: Introduction** - Programming Linux. **Shell Programming: Shell Introduction** - Pipes and Redirection - Shell Syntax - Working with Files: Linux File Structure -**The Standard i/o Library** - Formatted Input Output - File and Directory Maintenance

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Abraham G Silberschatz	Operating System	Wiley Publisher	10 th Edition, 2017

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Andrew.S. Tannenbaum	Modern operating System	Pearson Education	2014
2	Abraham Silberschatz, PeterB.Galvin, GregGane	Operating System Concepts	Wiley Global Education	9 th Edition, 2012

Note

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

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Ms. P. Parvathi

Course Number	Course Name	Category	L	T	P	Credit
CS21C05	Data Structures	Theory	71	4	-	4

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; L-Low.

Data Structures- CS21C05

(71Hrs)

Syllabus

Unit I

14 Hrs

Introduction and Overview: Introduction - Basic Terminology; Elementary Data Organisation - **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** - Representation of Linear Arrays in Memory - Traversing Linear array - Inserting and Deleting - Multidimensional Array.

Unit II

14 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 - Dequeue - PriorityQueues.

Unit III**15 Hrs**

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

Unit IV**14 Hrs**

Trees: Introduction - Binary Trees - Representing Binary Trees in Memory-traversing binary trees-**Graphs: Terminology and Representations**- Sequential Representation of Graphs- Adjacency Matrix, PathMatrix.

Unit V**14 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	5 th 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	Designand Analysis of Algorithms	Pearson Education	2014

Note

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

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Dr. J. Viji Gripsy

Course Number	Course Name	Category	L	T	P	Credit
PDB2103	Database Management Systems	Theory	71	4	-	4

Preamble

This course provides an insight on the basics of database, database design, relational model and querying a database. It also gives an overview of NoSQL databases and storing and accessing data in a key/value database MongoDB.

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 database management and NoSQL databases	K1
CLO2	Understand DDL, DML SQL statements and PL/SQL programming	K2
CLO3	Apply various queries, PL/SQL program to store and retrieve data from databases	K3
CLO4	Analyze the working of SQL, PL/SQL program, NoSQL database to solve real-world problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PO3	PO4	PO5
CLO1	M	S	M	S	M
CLO2	S	M	S	S	M
CLO3	M	S	S	M	S
CLO4	S	M	M	S	M

S- Strong; M-Medium; L-Low

Database Management Systems - PDB2103

(71 Hrs)

Syllabus

Unit I

14 Hrs

Database Concepts: Introduction - Relationships - DBMS - Relational data model - Integrity rules - **Theoretical relational languages**. Database Design: Data modeling - **Dependency** - Database design - Normal forms - **Dependency diagrams** - **Denormalization**.

Unit II

14 Hrs

Structured Query Language (SQL): Introduction - DDL - Naming rules and conventions - Data types - **Constraints** - Creating table - Displaying table information - **Altering an existing table** - **Dropping, renaming and truncating table** - Table type. Working with tables: DML - adding a new row/record - updating and deleting existing rows/records - Retrieving data from table - Sorting - CASE structure.

Unit III**14 Hrs**

Functions and Grouping: Built-in functions - Grouping data. Joins and Views: **Join -Join types.** Views: Views - **Creating a view - Removing a view - Altering a view.** PL/SQL: Fundamentals-Block structure - comments - Data types - Other data types - Variable declaration - Assignment operation.

Unit IV**14 Hrs**

Control Structures and Embedded SQL: Control structures - Nested blocks - SQL in PL/SQL - Data manipulation -**Transaction control statements.** PL/SQL Cursors: **Cursors -Implicit & explicit cursors and attributes** - cursor FOR loops - Records - Tables - **Procedures -Functions -Triggers.**

Unit V**15 Hrs**

An overview of NoSQL - **Characteristics of NoSQL - NoSQL storage types** - Advantages and Drawbacks - MongoDB Introduction -**Creating database and Dropping database - Creating collection and Dropping collection** -Insert, query and update document.

Text Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Nilesh Shah	Database Systems Using Oracle	Prentice Hall of India	2 nd Edition, 2016
2	Gaurav Vaish	Getting Started with NoSQL	Packt	2013

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Rajesh Narang	Database Management Systems	Prentice Hall of India	2 nd Edition, 2011
2	PramodSadalge, Martin Fowler	NoSQL Distilled	Addison-Wesley	2012
3	Kristina Chodorow	MongoDB: Definitive Guide	Oreilly	2 nd Edition, 2015

Note

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

Pedagogy

- Lecture, Demonstration, Case Studies

Course Designers

- Dr. S. Karpagavalli

Course Number	Course Name	Category	L	T	P	Credit
CS21CP3	DBMS Lab	Practical	-	-	60	2

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 experience a NoSQL key/value store database MongoDB.

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 primary and foreign key constraints	K2
CLO3	Apply functions and joins on data	K3
CLO4	Demonstrate PL/SQL programming on databases and differentiate Key/value store database from relational database	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; L-Low.

DBMS Lab - CS21CP3

(60 Hrs)

List of Programs

- Exercise using different data types and operators
- Exercise using integrity constraints
- Exercise to implement built-in functions and views
- Exercise to implement update and alter table
- Exercise to implement PL/SQL table and record
- Exercise to implement splitting and joining the table
- Exercise using Functions
- Exercise using Cursors

- Exercise using Triggers
- Exercise to create and drop database in MongoDB
- Exercise to create and drop collection in MongoDB
- Exercise to insert, query and update document in MongoDB

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. S. Karpagavalli

Course Number	Course Name	Category	L	T	P	Credit
CS21SBP1	SBS I: Robotic Process Automation Tools	Practical	-	-	45	3

Preamble

This course provides hands-on training on bot development using UiPath. It provides exposure on components of UiPath, workflow and business process automation.

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 elements of UiPath for bot development	K2
CLO2	Apply UiPath components to automate the business process	K3
CLO3	Illustrate the sequence of activities in business process automation	K3
CLO4	Demonstrate the steps to automate real world business processes	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	M	S	S
CLO4	S	S	S	S	S

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

Robotic Process Automation Tools - CS21SBP1

(45 Hrs)

List of Programs

- Check whether the number given by the user is even or odd
- Notepad Automation
- Basic and Desktop Recording
- Amazon Data Scrapping in Excel
- Google Form Filling Automation
- Email Automation
- Attendance Automation
- Files Handling

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. S. Karpagavalli

Course Number	Course Name	Category	L	T	P	Credit
CS21C07	Data Mining	Theory	71	4	-	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 datamining.

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 datamining 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; L-Low

Data Mining - CS21C07

(71Hrs)

Syllabus

Unit I

14 Hrs

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

Unit II

15 Hrs

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

Unit III **14 Hrs**
 Decision Tree: Introduction-**Tree construction principles**-Best split-splitting indices-splitting criteria- Tree construction algorithms: **CART-ID3-C4.5-CHAID**.

Unit IV **14 Hrs**
 Other Techniques: Introduction-**Neural Networks-Learning in NN**-Unsupervised Learning-Genetic algorithm-Support Vector Machine

Unit V **14 Hrs**
 Data Mining for Bioinformatics: Introduction-Bio medical data analysis-DNA data analysis-Protein 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 of Publication
1	Arun K Pujari	Data Mining Techniques	University Press	3 rd Edition, 2013

Reference Books

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

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Mrs. J. Gayathri

Course Number	Course Name	Category	L	T	P	Credit
CS21C08	Computer Networks	III	71	4	-	4

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; L-Low

Computer Networks -CS21C08

(71Hrs)

Syllabus

Unit I

14 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-**standards organizations**-internet standards the OSI model- layers in the OSI model-TCP/IP protocol suite.

Unit II **14 Hrs**

Guided Media: **Twisted-pair cable-coaxial cable** - fibre-optic cable- unguided media: - wireless: radio waves-microwaves-infrared. 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 **15 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**-multicastroutingprotocols.

Unit IV **14 Hrs**

Transport layer: **Process-to-Process delivery**- user datagram protocol - TCP- congestion control and quality a TCP connection- congestion control- **two examples**- quality ofservice.

Unit V **14 Hrs**

Application Layer: **Name space- domain name space**- distribution of name space- **DNS in the internet**- resolution- remote logging- telnet- **electronic mail**- file transfer- cryptography: Introduction- symmetric-key cryptography- asymmetric-keycryptography.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Behrouz A Forouzan	Data communications and networking	Tata McGraw Hill	5 th Edition, 2012

Reference Books

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

Pedagogy

- Lecture, Demonstration, Case Studies

Course Designer

- Mrs. S. Kavitha

Course Number	Course Name	Category	L	T	P	Credit
CS21C09	Python Programming	Theory	71	4	-	4

Preamble

This course provides basic idea on functions and concepts of Python programming. This course enables the students to solve problems using python 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 basic python programming constructs	K1
CLO2	Understand the purpose of functions, string, list, dictionary, tuples files and data retrieval in python	K2
CLO3	Apply the python supported data structures to solve real world problems	K3
CLO4	Analyze the problems and solve using python data types, structures and data handling methods	K4

Mapping with Programme Learning Outcomes

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

S-Strong; M-Medium; L-Low

Python Programming - CS21C09

(71Hrs)

Syllabus

Unit I

15 Hrs

Python - origins - features - variable and assignment - Python basics – statement and syntax Identifiers - **Basic style guidelines** - Python objects - Standard types and other built-in types Internal types-Standard type operators-Standard type built-in functions.

Unit II

14 Hrs

Numbers - Introduction to Numbers - Integers - Double precision floating point numbers Complex numbers - Operators - Numeric type functions - Sequences: Strings, Lists and

Tuples - Sequences - Strings and strings operators - String built-in methods - Lists - List type Built-in Methods - Tuples.

Unit III **14 Hrs**

Mapping type: Dictionaries - Mapping type operators - **Mapping type Built-in and Factory Functions** - Mapping type built in methods - Conditionals and loops - if statement - else Statement - else-if statement - conditional expression - while statement - for statement- break statement - continue statement - pass statement - Iterators and the iter() function - **Files and Input/ Output** - File objects - **File built-in functions** - File built-in methods - File built-in attributes - Standard files - command line arguments.

Unit IV **14 Hrs**

Functions and Functional Programming - Functions - calling functions - creating functions passing functions - Built-in Functions: **apply(), filter(), map() and reduce()** - Modules - Modules and Files - Modules built-in functions - classes - class attributes - Instances. **Database Programming - Introduction - Basic Database Operations and SQL** - Example of using Database Adapters, MySQL.

Unit V **14 Hrs**

Bioinformatics Programming - Pattern Matching: fundamental syntax - fixed length matching - variable length matching - the action of the re modules - functions - flags - methods - match object fields - match object methods - Extracting Descriptions from Sequence Files - Extracting Entries From SequenceFiles.

Text Books

S. No	Author	Title of Book	Publisher	Year of Publication
1	Wesley J. Chun	Core Python Programming	Pearson Education Publication	2012
2	Mitchell L Model	Bioinformatics Programming using Python	O ‘ Reilly Media	2009

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Wesley J. Chun	Core Python Application Programming	Pearson Education Publication	2015
2	Eric Matthes	Python crash course	William Pollock	2016
3	Zed Shaw	Learn Python the Hard Way	Addition Wesley	2017
4	Mark Lutz	Python Pocket Reference	O’Reilly Media	2014

Pedagogy

- Lectures, Group Discussions, Demonstrations, Case studies

Course Designer

- Mrs. D. Suganthi

Course Number	Course Name	Category	L	T	P	Credit
CS21CP4	Python Programming and Bioinformatics Lab	Practical	-	-	60	3

Preamble

This course includes a practice in the use of basic techniques of Python programming and to implement in real time environment. It enriches the knowledge in programming techniques using pattern matching concepts. It enables to understand object oriented programming concepts.

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 different functions in python programming	K2
CLO3	Apply filesfor data processing	K3
CLO4	Illustrate pattern matching and extra action using regular expression	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; L-Low

Python Programming and Bio Informatics Lab - CS21CP4

(60 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 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 to process biological data

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. J. Viji Gripsy

Course Number	Course Name	Category	L	T	P	Credit
CS21SBP2	SBS II - Data Mining Tools Lab	Practical	-	-	45	3

Preamble

This lab course provides hands on training to understand data mining techniques and machine learning algorithms using any one data mining tool.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the datamining concepts using a data mining tool	K1
CLO2	Apply machine learning algorithms on data sets	K2
CLO3	Analyze the results of machine learning algorithms using different parameters	K3
CLO4	Illustrate real world problem solving using data mining algorithms	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	M
CLO4	S	S	S	S	S

S - Strong; M-Medium; L-Low

Data Mining Tools Lab - CS21SBP2

(45 Hrs)

List of Exercises

- Exercise to load data, attributes and visualization
- Exercise to pre-processing data
- Exercise to implement association rule mining
- Exercise to implement classification - Decision Tree, MLP, Naïve Bayes
- Exercise to implement clustering - K-means, K-medoids, DBSCAN
- Exercise to implement regression - Linear, non-linear and muti variate
- Exercise to select attributes

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. S. Karpagavalli
- Mrs. J. Gayathri

Course Number	Course Name	Category	L	T	P	Credit
PD21A01	Digital Marketing	Theory	86	4	-	5

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; L- Low

Digital Marketing - PD21A01

(86 Hrs)

Syllabus

Unit I

17 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

17 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 Social Media Marketing: Introduction - Strategy - Implementation - Measure - Improve - Social Entertainment - Different forms of social entertainment - Gamification.

Unit III**17 Hrs**

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

Unit IV**18 Hrs**

Search Engine Optimization: Introduction - Search Engine - The Concept of SEO - SEO Phases -
 Website Audit - Content - On-Page Optimization - Off-Page Optimization - Social Media Reach –
 Maintenance - Local Search SEO - SEO Visual Search - Voice Change will change the SEO
 Industry - Sub domains vs Subfolders - SEO - UX and UI - Website Navigation - Social Media
 Icons - External Links - Pop-ups - Advanced Website Features.

Unit V**17 Hrs**

Mobile Marketing: Introduction - Mobile Advertising - Mobile Marketing Toolkit - Mobile
 Marketing Features - Mobile Analytics - Mobile APPS. Digital Analytics: Introduction - Data
 Collection - Key Metrics - Outcome Analysis - Experience Analysis - Making Web Analytics
 Actionable - Creating High- Impact Executive Dashboards - Types of Tracking Code -
 Competitive Intelligence.

Text Book

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

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. S. Kavitha

Course Number	Course Name	Category	L	T	P	Credit
PM21A02	M-Commerce	Theory	86	4	-	5

Preamble

This course provides an insight on M-Commerce principles and business models. It also explore 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 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; L-Low.

M-Commerce - PM21A02

(86 Hrs)

Syllabus

Unit I

17 Hrs

Introduction to E- commerce: Introduction - E-commerce - E-business - Categories of E-commerce applications - Global trading environment - Adoption of E-commerce - 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 - Consumer to Business (C2B) - Business to Government (B2G).

Unit II

17 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 - Overview of WML - Architectures of mobile commerce.

Unit III**17 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 - Mobile payment standardization - Reputation and trust - Application and Risk scenarios - Reputation systems - Trust model.

Unit IV**18 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 - Fraud management systems in M-commerce - Mobile payment and money transfers - Mobile payment landscapes.

Unit V**17 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 - Jurisprudence of Indian cyber law - Salient features of the Information Technology act 2008.

Text Book

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

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
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;	1 st Edition, 2001
3	Norman Sadeh	M-Commerce: Technologies, Services, and Business Models	John Wiley & Sons,	2003

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. P. Parvathi

Course Number	Course Name	Category	L	T	P	Credit
CS21C10	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, 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; L-Low

Web Design and Development - CS21C10

(73 Hrs)

Syllabus

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.**Number Handling:** Numerical Types - Mathematical Operators - Simple Mathematical Functions - Randomness - **Regular Expressions:** Tokenizing and parsing Functions.

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 of Publication
1	Steve Suehring Tim Converse and Joyce Park	PHP 6.0 and MySQL Bible	Wiley	2009
2	Fernando Monteiro	Hands-On Full-Stack Web Development with Angular 6 and Laravel 5	Packt Publisher	2018

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Mrs. S. Ponmalar

Course Number	Course Name	Category	L	T	P	Credit
CS21C11	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; L-Low.

Computer Graphics - CS21C11

(73 Hrs)

Syllabus

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 of Publication
1	Donald Hearn, M. Pauline	Computer Graphics	Pearson	2 nd Edition, 2012
2	Gregory Kipper, Joseph Rampolla	Augmented Reality	O'Reilley	2012

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. S. Karpagavalli

Course Number	Course Name	Category	L	T	P	Credit
CS21C12	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; L-Low.

Software Engineering - CS21C12

(73 Hrs)

Syllabus

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: Requirements 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 of Publication
1	Roger S. Pressman	Software Engineering - A Practitioners Approach	Mc-Graw Hill Education	7 th Edition, 2017
2	Mikael Krief	Learning DevOps (Unit II)	Packt Publishing Ltd.	1 st Edition, 2019

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Mrs. M. Dhivya

Course Number	Course Name	Category	L	T	P	Credit
CS21E01	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; L-Low.

Parallel Computing - CS21E01

(73 Hrs)

Syllabus

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 of Publication
1	Michael J Quinn	Parallel Computing	Tata Mc-Graw Hill	2 nd Edition 2008
2	V. Rajaraman, C. Siva Ram Murthy	Parallel Computers Architecture and Programming	Prentice Hall of India Pvt. Ltd	2008

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	MichealMcCool, ArchD.Robinson, JamesReindres	Structured Parallel Programming	Morgan Kaufmann Publishers	2012
2	Wilkinson Barry, Michael Allen	Parallel and Concurrent Programming	Pearson Education	2012
3	Peter Pacheco	Introduction to Parallel Programming	Morgan Kaufmann Publishers	2011

Pedagogy

- Lecture, Group Discussion, Case Studies

Course Designer

- Dr. K. Padmavathi

Course Number	Course Name	Category	L	T	P	Credit
CS21E02	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; L-Low

Big data analytics - CS21E02

(73 Hrs)

Syllabus

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: BigData and Hadoop - Hadoop Architecture -Main Components of Hadoop Framework – AnalysingBigData 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 of Publication
1	V.K. Jain	Big Data and Hadoop	Khanna Book Publishing	2017
2	Chandraish Sinha	Tableau 10 for Beginners	Createspace Independent Pub	2018
3	Bernard Marr	Big Data inPractice	Wiley Publications	2016

Reference Books

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

Pedagogy

- Lecture, Demonstration, Group Discussion

Course Designer

- Dr. S. Karpagavalli

Course Number	Course Name	Category	L	T	P	Credit
CS21E03	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; L-Low.

Virtualization and Cloud Services - CS21E03

(73 Hrs)

Syllabus

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 - Anatomy of the Cloud - Network Connectivity in Cloud Computing - Applications on 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. 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 – Other CloudService Models.

Unit III

15 Hrs

Virtualization: Introduction - Approaches in Virtualization - Hypervisors - Types of virtualization - Multi-core Technology - Memory and Storage Technology. Security in Cloud: Introduction - Security Aspects - Platform-Related Security - Audit and Compliance.

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 of data centers – 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 - Data center architecture - Data center services.

Text Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	K. Chandrasekaran	Essentials of Cloud Computing (Unit I, II, III & IV)	CRC Press	2015
2	Mauricio Arregoces, MaurizioPortolani	Data Center Fundamentals (Unit V)	Cisco press	2003

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designers

- Mrs. S. Kavitha

Course Number	Course Name	Category	L	T	P	Credit
CS21CP5	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; L-Low.

Web Designing and Development Lab - CS21CP5

(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
- 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

Course Number	Course Name	Category	L	T	P	Credit
CS21SBP2	SBS III - Software Testing Tools	Practical	-	4	41	3

Preamble

The objective of this course is to understand the importance of test automation and to impart the features of selenium web driver tool and to develop automated tests for web applications

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the features & components Selenium Web Driver Tool	K2
CLO2	Explore to design and implement test automation framework for a software project	K3
CLO3	Apply the knowledge to adapt and develop automated tests for web applications	K3
CLO4	Demonstrate the steps to develop automated tests for web applications	K4

Mapping with Programme Learning Outcomes

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

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

SBS III: Software Testing Tools – CS21SBP2

(41Hrs)

List of Programs

- Write a test case based on controls
- Test data in a flat file
- Manual test case to verify student grade
- Write and test a program to select the number of students who have scored more than 60 in any one subject (or all Subjects)
- Write and test a program to login a specific web page.
- Write and test a program to get the number of list items in a list / combo box.
- Test a HTML file
- Test a program in MS Excel for Data Driven Wizard
- Test the addition of two values in C++ Program
- Write a test suite containing minimum 4 test cases

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. S. Ponmalar

Course Number	Course Name	Category	L	T	P	Credit
CS20SBCE	Coursera: Data Visualization Tools	Theory	-	-	-	3

Course Contents

(47 Hrs)

- Fundamentals of Visualization with Tableau (11Hrs)
- Visual Analytics with Tableau (9 Hrs)
- Creating Dashboards and Storytelling with Tableau (15 Hrs)
- Data Visualization with Tableau Project (12 Hrs)

Course Number	Course Name	Category	L	T	P	Credit
NM21CS1	Cyber Security 1	Theory	30	-	-	Grade

Objective

This course introduces fundamental concepts of Cyber Security in the digital era. It provides the knowledge of cybercrimes, cyber laws and also the security of digital devices. It helps to do secure digital transactions and safe usage of social media.

Cyber Security - NM21CS1

(30 Hrs)

Syllabus

Unit I

6 Hrs

Principles of Cyber security: Introduction to Cyber security - Defining cyberspace - Architecture of cyberspace - Communication and web technology - Internet infrastructure for data transfer and governance - Regulation of cyberspace - Concept of Cyber security - Issue and challenges of cyber security.

Unit II

6 Hrs

Cyber Crime: Introduction to Cybercrime - Classification of Cyber-crimes – Cyber-crime against women and children – Financial frauds - Social engineering attacks – Malware - Zero day and zero click attacks.

Unit III

6 Hrs

Cyber Law: Cyber Criminals modus-operandi – Reporting of cybercrimes – remedial and mitigation measures – Legal perspective of cybercrime– IT Act 2000 and its amendments – Organization dealing with cybercrimes and cyber security in India.

Unit IV

6

Hrs

Social Media Security: Introduction to social network – Types of social media – Social media platform – Hashtag – Viral content – Security issues related to social media. – **Cyber Security tools:** Nmap – Introduction to Nmap – Nmap scan types- Nmap command list.

Digital Transaction: Introduction to digital payments – Components of digital payments – Modes of digital payments – Banking cards – UPI (Unified Payment Interface) – e-Wallets.

Unit V

6 Hrs

Digital Devices Security: End point device and Mobile phone security – Password policy – Security patch management – Data backup – Device security policy – Cyber security best practices. Installation and configuration of Computer Anti-Virus.

Case studies: Illustrations of Financial frauds – Digital Signature. Prepare a checklist for secure net banking

*e-Content will be provided

*This course is for all final year students of all streams from 2023-24 year onwards.

Reference books:

1. Raef Meeuwisse, Cybersecurity for Beginners, Lulu Publishing Services, 2nd Edition, 2017
2. Scott Augenbaum, The Secret to Cybersecurity-A Simple Plan to Protect Your Family and Business from Cybercrime, Forefront Books Publisher, 2019
3. Sunit Belapure and Nina Godbole, Cyber security understanding cybercrimes computer forensics and Legal perspectives, Wiley India Pvt Ltd, 2011
4. Christopher Hadnagy, Social Engineering: The Science of Human Hacking, Wiley Publisher, 2nd Edition, 2018
5. Pavan Duggal, Artificial Intelligence, Cybercrimes & Cyberlaw, 2018
6. Joe Gray, Practical Social Engineering: A Primer for the Ethical Hacker, 2022
7. Henry A. Oliver, Security in the digital age: social media security threats and vulnerabilities, Create Space Independent publishing platform, 2015.

Evaluation Pattern

Quiz	60 Marks
Case Study	20 Marks
Poster	20 Marks
Total	100 Marks

Course Number	Course Name	Category	L	T	P	Credit
CS20AC1	Multimedia	Theory	Self-Study			5

Preamble

This course provides basic concepts in multimedia and devices, systems, tools and techniques. It also focuses on animation, distributing multimedia in networks, art, design and digital cinematography.

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 components of multimedia systems and techniques in handling multimedia	K1
CLO2	Understand the tools, devices, animation, streaming multimedia and digital media	K2
CLO3	Apply various multimedia techniques in solving problems	K3
CLO4	Demonstrate the steps in handling multimedia data, sharing data, animation and motion picture	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; L-Low

Multimedia - CS20AC1

Syllabus

Unit I

Multi Media Fundamentals :History of Multimedia - Multimedia Objects - Multimedia in business and work- Multimedia hardware - Memory & Storage devices - Communication devices.

Unit II

Multimedia Presentation tools- Tool Features - object generation with video sound - image capturing- Authoring tools - card and page based authoring tools - Digital Audio / Video: Perception of sound- hearing sensitivity - frequency range – sound - wavelength - Speed of sound- Measuring the sound - Noise Signal - Video Signal - Video Format - Video Lights-Types and Functions.

Unit III

Graphics/Image: Image file format-Principles of animation: 2D and 3D animation - Morphing - Kinematics, Tweening - Motion capture - Character animation – Modeling - Special effects and Video Conferencing - Web Streaming - Video Streaming - Internet Telephony.

Unit IV

Multimedia Networking - Applications - streamed stored and audio-making - Protocols for real time interactive Applications - Distributing multimedia - Secluding and Policing Mechanisms -Integrated services - Design Consideration for Web pages.

Unit V

Motion Picture: Analogue and Digital camera, lenses-viewing and monitoring - Types of Films - various storage media - Types of lights - video lights - cine lights - reflectors - Digital Video Camera.

Text Book

S.No	Author	Title of The Book	Publishers	Year of Publication
1	Tay Vaughan	Multimedia: Making it Work	Tata Mc-Graw Hill Education	9 th Edition, 2017

Reference Books

S.No	Author	Title of The Book	Publishers	Year of Publication
1	Sreeparna Banerjee	Elements of Multimedia	Chapman and Hall/CRC	2018
2	Prabhat K. Andleigh and Kiran Thakrar	Multimedia Systems Design	Pearson Education	2015
3	Ze - Nian Li & Mark S Drew	Fundamentals Of Multimedia	Pearson Education	2004

Course Designer

- Mrs. A. Priyadharshini

Course Number	Course Name	Category	L	T	P	Credit
CS20AC2	Blockchain Technology	Theory	Self-Study			5

Preamble

This course provides conceptual understanding of block chain technology and how it can be used in Industry 4.0 It covers the technological underpinning of block chain operations using Ethereum.

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 and operations of blockchain technology	K1
CLO2	Understand the building blocks and functionality of block chain components	K2
CLO3	Apply knowledge of blockchain to different application areas	K3
CLO4	Analyze the benefits and issues in blockchain technology specific to use cases	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; L-Low

Blockchain Technology - CS20AC2

Syllabus

Unit I

Introduction: Overview of Block chain - History of Blockchain - Peer to Peer Network - Smart Contract - Wallet - Digital Currency - Ledgers - Types of Blockchain - Platform.

Unit II

Consensus Mechanism: Permissioned Blockchain - Permissionless Blockchain - Different Consensus Mechanism - Proof of Work - Proof of Stake - Proof of Activity - Proof of Burn - Proof of Elapsed Time - Proof of Authority - Proof of Importance.

Unit III

Distributed Consensus: Nakamoto consensus - Proof of Work - Proof of Stake - Proof of Burn, Difficulty Level - Sybil Attack - Energy utilization and alternate.

Unit IV

Smart contract and Ethereum: Overview of Ethereum - Writing Smart Contract in Solidity - Remix IDE - Different networks of Ethereum - understanding blocks practically at blockchain.com - how to compile and deploy smart contract in remix.

Unit V

Understanding Hyper ledger Fabric: Overview of Open source Hyper ledger project - Hyper ledger Fabric - Architecture - Identities and Policies - Membership and Access Control - Channels-Transaction Validation - Writing smart contract using Hyper ledger Fabric. Enterprise application of Blockchain: Cross border payments - Know Your Customer (KYC).

Text Books

S.No	Author	Title of The Book	Publishers	Year of Publication
1	Melanie Swan	Blockchain	O'Reilly Media	2015
2	Imran Bashier	Mastering Blockchain	Packt	2020
3	Andreas M. Antonopoulos & Gavin Wood	Mastering Ethereum: Building Smart Contracts and DApps	O'Reilly Media	2018

Reference Books

S.No	Author	Title of The Book	Publishers	Year of Publication
1	EladElrom	The Blockchain Developer	Apress	2019
2	Daniel Drescher	Blockchain Basics	Apress	2017
3	Don Tapscott & Alex Tapscott	Blockchain Revolution	Portfolio Penguin	2016

Course Designer

- Mrs. J. Gayathri