ANNAMALAI UNIVERSITY

(Affiliated Colleges)

214 – B.Sc. Computer Science

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Part	Course Code	Study Components & Course Title	Credit	Hours/ Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
I	23UTAML11/ 23UHINL11/ 23UFREL11	Language– I பொது தமிழ்– I: தமிழிலக்கிய வரலாறு-1/ Hindi-I/ French-I	3	6	25	75	100
II	23UENGL12	General English – I	3	6	25	75	100
III	23UCSCC13	Core – I: Python Programming	5	5	25	75	100
	23UCSCP14	Core – II : Practical – I : Python Programming Lab	5	5	25	75	100
	23UMAFE15	Elective - I Mathematical Foundations – I	3	4	25	75	100
IV	23UTAMB16 23UTAMA16	Skill Enhancement Course-I* NME-I / Basic Tamil – I / Advanced Tamil – I	2	2	25	75	100
	23UCSCF17	Foundation Course: Problem Solving Techniques	2	2	25	75	100
		Total	**23**	**30**			**700**
		SEMESTER – II					
I	23UTAML21/ 23UHINL21/ 23UFREL21	Language– II பொது தமிழ் -II: தமிழிலக்கிய வரலாறு-2/ Hindi-II French-II	3	6	25	75	100
II	23UENGL22	General English – II:	3	6	25	75	100
III	23UCSCC23	Core –III: Data Structure and Algorithms	5	5	25	75	100
	23UCSCP24	Core – IV: Practical-II: Data Structure and Algorithms Lab	5	5	25	75	100
	23UMAFE25	Elective - II Mathematical Foundations - II	3	4	25	75	100
IV	23UTAMB26 23UTAMA26	Skill Enhancement Course – II * NME-II / Basic Tamil – II / Advanced Tamil - II	2	2	25	75	100
	23USECG27	Skill Enhancement Course – III Internet and its Applications (Common Paper)	2	2	25	75	100
	23UNMSD01	Language Proficiency for employability: Overview of English Communication**	2	-	25	75	100
		Total	**25**	**30**			**800**

		SEMESTER – III					
23UTAML31/ 23UHINL31/ 23UFREL31	I	Language– III பொது தமிழ் -**III**: தமிழக வரலாறும், பண்பாடும்/ Hindi-III/ French-III	3	6	25	75	100
23UENGL32	II	General English-III	3	6	25	75	100
23UCSCC33	III	Core – V: Object Oriented Programming with C++	5	5	25	75	100
23UCSCP34		Core – VI: Practical: Object Oriented Programming with C++ Lab	5	4	25	75	100
23USTAE35 23UPHYE35		Elective III: Theory: Statistics-I / Physics-I	2	3	25	75	100
23USTAEP3 23UPHYEP3		Elective III: Practical: Statistics-I Lab / Physics-I Lab	1	2	25	75	100
23UCSCS36	IV	Skill Enhancement Course - IV: Enterprise Resource Planning	1	1	25	75	100
23UCSCS37		Skill Enhancement Course - V: Digital Computer Fundamentals	2	2	25	75	100
		Environmental Studies	-	1	-	-	-
		Total	**22**	**30**			**800**
		SEMESTER – IV					
23UTAML41/ 23UHINL41/ 23UFREL41	I	Language– IV பொது தமிழ்-IV: **தமிழும் அறிவியலும்** Hindi-IV/ French-IV	3	6	25	75	100
23UENGL42	II	General English-IV	3	6	25	75	100
23UCSCC43	III	Core – VII Industry Module – Java Programming	5	5	25	75	100
23UCSCP44		Core – VIII Practical: Java Programming Lab	5	3	25	75	100
23USTAE45 23UPHYE45		Elective IV: Theory: Statistics-II / Physics-II	2	3	25	75	100
23USTAEP4 23UPHYEP4		Elective IV: Practical : Statistics-II Lab / Physics-II Lab	1	2	25	75	100
23UCSCS46	IV	Skill Enhancement Course – VI: PHP Programming	2	2	25	75	100
23UCSCS47		Skill Enhancement Course – VII: Computer Networks	2	2	25	75	100
23UEVSG48		Environmental Studies	2	1	25	75	100
		Total	**25**	**30**			**900**

		SEMESTER – V					
23UCSCC51	III	Core – IX: Software Engineering	4	5	25	75	100
23UCSCC52		Core – X: Database Management System	4	5	25	75	100
23UCSCP53	III	Core – XI: Practical: Database Management System Lab	4	5	25	75	100
23UCSCD54		Core – XII: Project with viva-voce	4	5	25	75	100
23UCSCE55-1 23UCSCE55-2 23UCSCE55-3		Elective – V: Operating Systems Multimedia Systems Human – Computer Interaction	3	4	25	75	100
23UCSCE56-1 23UCSCE56-2 23UCSCE56-3		Elective – VI: Data Mining and Warehousing Cloud Computing Grid Computing	3	4	25	75	100
23UVALG57	IV	Value Education	2	2	25	75	100
23UCSCI58		Summer Internship[++]	2	_	25	75	100
		Total	**26**	**30**			**800**

		SEMESTER – VI					
23UCSCC61	III	Core – XIII: Microprocessor and Microcontroller	4	6	25	75	100
23UCSCC62	III	Core – XIV: .NET Programming	4	6	25	75	100
23UCSCP63	III	Core – XV: Practical: .NET Programming	4	6	25	75	100
23UCSCE64-1 23UCSCE64-2 23UCSCE64-3		Elective: VII: Introduction to Data Science Mobile Adhoc Network Computing Intelligence	3	5	25	75	100
23UCSCE65-1 23UCSCE65-2 23UCSCE65-3		Elective: VIII: Cyber Security Software Testing E-Commerce	3	5	25	75	100
23UCSCF66	IV	Professional Competency Skill: Big Data Analytics	2	2	25	75	100
23UCSCX67	V	Extension Activity	1	_	100	-	100
		Total	**21**	**30**			**700**
		Grant Total	**142**				**4700**

Non-major (NME) Electives offered to other Departments

IV	23UCSCN16	Office Automation	2	2	25	75	100
	23UCSCN26	Advanced Excel	2	2	25	75	100

* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)
Students who have not studied Tamil upto 12th Standard and have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester.
Students who have studied Tamil upto 10th & 12th Standard and have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

** The course "23UNMSD01: Overview of English Communication" is to be taught by the experts from Naan Mudhalvan Scheme team. However, the faculty members of Department of English should coordinate with the Naan Mudhalvan Scheme team for smooth conduct of this course.

[++]Students should complete two weeks of internship before the commencement of V semester.

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course SEC-1 (NME-I)	2	2
	Foundation Course	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-2 (NME-II)	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	**30**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	13
Part IV	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	**30**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical, Project & Elective Courses	22	28
Part IV	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	-
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical & Elective Courses	18	28
Part IV	Professional Competency Skill	2	2
Part V	Extension Activity	1	-
		21	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	**140**

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components Part IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

CREDIT DISTRIBUTION FOR U.G. PROGRAMME

Part	Course Details	No. of Courses	Credit per course	Total Credits
Part I	Tamil	4	3	12
Part II	English	4	3	12
Part III	Core Courses	15	4/5	68
	Elective Courses: Generic / Discipline Specific (3 or 2+1 Credits)	8	3	24
Part I, II and III Credits				116
Part IV	Skill Enhancement Courses / NME / Language Courses	7	1/2	15
	Professional Competency Skill Course	1	2	2
	Environmental Science (EVS)	1	2	2
	Value Education	1	2	2
	Internship	1	2	2
Part IV Credits				**23**
Part V	Extension Activity (NSS / NCC / Physical Education)	1	1	1
Total Credits for the UG Programme				**140**

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks

Methods of Assessment	
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
Analyze(K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons
Create(K6)	Check knowledge in specific or off beat situations, Discussion, Debating or Presentations

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The

Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

2. Programme Outcomes (PO) of B.Sc. degree programme in Computer Science

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.
- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design / Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

3. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake

further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent

and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

SEMESTER: I CORE - I	23UCSCC13: PYTHON PROGRAMMING	CREDIT: 5 HOURS: 5/W

Learning Objectives		
LO1	To make students understand the concepts of Python programming.	
LO2	To apply the OOPs concept in PYTHON programming.	
LO3	To impart knowledge on demand and supply concepts	
LO4	To make the students learn best practices in PYTHON programming	
LO5	To know the costs and profit maximization	
UNIT	**Contents**	**No. of Hours**
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	**15**
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	**15**
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Python Strings:** String operations-Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	**15**
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	**15**
V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
	TOTAL HOURS	**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	ReemaThareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.	
2	Dr. R. NageswaraRao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.	
Reference Books		
1.	VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.	
2.	Mark Lutz, "Learning Python", Orielly.	
3.	Adam Stewarts, "Python Programming", Online.	
4.	Fabio Nelli, "Python Data Analytics", APress.	
5.	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.	
Web Resources		
1.	https://www.programiz.com/python-programming	
2.	https://www.guru99.com/python-tutorials.html	
3.	https://www.w3schools.com/python/python_intro.asp	
4.	https://www.geeksforgeeks.org/python-programming-language/	
5.	https://en.wikipedia.org/wiki/Python_(programming_language)	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER: I CORE: II Practical :I	23UCSCP14: PYTHON PROGRAMMING LAB	CREDIT: 5 HOURS: 5/W

Learning Objectives	
LO1	Be able to design and program Python applications.
LO2	Be able to create loops and decision statements in Python.
LO3	Be able to work with functions and pass arguments in Python.
LO4	Be able to build and package Python modules for reusability.
LO5	Be able to read and write files in Python.

LAB EXERCISES	Required Hours
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	**60**

Course Outcomes	
On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER: I ELECTIVE: I	23UMAFE15: I (GENERIC / DISCIPLINE SPECIFIC) : MATHEMATICAL FOUNDATIONS – I	CREDIT: 3 HOURS: 4/W

MATHEMATICAL FOUNDATIONS - I

UNIT-I: SYMBOLIC LOGIC

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

UNIT-II: SET THEORY

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

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

Functions: Types of Functions, Composition of Functions.

UNIT-III: BINARY OPERATIONS

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

UNIT-IV: DIFFERENTIATION

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

UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY

Straight Lines - Pair Straight Lines

Text Book

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

Reference Books

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V. Sundaram & Others, Discrete Mathematical Foundation - A.P. Publication, Sirkali.
3. P. Duraipandian & Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.

COURSE OUTCOMES

The students after undergoing this course will be able to

CLO1: Understand operators and solve problems using operators

CLO2: Know the concept of set theory, relations and functions

CLO3: Solve problems using permutation and combination

CLO4: Know the concept of limits, differentiation

CLO5: Solve Problems on straight lines and pair straight lines

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	3	1	2	3	2	2
CLO2	2	2	3	3	-	3	3	3	1
CLO3	3	2	2	3	-	-	2	3	2
CLO4	2	2	3	3	3	-	2	3	2
CLO5	3	2	3	3	3	-	3	3	1

SEMESTER: I	23UCSCF17 FOUNDATION CORSE: PROBLEM SOLVING TECHNIQUES	CREDIT: 2 HOURS: 2/W

Learning Objectives		
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.	
LO2	Implement different programming constructs and decomposition of problems into functions.	
LO3	Use data flow diagram, Pseudo code to implement solutions.	
LO4	Define and use of arrays with simple applications	
LO5	Understand about operating system and their uses	
UNIT	**Contents**	**No. Of. Hours**
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	**6**
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.**Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	**6**
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	**6**
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	**6**
V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	**6**
	TOTAL HOURS	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	**Stewart Venit,** "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.	
Web Resources		
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm	
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067	
3.	http://utubersity.com/?page_id=876	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	14	14	15	15	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER: II CORE: III	23UCSCC23: DATA STRUCTURE AND ALGORITHMS	CREDIT: 5 HOURS: 5/W

Learning Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph strutures and and application of graphs	
LO5	To understand various sorting and searching	
UNIT	**Contents**	**No. of Hours**
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementationsingly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix topostfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- deQueueapplications of queues.	15
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-RehashingExtendible Hashing	15
	Total	**75**

Course Outcomes		Programmeme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6

Text Book	
1	1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.
2	ReemaThareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition

Reference Books	
1.	Thomas H.Cormen, ChalesE. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
Web Resources	
1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER: II CORE: IV PRACTICAL- II	**23UCSCP24: DATA STRUCTURE AND ALGORITHMS LAB** [Note: Practicals may be offered through C / C++ / Python]	**CREDIT: 5** **HOURS: 5/W**

Learning Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph strutures and and application of graphs	
LO5	To understand various sorting and searching	
Sl. No	**Contents**	**No. of Hours**
1.	Write a program to implement the List ADT using arrays and linked lists.	**60**
2.	Write a programs to implement the following using a singly linked list. • Stack ADT • Queue ADT	
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	
4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: • Insert an element into a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree.	
6.	Write a program to perform the following operations • Insertion into an AVL-tree • Deletion from an AVL-tree	
7.	Write a programs for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: • Linear search • Binary search.	

9.	Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.	
	Total	**60**

Course Outcomes		**Programmem Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
Text Book		
1	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.	
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition	
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER: II ELECTIVE- II	23UMAFE25: (GENERIC/DISCIPLINE SPECIFIC) MATHEMATICAL FOUNDATIONS- II	CREDIT: 3 HOURS: 4/W

UNIT-I: MATRICES

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

UNIT-II: MATRICES

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem,

UNIT-III: INTEGRATION

Integration Simple problems, integration of rational function involving algebraic expressions of the form $\frac{1}{ax^2+bx+c}$, $\frac{1}{\sqrt{a^2+bx+c}}$, $\frac{px+q}{ax^2+bx+c}$, $\frac{px+q}{\sqrt{a^2+bx+c}}$

Integrations using simple substitutions, integrations involving trigonometric functions of the form $\frac{1}{a+bcosx}$, $\frac{1}{a^2sin^2x+b^2cos^2x}$, integration by parts.

UNIT-IV : INTEGRATION

Applications of Integration for (i) Area under plane curves, (ii) Volume of solid of revolution.

UNIT-V: ANALYTICAL GEOMETRY OF THREE DIMENSION

Planes, straight lines.

Text Book.

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

Reference Books

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

COURSE OUTCOMES

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

CLO1: Understand different types of matrix operators

CLO2: Know the concept of Consistency and Inconsistency of linear equations

CLO3: Solve different forms of Integration

CLO4: Find the Area and volume using integration for real world problems.

CLO5: Know the concept of Planes, straight lines

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	3	1	2	3	2	2
CLO2	2	2	3	2	-	3	3	3	1
CLO3	3	3	2	3	-	-	3	3	2
CLO4	3	3	3	3	3	-	2	3	2
CLO5	3	2	3	2	3	-	3	3	1

Skill Enhancement Course-1 (NME-I)

<table>
<tr><td>Course Code: 23UCSCN16</td><td colspan="2">Office Automation</td><td>Credits: 2</td></tr>
<tr><td>Lecture Hours: (L)
per week: 2</td><td>Tutorial Hours :
(T) per week</td><td>Lab Practice
Hours: (P)per week</td><td>Total: (L+T+P)
per week: 2</td></tr>
<tr><td>Course Category : SEC-1</td><td colspan="2">Year & Semester: I Year I Semester</td><td>Admission Year:</td></tr>
<tr><td>Pre-requisite</td><td colspan="3">Basic skills in Computer operations</td></tr>
<tr><td colspan="4">Learning Objectives: (for teachers: what they have to do in the class/lab/field)
• The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point.
• The course is highly practice oriented rather than regular class room teaching.
• To acquire knowledge on editor, spread sheet and presentation software.</td></tr>
<tr><td colspan="4">Course Outcomes: (for students: To know what they are going to learn)
CO1:Understand the basics of computer systems and its components.
CO2:Understand and apply the basic concepts of a word processing package.
CO3:Understand and apply the basic concepts of electronic spreadsheet software.
CO4: Understand and apply the basic concepts of database management system.
CO5: Understand and create a presentation using PowerPoint tool.</td></tr>
<tr><td colspan="4">Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)</td></tr>
<tr><td>Units</td><td colspan="2">Contents</td><td>Required Hours</td></tr>
<tr><td>I</td><td colspan="2">Introductory concepts: Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS – UNIX– Windows. Introduction to Programming Languages.</td><td>17</td></tr>
</table>

II	**Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets;Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing – Preview, options, merge.	**17**
III	**Spreadsheets:** Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying; Charts – creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	**17**
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS – Access).	**17**
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.	**17**
Extended Professional Component (is a part of internal component only, Not to	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

be included in the External Examination question paper)		
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. Peter Norton, "Introduction to Computers" –Tata McGraw-Hill.

- **Reference Books**

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGraw-Hill.

- **Web resources :** Web content from NDL / SWAYAM or open source web resources

Skill Enhancement Course-2 (NME-II)

<table>
<tr><td>Course Code: 23UCSCN26</td><td colspan="2">Advanced Excel</td><td>Credits: 2</td></tr>
<tr><td>Lecture Hours: (L) per week: 2</td><td>Tutorial Hours : (T) per week</td><td>Lab Practice Hours: (P)per week</td><td>Total: (L+T+P) per week: 2</td></tr>
<tr><td>Course Category : SEC-3</td><td colspan="2">Year & Semester :I Year II Semester</td><td>Admission Year:</td></tr>
<tr><td>Pre-requisite</td><td colspan="3">Basic knowledge in office automation / Excel</td></tr>
<tr><td colspan="4">Learning Objectives: (for teachers: what they have to do in the class/lab/field)
The objective of this course is to help the students learn the advanced features of Excel, to summarise, analyse, explore, and present visualisations of data in the form of charts, graphs.</td></tr>
<tr><td colspan="4">Course Outcomes: (for students: To know what they are going to learn)
CO1:Handle large amounts of data
CO2: Aggregate numeric data and summarise into categories and subcategories
CO3:Filtering, sorting, and grouping data or subsets of data
CO4: Create pivot tables to consolidate data from multiple files
CO5: Presenting data in the form of charts and graphs</td></tr>
<tr><td colspan="4">Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)</td></tr>
<tr><td>Units</td><td colspan="2">Contents</td><td>Required Hours</td></tr>
<tr><td>I</td><td colspan="2">Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets</td><td>15</td></tr>
<tr><td>II</td><td colspan="2">Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -</td><td>15</td></tr>
</table>

	Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	**15**
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- WhatIf Analysis - Goal Seek- Data Tables- Scenario Manager.	**15**
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.	**15**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Tex**

  Excel 2019 All-in-One For Dummies – 2018- Greg Harvey

- **Reference Books**

  Microsoft Excel 2019 Pivot Table Data Crunching-2019,Bill Jelen and Michael Alexander

- **Web resources:** Web resources from NDL Library, E-content from open source libraries

Semester - III

Course Code 23UCSCC33	**Object Oriented Programming with C++**		**Credits 5**
Lecture Hours: (L) 5 per week	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 5**
Course Category :	**Year & Semester: II & III**		**Admission Year:2023**
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To engender an appreciation for the need and characteristics of Object-orientation.
- To impart knowledge of the C++ language grammar in order to design and implement programming solutions to simple problems by applying Object-oriented thinking.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Explain the various basic concepts of Object-orientation.

CO2: Write programs to implement static binding

CO3: Write programs to implement inheritance and dynamic binding

CO4: Write programs to implement templates and exception handling and learn how to use STL class library.

CO5: Write programs implementing File and Stream I/O.

Conceptualize a given simple problem in an Object-oriented way, design classes and write a program to solve the problem by applying the concepts of Object-orientation and features of C++.

Find and fix bugs in a given program snippet.

Determine the output of a given program snippet.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	**Contents**	**Required Hours**
I	**Object Oriented Programming Concepts:** Complexity in software - The need for object-orientation – Abstraction – Encapsulation – Modularity – Hierarchy. **Basic Elements of C++:** Classes – Objects – Data members and member functions – *private* and *public* access specifiers - Static members - Constructors – Singleton class - Destructors - Friend Functions and Friend Classes - Array of objects – Pointer to objects - *this* pointer – References – Dynamic memory allocation - Namespaces.	**12**

II	**Function Overloading:** Overloading a function - Default arguments – Overloading Constructors. **Operator Overloading:** Overloading an operator as a member function – Overloading an operator as a friend function – Overloading the operators [], (), -> and comma operators – Conversion Functions.	**12**
III	**Inheritance:** Types of inheritance – *protected* access specifier –Virtual Base Class – Base class and derived class constructors. **Run-time Polymorphism:** Virtual Functions – Function overriding - Pure virtual function – Abstract base class.	**12**
IV	**Templates:** Function templates – Overloading a function template – Class templates. **Standard Template Library (STL):** Containers: vector, list – Iterators: forward, backward – Algorithms: removing and replacing elements, sorting, counting, reversing a sequence. **Exception Handling:** Exceptions – *try*, *catch*, *throw* – Rethrowing an exception – Restricting exceptions - Handling exceptions in derived classes - *terminate(), abort(), unexpected(), set_terminate()*.	**12**
V	**I/O Streams:** Formatted I/O with *ios* class functions - Manipulators – Creating own manipulator – Overloading << and >> operators. **File I/O:** *fstream* class – Opening and closing a file – Reading from and writing to a text file - Unformatted and Binary I/O – Random access I/O.	**12**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. Herbert Schildt, *C++ - The Complete Reference*, Third Edition, TMH, 1999.
2. Grady Booch, *Object Oriented Analysis and Design*, Pearson Education, 2008. (For Unit I)

- **Reference Books**

1. Bjarne Strousstrup, *The C++ Programming Language*, Addison Wesley, 2000.
2. J. P. Cohoon and J. W. Davidson, *C++ Program Design – An Introduction to Programming and Object-Oriented Design*, Second Edition, McGraw Hill, 1999.
3. C. J. Lippman, *C++ Primer*, Third Edition, Addison Wesley, 2000.

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

- **Web resources**

Course Code 23UCSCP34	Object Oriented Programming with C++ Lab		Credits 5
Lecture Hours: (L) per week – 4	Tutorial Hours : (T) per week	Lab Practice 4 Hours: (P)per week	Total: (L+T+P) per week 4
Course Category : Practical	Year & Semester: II - III		Admission Year: 2023
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Design classes for the given problems.
- Write programs in C++.
- Code, debug and execute a C++ program to solve the given problems using an IDE.

Course Outcomes: (for students: To know what they are going to learn)

CO1:*Design and create classes.Implement Stream I/O as appropriate.*

CO2:*Design appropriate data members and member functions.*

CO3: *Implement functions, friend functions, static members, constructors and compile-time polymorphism.*

CO4: *Implement inheritance, run-time polymorphism and destructors.*

CO5: *Implement templates and exceptions. Use STL class library.Implement File I/O.*

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	1. Write a class to represent a complex number which has member functions to do the following a. Set and show the value of the complex number b. Add, subtract and multiply two complex numbers c. Multiplying the complex number with a scalar value 2. Write a Point class that represents a 2-d point in a plane. Write member functions to a. Set and show the value of a point b. Find the distance between two points c. Check whether two points are equal or not 3. Design and implement a class that represents a Harmonic Progression (HP). Implement functions to do the following: a. Generate the HP up to a specified number of terms b. Calculate the sum of the HP to n terms and to infinity c. Generate the nth term of the HP d. Generate the corresponding Arithmetic Progression. (Design and implement a class that encapsulates an AP, and allow the HP class to use its facilities by implementing friend functions.) 4. Design and implement a class to represent a Solid object. a. Apart from data members to represent dimensions, use a data member to specify the type of solid. b. Use functions to calculate volume and surface area for different solids. 5. Design a class representing time in hh:mm:ss. Write functions to a. Set and show the time b. Find the difference between two time objects	48

	c. Adding a given duration to a time d. Conversion of the time object to seconds 6. Design a 3x3 matrix class and demonstrate the following: a. Addition and multiplication of two matrices using operator overloading b. Maintaining a count of the number of matrix object created 7. Design a class called cString to represent a string data type. Create a data member in the class to represent a string using an array of size 100. Write the following functionality as member functions: a. Copy Constructor b. Concatenate two strings c. Find the length of the string d. Reversing a string e. Comparing two strings 8. Design a class called cString to represent a string data type. Create a data member in the class to represent a string whose size is dynamically allocated. Write the following as member functions: a. Copy Constructor b. Destructor c. Concatenate two strings d. Find the length of the string e. Reversing a string f. Comparing two strings 9. Create a class to represent a 2-d shape and derive classes to represent a triangle, rectangle and circle. Write a program using run-time polymorphism to compute the area of the figures. 10. Define a class template representing a single-dimensional array. Implement a function to sort the array elements. Include a mechanism to detect and throw an exception for array-bound violations. 11. Demonstrate the use of the vector STL container. Implement a telephone directory using files	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

Elective III: Statistics – I

SEMESTER: III PART: III ELECTIVE III THEORY	23USTAE35 STATISTICS - I	CREDIT: 2 HOURS: 3

OBJECTIVE

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

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Correlation - Karl Pearson - Spearman's Rank correlation – concurrent deviation methods. Regression Analysis: Simple Regression Equations.

BOOKS FOR REFERENCE:

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

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

SEMESTER: III PART: III ELECTIVE III THEORY	23UPHYE35 PHYSICS - I	CREDIT: 2 HOURS: 3

COURSE OBJECTIVES

To impart basicprinciplesof Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS COURSE DETAILS

UNIT-I

WAVES, OSCILLATIONS AND ULTRASONICS: simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production –piezoelectric method – application of ultrasonics: medical field –lithotripsy, ultrasonography – ultrasonoimaging- ultrasonics in dentistry – physiotheraphy, opthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.

UNIT-II

PROPERTIES OF MATTER: Elasticity: elastic constants – bending of beam – theory of non-uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire –torsion of a wire – determination of rigidity modulus by torsional pendulum Viscosity: streamline and turbulent motion – critical velocity –coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, Surface tension: definition – molecular theory – droplets formation–shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.

UNIT-III

HEAT AND THERMODYNAMICS: Joule-Kelvin effect – JouleThomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.

UNIT-IV

ELECTRICITY AND MAGNETISM: potentiometer – principle –measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current

and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart wifi switchesfuses and circuit breakers in houses

UNIT-V

DIGITAL ELECTRONICS AND DIGITAL INDIA: logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem –verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India

TEXT BOOKS

1. R.Murugesan (2001), Allied Physics, S. Chand & Co, NewDelhi.
2. Brijlal and N.Subramanyam (1994), Waves and Oscillations,Vikas Publishing House, New Delhi.
3. BrijlalandN.Subramaniam (1994), PropertiesofMatter,S.Chand&Co.,NewDelhi.
4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand&Co.,New Delhi.
5. R.Murugesan(2005), OpticsandSpectroscopy,S.Chand&Co,NewDelhi.
6. A.Subramaniyam, AppliedElectronics2ndEdn.,NationalPublishingCo.,Chennai.

REFERENCE

1. Resnick Halliday and Walker (2018).Fundamentals of Physics(11 the dition), John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. V. R. Khanna and R.S.Bedi (1998), Text book of Sound 1st Edn. Kedharnaath Publish & Co, Meerut.
3. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism 10th Edn.,Atma Ram & Sons, New Delhi.
4. D.R.Khanna and H.R. Gulati (1979). Optics, S. Chand & Co.Ltd., New Delhi.
5. V.K.Metha (2004).Principles of electronics, 6th Edn. S.Chandandcompany.

WEBLINKS

1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanicslab/
6. http://hyperphysics.phyastr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watc
7. h?v=gT8Nth9NWPM

8. https://www.youtube.com/watch?v=9mXOMzUruMQ&t=1shttps://www.youtube.com/watch?v=m4uSuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-aresurfactants-and-how-do-they-work

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1

Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in the medical field.

CO2

Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.

CO3

Comprehend the basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.

CO4

Articulate the knowledge about electric current resistance, and capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field and analyze them mathematically verify circuits and apply the concepts to construct circuits and study them.

CO5

Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquiree lementary ideas of IC circuits.Acquire information about various Govt. programs/ institutions in this field.

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

SEMESTERs: III PART: III ELECTIVE III PRACTICAL	23USTAEP3 STATISTICS - I LAB	CREDIT: 1 HOURS: 2

LIST OF EXPERIMENTS

1. Calculation of Mean, Median, Mode, Geometric Mean and Harmonic Mean for raw data.
2. Calculation of Mean, Median and Mode for discrete data.
3. Calculation of Mean, Median and Mode for frequency distribution with Class Intervals.
4. Calculation of raw and central moments for raw data.
5. Calculation of raw and central moments for frequency distribution.
6. Calculation of range, Quartile Deviation, Standard Deviation, Mean Deviation, Coefficient of
Variation and Variance for raw data.
7. Calculation of range, Quartile Deviation, Standard Deviation, Mean Deviation, Coefficient of
Variation and their relative measures for frequency distribution.
8. Calculation of Pearson's, Bowley's Coefficient of Skewness and Kelly's Coefficient of Skewness.
9. Calculation of Simple Correlation, Rank Correlation and Regression Coefficients.
10. Forming of Regression Lines and Predictions from Bivariate Data.

BOOKS FOR REFERENCE:

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

Note:

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

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

SEMESTER: III PART: III ELECTIVE III PRACTICAL	23UPHYEP3 PHYSICS – I LAB	CREDIT: 1 HOURS: 2

COURSE OBJECTIVES

Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results ANY Seven only

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever,scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
5. Surface tension and interfacial Surface tension – drop weight method
6. Comparison of viscosities of two liquids – burette method
7. Specific heat capacity of a liquid – half time correction
8. Verification of laws of transverse vibrations using sonometer
9. Calibration of low range voltmeter using potentiometer
10. Determination of thermo emf using potentiometer
11. Verification of truth tables of basic logic gates using ICs
12. Verification of De Morgan's theorems using logic gate ICs.
13. Use of NAND as universal building block.

Note : Use of digital balance permitted

Course Code 23UCSCS36	ENTERPRISE RESOURCE PLANNING		Credits 1
Lecture Hours: (L) per week - 1	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week - 1**
Course Category : SEC-4 Theory	**Year & Semester: II & III**		**Admission Year:2023-24**
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Understand the concept of ERP and the ERP model; define key terms.
- To integrate business processes; study the different related ERP technologies.
- To know the elements of a value chain, and explain how market business models and different functional modules are used.
- Study the ERP life cycle and implementation methods.
- Understand the various corporate companies using ERP and tools.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic concepts of ERP.

CO2: Identify different technologies used in ERP

CO3: Understand and apply the concepts of ERP Marketplace and ERP Functional Modules

CO4: Discuss the ERP implementation and Benefits of ERP

CO5: Discuss different tools used in ERP using Case Study.

Units	Contents	Required Hours
I	**ERP Introduction:** Introduction-Definition-Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP. Advantages & Limitations of ERP Packages.	**5**
II	**ERP-Related Technologies**: Business Process Reengineering (BPR), Data Warehousing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), Supply Chain Management (SCM).	**5**
III	**ERP Marketplace and Modules**: ERP - Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics. ERP- Functional Modules: Functional Modules of ERP Software, Integration of ERP.	**5**

IV	**ERP Implementation and ERP Benefits**: Basics, ERP implementation Strategy, ERP Implementation Life Cycle. Consultants, Vendors and Employee. Benefits of ERP.	**5**
V	**ERP Future Directives and Tools**: ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Using ERP tool: SAP or ORACLE Case Study.	**5**

Learning Resources:

- **Recommended Texts**

  1.Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.

- **Reference Books**

  1.Enterprise Resource Planning – Diversified by Alexis Leon, TMH.

  2.Enterprise Resource Planning – Ravi Shankar & S. Jaiswal, Galgotia

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	3
CO2	3	3	3	3	2
CO3	2	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCS37	Digital Computer Fundamentals		**Credits 2**
Lecture Hours: (L) 2 per week	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 2**
Course Category : Theory	**Year & Semester: II & III**		**Admission Year: 2023**
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- It aims to train the student to the basic concepts of Digital Computer Fundamentals
- To impart the in-depth knowledge of logic gates, Boolean algebra,combinational circuits and sequential circuits.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Identify the logic gates and their functionality.

CO2: Perform number conversions from one system to another system

CO3: Understand the functions of combinational circuits

CO4: Perform number conversions.

CO5: Perform Counter design and learn its operations.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	**Contents**	**Required Hours**
I	Number Systems and Codes: Number System – Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.	**7**
II	Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map, Prime – Implicant Method – Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers – Arithmetic Building Blocks – Adder – Subtractor.	**7**
III	Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders – Code Converters – Parity Generators and Checkers.	**7**
IV	Sequential Logic: RS, JK, D, and T Flip-Flops – Master-Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.	**7**
V	Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up-Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs – Types of RAMs.	**7**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. V.Rajaraman and T.Radhakrishnan, *Digital Computer Design*, Prentice Hallof India, 2001
  2. D.P.Leach and A.P.Malvino, *Digital Principles and Applications* – TMH – FifthEdition – 2002.
  3. M. Moris Mano, *Digital Logic and Computer Design*, PHI, 2001.
  4. T.C.Bartee, *Digital Computer Fundamentals*, 6th Edition, Tata McGraw Hill,1991.

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	2	3	2	3	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

SEMESTER - IV

Course Code 23UCSCC43	**Java Programming**		**Credits 5**
Lecture Hours: (L) 5 per week	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 5**
Course Category :	**Year & Semester: II & IV**		**Admission Year: 2023**
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide fundamental knowledge of object-oriented programming.
- To equip the student with programming knowledge in Core Java from the basics up.
- To enable the students to use AWT controls, Event Handling and Swing for GUI.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic Object-oriented concepts.
Implement the basic constructs of Core Java

CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.

CO3: Implement multi-threading and I/O Streams of Core Java

CO4: Implement AWT and Event handling.

CO5: Use Swing to create GUI.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	**Contents**	**Required Hours**
I	**Introduction:** Review of Object Oriented concepts - History of Java - Java buzzwords - JVM architecture - Data types - Variables - Scope and life time of variables - arrays - operators - control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - Static Method String and String Buffer Classes	**9**
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**: Definition - Access Protection - Importing Packages. **Interfaces**: Definition – Implementation – Extending Interfaces. **Exception Handling**: *try – catch - throw - throws – finally* – Built-inexceptions - Creating own Exception classes.	**9**

III	**Multithreaded Programming**: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using *synchronized* statement - Interthread Communication – Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	**9**
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.	**9**
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane	**10**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
  2. Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.
- **Reference Books**
  1. Head First Java, O'Rielly Publications,
  2. Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.
- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	2	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCP44	Java Programming Lab		Credits 5
Lecture Hours: (L) per week	Tutorial Hours : (T) per week	Lab Practice 3 Hours: (P)per week	Total: (L+T+P) per week 3
Course Category : Practical	Year & Semester: II & IV		Admission Year: 2023
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To gain practical expertise in coding Core Java programs
- To become proficient in the use of AWT, Event Handling and Swing.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Code, debug and execute Java programs to solve the given problems

CO2: Implement multi-threading and exception-handling

CO3: Implement functionality using String and StringBuffer classes

CO4: Demonstrate Event Handling.

CO5: Create applications using Swing and AWT

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer? 2. Write a Java program to multiply two given matrices. 3. Write a Java program that displays the number of characters, lines and words in a text? 4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated. 5. Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings 6. Write a program to perform the following string operations using String class: a. String Concatenation	48

	b. Search a substring c. To extract substring from given string 7. Write a program to perform string operations using StringBuffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string 8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number. 9. Write a threading program which uses the same method asynchronouslyto print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2. 10. Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception 11. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes? 12. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls. 13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes). 14. Write a Java program that works as a simple calculator.	

	Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero. 15. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
- **Reference Books**
- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	2	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Elective IV: Statistics – II

SEMESTER: IV PART: III ELECTIVE IV THEORY	23USTAE45 STATISTICS - II	CREDIT: 2 HOURS: 3

OBJECTIVE

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

UNIT-I

Curve fitting by the methods of least squares -

Y = a x + b, Y = a x2 + b x + c, Y = a xb, Y = a e bx and Y= abx

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

BOOKS FOR REFERENCE:

1. Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand

2. Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor – Sultan Chand

3. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII

4. Elements of Statistics - Mode . E.B. – Prentice Hall

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

SEMESTER: IV PART: III ELECTIVE IV THEORY	23UPHYE45 PHYSICS – II	CREDIT: 2 HOURS: 3

COURSE OBJECTIVES

To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

UNITS COURSE DETAILS

UNIT-I

OPTICS: interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries

UNIT-II

ATOMIC PHYSICS: atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices

UNIT-III

NUCLEAR PHYSICS: nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction –nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods – introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.

UNIT-IV

INTRODUCTION TO RELATIVITY AND GRAVITATIONAL

WAVES:frame of reference – postulates of special theory of relativity – Galilean ransformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence –introduction on gravitational waves, LIGO, ICTS opportunities at International Centre for Theoretical Sciences

UNIT-V

SEMICONDUCTOR PHYSICS: p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger –introduction to e-vehicles and EV charging stations

TEXT BOOKS

1. R.Murugesan (2005), Allied Physics,S.Chand & Co,New Delhi.
2. K.Thangaraj and D.Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3. Brijlal and N.Subramanyam (2002), Text book of Optics, S.Chand & Co, NewDelhi.
4. R.Murugesan (2005), Modern Physics, S.Chand & Co,New Delhi.
5. A.Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co.,Chennai.

REFERENCE BOOKS

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd.,Singapore.
2. D.R.Khanna and H.R. Gulati (1979).Optics, S.Chand & Co. Ltd., New Delhi.
3. A.Beiser (1997), Concepts of Modern Physics,Tata McGraw Hill Publication, New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
5. V.K.Metha(2004), Principlesofelectronics, 6th Edn., S. Chand and Company, New Delhi.

WEBLINKS

1. https://www.berkshire.com/learning-center/delta-pfacemask/https://www.youtube.com/watch?v=QrhxU47gtj4https: //www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo
2. https://www.youtube.com/watch?v=JrRrp5F-Qu4
3. https://www.validyne.com/blog/leak-test-using-pressuretransducers/
4. https://www.atoptics.co.uk/atoptics/blsky.htm -
5. https://www.metoffice.gov.uk/weather/learnabout/weather/optical-effects

METHOD OF EVALUATION:

Continuous InternalAssessment End Semester Examination Total Grade
25 75 100

COURSE OUTCOMES:

CO1

Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns

CO2

Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving the oretical models based on observation.Appreciate interdisciplinary nature of science and in solar energy related applications.

CO3

Summarize the properties of nuclei, nuclear forces structure of the atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.

CO4

To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.

CO5

Summarize the working of semiconductor devices like junction diode, Zenerdiode, transistors and practical devices we daily use like USB chargers and EV charging stations.

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

SEMESTER: IV PART: III ELECTIVE – IV PRACTICAL	23USTAEP4 STATISTICS-II LAB	CREDIT: 1 HOURS: 2

LIST OF EXPERIMENTS

1. Curve fitting by the methods of least square y = ax+b
2. Curve fitting by the methods of least square $y=ax^2+bx+c$
3. Curve fitting by the methods of least square $y=ax^b$, $y=ae^{bx}$
4. Fitting of Binomial distributions
5. Fitting of Poisson distributions
6. Fitting of Normal distributions
7. Test of significance small sample tests based on mean, S.D. correlation and proportion - confidence interval.
8. Test of significance large sample tests based on mean, S.D. correlation and proportion - confidence interval.
9. Analysis of Variance: one way classification, Two-way classification
10. Design ofExperiments - C.R.D, R.B.D & L.S.D

BOOKS FOR REFERENCE:

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

Note:

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

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

SEMESTER: IV PART: III ELECTIVE IV PRACTICAL	23UPHYEP4 PHYSICS – II LAB	CREDIT: 1 HOURS: 2

COURSE OBJECTIVES

Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Any Eight

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistanceof a wire using PO box
8. Thermal conductivity of poor conductor using Lee's disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth's magnetic field using field along the axis of a coil
11. Characterisation of Zener diode
12. Construction of Zerner/IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NOR gate as a universal building block

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

Course Code: SEC-6 23UCSCS46	PHP Programming		Credits: 2
Lecture Hours: (L) per week: 2	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 2
Course Category :SEC-6	Year & Semester:II & IV		Admission Year:2023
Pre-requisite	Basic Knowledge on Web		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)
The objective of this course is to teach the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement simple programs in PHP Programming.
CO2: Develop and Demonstrate the control structures using basic data types.
CO3:Implement arrays and string functions using looping structures.
CO4:Demonstrate and Design programs using OOPS concepts
CO5: Create web pages with data validation and cookies

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction to PHP -Basic Knowledge of websites - Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation- PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML - Embedding HTML in PHP .	5
II	Introduction to PHP Variable -Understanding Data Types - Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement -Switch() Statements -Using the while() Loop -Using the for() Loop	5
III	PHP Functions -PHP Functions -Creating an Array - Modifying Array Elements -Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions -Using Predefined PHP Functions -Creating User-Defined Functions	5
IV	PHP Advanced Concepts -Reading and Writing Files - Reading Data from a File -Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies	5
V	OOPS Using PHP -OOPS Concept-Class, Object, Abstractions, Encapsulation, Inheritance, Polymorphism - Creating Classes and Object in PHP-Cookies and Session Management-Working with forms and system file - Error Handling- Model View Controller – AJAX.	5

Extended Professional Component (is a part of internal component only, Not to be includedin the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.
- **Reference Books**
  The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	3

1-LOW 2- MODERATE 3-HIGH

Course Code: 23UCSCS46	Computer Networks		Credits: 2
Lecture Hours: (L) per week: 2	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 2
Course Category :SEC-7	Year & Semester: II Year IV Semester		Admission Year:2023
Pre-requisite	Basic Knowledge on Networking		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the concept of Data communication and Computer network
- To get a knowledge on routing algorithms.
- To impart knowledge about networking and inter networking devices

To gain the knowledge on Security over Network communication

Course Outcomes: (for students: To know what they are going to learn)

CO1: To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models

CO2: To gain knowledge on Telephone systems and Satellite communications

CO3: To impart the concept of Elementary data link protocols

CO4: To analyze the characteristics of Routing and Congestion control algorithms

CO5: To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media	5
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	5
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth	5
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	5
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transporet Protocols (ITP) - Network Security: Cryptography.	5

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.
- **Reference Books**
  1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017.
  2. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008.
  3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
  4. Lamarca, "Communication Networks", Tata McGraw- Hill, 2002

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	3
CO3	2	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: 23UCSCC51	Software Engineering		Credits: 4
Lecture Hours: (L) per week: 5	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 5
Course Category :CC9	Year & Semester:III Year V Semester		Admission Year:2023
Pre-requisite	Basic Knowledge on Software Applications		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the software engineering concepts and to create a system model in real life applications

Course Outcomes: (for students: To know what they are going to learn)

CO1: Gain basic knowledge of analysis and design of systems

CO2: Ability to apply software engineering principles and techniques

CO3: Model a reliable and cost-effective software system

CO4: Ability to design an effective model of the system

CO5: Perform Testing at various levels and produce an efficient system.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.	12
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS)	12

	Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	
III	Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.	**12**
IV	Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	**12**
V	Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;	**12**
Extended Professional Component (is a part of internal component only, Not to be included	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

in the External Examination question paper)		
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

Recommended Texts

1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

Reference Books

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.
2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	3
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: CC-10 23UCSCC52	**Database Management Systems**		**Credits:4**
Lecture Hours: (L) per week: 5	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week: 5**
Course Category :CC-10	**Year & Semester: III YEAR V SEMESTER**		**Admission Year:2023**
Pre-requisite	Basic knowledge on Data and its relations		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database models
- To learn and understand to write queries using SQL, PL/SQL.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.

CO2: Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.

CO3: Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML).

CO4: Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.

CO5: Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Database Concepts:** Database Systems - Data vs Information - Introducing the database -File system - Problems with file	**12**

	system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram	**12**
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	**12**
IV	**Advanced SQL**:Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.**Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	**12**
V	**PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation – Arithmetic operators.**Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	**12**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
  2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
- **Reference Books**
  1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition.
  2. Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	1	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: CC-11 23UCSCP53	**DATABASE MANAGEMENT SYSTEMS LAB**		**Credits:4**
Lecture Hours: (L) per week 5	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week: 5**	**Total: (L+T+P) per week:5**
Course Category :CC-11	**Year & Semester: III Year V semester**		**Admission Year: 2023**
Pre-requisite	Basic Knowledge on Database Tools		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

Students can learn various SQL and PL/SQL commands, cursor and various application programs.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.

CO2: Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.

CO3: Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML).

CO4: Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.

CO5: Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

	List of Exercises:	**Required Hours**
	I. SQL 1. DDL COMMANDS 2. DML COMMANDS 3. TCL COMMANDS ***II. PL/SQL*** 4. FIBONACCI SERIES	**60**

	5. FACTORIAL 6. STRING REVERSE 7. SUM OF SERIES 8. TRIGGER ***III. CURSOR*** 9. STUDENT MARK ANALYSIS USING CURSOR ***IV. APPLICATION*** 10. LIBRARY MANAGEMENT SYSTEM 11. STUDENT MARK ANALYSIS	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
  2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
- **Reference Books**
  1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition.
  2. Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition
  3. Albert Lulushi, "Developing ORACLE FORMS Applications", Prentice Hall ,1997

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	3	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCD54	Project with Viva-Voce		Credits 4
Lecture Hours: (L) per week 6	**Tutorial Hours : (T) per week**	**Lab Practice 6 Hours: (P)per week**	**Total: (L+T+P) per week 6**
Course Category :	**Year & Semester: III & VI**	**Admission Year:**	
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

Course Outcomes: (for students: To know what they are going to learn)

CO1: To know the problem statement to do the project

CO2: Understand the requirements for the problem

CO3: Analysis of the Problem

CO4: Design work to be done

CO5: Implement and deploy

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
	Each student will take a specific problem for the Project and solve it using any one of latest tool and submit a report. Further each student will participate in regular project review with group project guide / Faculty.	**48**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
- **Reference Books**
- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

(Refer to the Regulations for addition information)

SEMESTER – V (ELECTIVE SUBJECTS)

Course Code 23UCSCE55-1	**Operating Systems**		**Credits 3**
Lecture Hours: (L) per week 4	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 4**
Course Category : EC-5	**Year & Semester: III & V**		**Admission Year: 2023**
Pre-requisite			
Links to other Courses			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Understanding the design of the Operating System
- Imparting knowledge on CPU scheduling, Process and Memory Management.
- To code specialized programs for managing overall resources and operations of the computer.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Define the fundamentals of OS and identify the concepts relevant to process , process life cycle, Scheduling Algorithms, Deadlock and Memory management

CO2: know the critical analysis of process involving various algorithms, an exposure to threads and semaphores

CO3: Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock. .

CO4: Have complete knowledge of Scheduling Algorithms and its types.

CO5: understand memory organization and management

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	**Contents**	**Required Hours**
I	**Introduction**: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. **Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	**12**

II	**Asynchronous concurrent processes:** mutual exclusion-critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm,software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing	**12**
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery	**12**
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms- FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling	**12**
V	**Real Memory organization and Management::** Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. **Virtual Memory Management:** Demand Paging, Page replacement strategies	**12**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011

- **Reference Books**

1. William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.
2. A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	3	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	3	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE55-2	Multimedia Systems		Credits 3
Lecture Hours: (L) 4 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 4
Course Category : EC-5	Year & Semester: III & V		Admission Year: 2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the standards available for different audio, video and textapplications
- To learn various multimedia authoring systems in multimedia productionteam

Course Outcomes: (for students: To know what they are going to learn)

CO1:Understand the definition of Multimedia

CO2:To study about the Image File Formats, Sounds Audio File Formats

CO3:Understand the concepts of Animation and Digital Video Containers

CO4:To study about the Stage of Multimedia Project

CO5:Understand the concept of Ownership of Content Created for Project Acquiring Talent

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

	Contents	Required Hours
I	Multimedia Definition - Use Of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext.	12
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound - Digital Audio - Midi Audio - Midi vs. Digital Audio - Multimedia System Sounds - Audio File Formats -Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.	12
III	Animation: The Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.	12

IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs - The Hardware Needs - The Software Needs - An Authoring Systems Needs- Multimedia Production Team.	**12**
V	Planning and Costing: The Process of Making Multimedia - Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content - Ownership of Content Created for Project - Acquiring Talent.	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

  1. Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw- Hill, 2001.

- **Reference Books**

  1. Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication& Applications", Pearson Education, 2012

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE55-3	Human – Computer Interaction		Credits 3
Lecture Hours: (L) 4 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 4
Course Category :EC-5	Year & Semester: III & V		Admission Year:2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface

Course Outcomes: (for students: To know what they are going to learn)

CO1: Design effective dialog for HCI

CO2: Design effective HCI for individuals and persons with disabilities

CO3:designing multimedia/ ecommerce/ e-learning Web sites

CO4: Assess the importance of user feedback.

CO5: Designing web interfaces and understand the case studies.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**FOUNDATIONS OF HCI:** • The Human: I/O channels – Memory • Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; • Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies	12
II	**DESIGN & SOFTWARE PROCESS:** • Interactive Design: • Basics – process – scenarios • Navigation: screen design Iteration and prototyping. • HCI in software process: • Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design	12

III	**MODELS AND THEORIES:** • HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements • Communication and collaboration models-Hypertext, Multimedia and WWW.	**12**
IV	**Mobile HCI:** • Mobile Ecosystem: Platforms, Application frameworks • Types of Mobile Applications: Widgets, Applications, Games • Mobile Information Architecture, Mobile 2.0, • Mobile Design: Elements of Mobile Design, Tools. - Case Studies	**12**
V	**WEB INTERFACE DESIGN:** Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ”Human -Computer Interaction‖”, III Edition, Pearson Education, 2004 (UNIT I, II & III)
  2. . Brian Fling, —”Mobile Design and Development”, I Edition, O‘Reilly Media Inc., 2009 (UNIT – IV)
  3. . Bill Scott and Theresa Neil, —Designing Web Interfaces‖, First Edition, O‘Reilly, 2009. (UNIT-V)

- **Reference Books**

  1. Shneiderman, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, V Edition, Pearson Education

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: EC-6 23UCSCE56-1	Data Mining and Warehousing		Credits:3
Lecture Hours: (L) per week: 4	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week: 4**
Course Category : EC-6	**Year & Semester:III Year VI Semester**		**Admission Year: 2023**
Pre-requisite	Basic concept of database knowledge		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms, and applications

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic concepts and the functionality of the various data mining and data warehousing component

CO2: To know the concepts of Data mining system architectures

CO3: To analyse the principles of association rules

CO4: To get analytical idea on Classification and prediction methods.

CO5: To Gain knowledge on Cluster analysis and its methods.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction	**10**
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical	**10**

	Characterization, Mining Class Comparison – Statistical Measures	
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses	**10**
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy.	**10**
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method	**8**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

  1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

- **Reference Books**

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques',
   Cambridge University Press, 2019

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

23UCSCE56-2	Cloud Computing		Credits 3
Lecture Hours: (L) 4 per week	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 4**
Course Category : EC-6	**Year & Semester: III & V**		**Admission Year:2023**
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart fundamental concepts of Cloud Computing.
- To impart a working knowledge of the various cloud service types and their uses and pitfalls.
- To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.
- To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the concepts and technologies involved in Cloud Computing.

CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.

CO3: To understand the aspects of application design for the Cloud.

CO4: To understand the concepts involved in benchmarking and security on the Cloud.

CO5: To understand the way in which the cloud is used in various domains.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Introduction to Cloud Computing:** Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. **Cloud Concepts and Technologies:** Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	10

II	**Cloud Services** **Compute Services:** Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. **Storage Services:** Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service **Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services **Content Delivery Services:** Amazon CloudFront - Windows Azure Content Delivery Network **Analytics Services:** Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight **Deployment and Management Services:** Amazon Elastic Beanstack - Amazon CloudFormation **Identity and Access Management Services:** Amazon Identiy and Access Management - Windows Azure Active Directory **Open Source Private Cloud Software:** CloudStack – Eucalyptus - OpenStack	**10**
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component	**10**

	Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.	**10**
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	**8**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

course		

Learning Resources:

- **Recommended Texts**

1. Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

- **Reference Books**

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2012.
4. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE56-3	Grid Computing		Credits 3
Lecture Hours: (L) 4 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 4
Course Category :EC-6	Year & Semester: III & V		Admission Year: 2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on the basic construction and use of Grid computing.
- To know and understand the grid computing applications.
- To assess the efficiency of the grid computing in solving large scale scientific problems

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic elements and concepts related to Grid computing

CO2: To identify the Grid computing toolkits and Framework.

CO3: To know about the concepts of Virtualization

CO4: To analyze the concept of service oriented architecture.

CO5: To Gain knowledge on grid and web service architecture.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.	10
II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.	10
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology	10
IV	The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#.	10
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, #XML messages and Enveloping#, Service message description Mechanisms, Relationship between Web	8

	Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.
- **Reference Books**
  2. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.
- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: 23UCSCI58	**SUMMER INTERNSHIP**		**Credits: 2**
Lecture Hours: (L) per week: -	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week: -**
Course Category :-	**Year & Semester: III Year V Semester**		**Admission Year:2023**

(Refer to the Regulations)

SEMESTER – VI

Course Code: 23UCSCC61	**Microprocessor and Microcontroller**		**Credits: 4**
Lecture Hours: (L) per week: 5	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week: 5**
Course Category :CC12	**Year & Semester: III Year VI Semester**		**Admission Year:2023**
Pre-requisite	Basic knowledge on micro processor and micro controllers		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce the internal organization of Intel 8085 Microprocessor.
- To enable the students to write assembly language programs using 8085.
- To interface the peripheral devices to 8085 using Interrrupt controller and DMA interface.
- To provide real-life applications using microcontroller.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085.

CO2: Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic..

CO3: Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.

CO4: Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.

CO5: An exposure to create real time applications using microcontroller.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	**Contents**	**Required Hours**
I	Digital Computers - Microcomputer Organization-Computer languages –Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.	**12**

II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.	**12**
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.	**12**
IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.	**12**
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

Recommended Texts

1. R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV].
2. Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].

Reference Books

1. Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2. Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
3. Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008.

Web resources: Web resources from NDL Library, E-content from open source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	2	2	2	3	2
CO3	3	3	2	2	3
CO4	3	2	3	3	2
CO5	2	2	2	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: CC14 23UCSCC62	.Net Programming		Credits: 4
Lecture Hours: (L) per week: 6	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week:6
Course Category :CC14	Year & Semester: III Year VI Semester		Admission Year:202312
Pre-requisite	Basic knowledge on web programming		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

1. To develop ASP.NET Web application using standard controls.
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To utilize ASP.NET security features for authenticating the web site.
5. To handles SQL Server Database using ADO.NET.

Course Outcomes: (for students: To know what they are going to learn)

CO1: To identify and **understand** the goals and objectives of the .NET framework and ASP.NET with C# language.

CO2: To **develop** web application using various controls.

CO3: To analyze C# programming techniques in developing web applications.

CO4: To assess a Web application using Microsoft ADO.NET.

CO5: To **develop** a software to solve real-world problems using ASP.NET

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.	12

II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls - List Controls: Properties and its events.	
III	Rich Controls: Properties and its events – validation controls: Properties and its events – File Stream classes - File Modes – File Share – Reading and Writing to files –Creating, Moving, Copying and Deleting files – File uploading.	**12**
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties - Data Binding	**12**
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication, 2019.
2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill ,2015.

- **Reference Books**

1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill,2017.
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc. 2016.
4. DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill,2008.
5. Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS,2010.

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

<table>
<tr><td>Course Code: CC15
23UCSCP63</td><td colspan="2">.Net Programming Lab</td><td>Credits: 4</td></tr>
<tr><td>Lecture Hours: (L)
per week 6</td><td>Tutorial
Hours :
(T) per week</td><td>Lab Practice
Hours: (P)per week: 6</td><td>Total: (L+T+P)
per week: 6</td></tr>
<tr><td>Course Category :CC14</td><td colspan="2">Year & Semester: III Year VI Semester</td><td>Admission Year:2023</td></tr>
<tr><td>Pre-requisite</td><td colspan="3">Basic knowledge on</td></tr>
<tr><td colspan="4">Learning Objectives: (for teachers: what they have to do in the class/lab/field)
1. To develop ASP.NET Web application using standard controls.
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To utilize ASP.NET security features for authenticating the web site.
5. To handles SQL Server Database using ADO.NET.</td></tr>
<tr><td colspan="4">Course Outcomes: (for students: To know what they are going to learn)
CO1: To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.
CO2:To develop web application using various controls.
CO3:To analyze C# programming techniques in developing web applications.
CO4: To assess a Web application using Microsoft ADO.NET.
CO5: To develop a software to solve real-world problems using ASP.NET</td></tr>
<tr><td colspan="4">Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)</td></tr>
<tr><td></td><td colspan="2">List of Exercises:</td><td>Required Hours</td></tr>
<tr><td></td><td colspan="2">1. Create an exposure of Web applications and tools
2. Implement the Html Controls
3. Implement the Server Controls
4. Web application using Web controls.
5. Web application using List controls.</td><td>60</td></tr>
</table>

	6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts. 7. Web application using Data Controls. 8. Data binding with Web controls 9. Data binding with Data Controls. 10. Database application to perform insert, update and delete operations. 11. Database application using Data Controls to perform insert, delete, edit, paging and sorting operation. 12. Implement the Xml classes. 13. Implement Authentication – Authorization. **14.** Ticket reservation using ASP.NET controls. Online examination using ASP.NET controls	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication, 2019.
2. Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill ,2015.

- **Reference Books**

1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill,2017.
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc. 2016.
6. DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill,2008.
7. Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS,2010.

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: EC7 23UCSCE64-1	Introduction to Data Science		Credits: 3
Lecture Hours: (L) per week: 5	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 5
Course Category : EC7	Year & Semester: III Year VI Semester		Admission Year:2023
Pre-requisite	Basic knowledge on Data and statistics		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce the concepts, techniques and tools in Data Science
- To understand the various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling and effective communication.

Course Outcomes: (for students: To know what they are going to learn)

CO1: To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

CO2: To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

CO3: To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

CO4: To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

CO5: To describe what Data Science is, what Statistical Inference means, identify probability distributions, fit a model to data and use tools for basic analysis and communication

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Introduction:** Benefits and uses – Facets of data – Data science process – Big data ecosystem and data science	14
II	**The Data science process**: • Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building	14

III	**Algorithms** : • Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	**14**
IV	**Introduction to Hadoop** : • Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	**15**
V	**Case Study**: • Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	**15**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
    1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016

- **Reference Books**

    1. Roger Peng, "The Art of Data Science", lulu.com 2016.
    2. MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.
    3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali,"Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.
    4. Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017,1st Edition.
    5. Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.
    6. Lillian Pierson, "Data Science for Dummies", 2017 II Edition

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE64-2	Mobile Ad-hoc Network		Credits 3
Lecture Hours: (L) 5 per week	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week 5**
Course Category :EC-7	**Year & Semester:III & VI**		**Admission Year:2023**
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- To introduce students to artificial neural networks and fuzzy theory from a theoretical perspective

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic concepts ad-hoc networks and ad-hoc mobility models.

CO2: Acquire knowledge about Medium access protocols and standards like IEEE 802.11a and HIPERLAN.

CO3: Identify the significance of Routing protocols and analyze about routing Algorithm.

CO4: Understand about the applications of end-end delivery and security issues in ad-hoc networks

CO5: Analyze and understand the concept of cross-layer design and parameter optimization techniques.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Introduction**: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.	**15**
II	**Medium Access Protocol:** • MAC Protocols: Design issues, goals and classification. • Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. • IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.	**15**
III	Network Protocols :	**14**

	: Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.	
IV	**End – end delivery and security:** Transport Layer: Issues in designing – Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.	**14**
V	**CROSS -LAYER DESIGN:** Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.	**14**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols II edition, Pearson Edition, 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

- **Reference Books**

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-
2. hoc networking, Wiley-IEEE press, 2004.
3. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
4. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad-hoc Network"
5. Research, "Wireless Commn. and Mobile Comp - Special Issue on Mobile Ad-
6. hoc networking Research, Trends and Applications", Vol. 2, no. 5, 2002, pp. 483 – 502.
7. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri
8. M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no:12007.

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE64-3	Computing Intelligence		Credits 3
Lecture Hours: (L) 5 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 5
Course Category :EC-7	Year & Semester:III & VI		Admission Year:2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide strong foundation on fundamental concepts in Computing Intelligence
- To apply basic principles of Artificial Intelligence and solutions that require problem solving, influence, perception, knowledge representation and learning

Course Outcomes: (for students: To know what they are going to learn)

CO1: Describe the fundamentals of artificial intelligence concepts and searching techniques.
CO2: Develop the fuzzy logic sets and membership function and defuzzification techniques.
CO3: Understand the concepts of Neural Network and analyze and apply the learning techniques
CO4: Understand the artificial neural networks and its applications
CO5: Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.	15
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.	15
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.	14
IV	**Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	14

V	**Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.	**14**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

1. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2nd Edition, Pearson Education in Asia.
3. S. Rajasekaran, G. A. Vijayalakshmi, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI.

- **Reference Books**

1. F. Martin, Mc neill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.
2. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: EC8 23UCSCE65-1	Cyber Security		Credits: 3
Lecture Hours: (L) 5 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 5
Course Category :EC8	Year & Semester:III Year VI Semester		Admission Year:2023
Pre-requisite	Basic skills on internet and its functions		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

The students will be able to

- Understand various block cipher and stream cipher models
- Describe the principles of public key cryptosystems, hash functions and digital signature
- To get a firm knowledge on Cyber Security Essentials

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement basic security algorithms required by any computing system

CO2: Analyze the vulnerabilities in any computing system and hence be able to design a security solution

CO3: Analyze the possible security attacks in complex real time systems and their effective countermeasures

CO4: Differentiate various governing bodies of cyber laws

CO5: Impart various privacy policies for an organization

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Introduction to Security** Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm.	12
II	**Public Key Cryptography and Hash Algorithms** Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange- Hash functions-Hash Algorithms (MD5, Secure Hash Algorithm	12

III	**Fundamentals of Cyber Security** How Hackers Cover Their Tracks- Fraud Techniques- Threat Infrastructure- Techniques to Gain a Foothold (Shellcode, SQL Injection, Malicious PDF Files)- Misdirection, Reconnaissance, and Disruption Methods.	**12**
IV	**Planning for Cyber Security** Privacy Concepts -Privacy Principles and Policies - Authentication and Privacy - Data Mining - Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.	
V	**Cyber Security Management** Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster – Legal Issues – Protecting programs and Data – Information and the law – Rights of Employees and Employers - Emerging Technologies - The Internet of Things - Cyber Warfare.	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**

. 1. William Stallings, "Cryptography and Network Security", Pearson Education, 6th Edition,2013.

2. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015.

- **Reference Books**

1. Graham, J. Howard, R., Olson, R., Cyber Security Essentials, CRC Press, 2011.

2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE65-2	Software Testing		Credits 3
Lecture Hours: (L) 5 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 5
Course Category :EC8	Year & Semester:III & VI		Admission Year:2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To study various Software techniques
- To study fundamental concepts in software testing

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the Purpose of Software Testing.
CO2: Demonstrate the Transaction flow testing techniques.
CO3: To know the various Data Flow Techniques.
CO4: Implement the various Test Cases.
CO5: Understand the state graph and testing.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	Introduction: Purpose – Productivity and Quality in Software – Testing Vs Debugging – Model for Testing – Bugs – Types of Bugs – Testing and Design Style.	12
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation – Application – Transaction Flow Testing Techniques	12
III	Data Flow Testing Strategies - Domain Testing: Domains and Paths – Domains and Interface Testing.	12
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing – Formats – Test Cases.	12
V	Logic Based Testing – Decision Tables – Transition Testing – States, State Graph, State Testing.	17

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. B. Beizer, "Software Testing Techniques", II Edn., DreamTech India, NewDelhi, 2003.
  2. K.V.K. Prasad , "Software Testing Tools", DreamTech. India, New Delhi,2005.
- **Reference Books**

1. Burnstein, 2003, "Practical Software Testing", Springer International Edn.
2. . Kit, 1995, "Software Testing in the Real World: Improving the Process", Pearson Education, Delhi.
3. R. Rajani, and P.P.Oak, 2004, "Software Testing", Tata Mcgraw Hill, New Delhi.

- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code 23UCSCE65-3	E-Commerce		Credits 3
Lecture Hours: (L) 5 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week 5
Course Category :EC-8	Year & Semester:III & VI		Admission Year:2023
Pre-requisite			

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide knowledge on Ecommerce technology, Business Models and M-Commerce.
- To explore the major issues associated with e-commerce-security, privacy, authentication, encryption and e-Payment

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understanding the basic electronic business management

CO2: Analyze the technologies and marketing trends in Ecommerce

CO3: Knowledge gain in E security, Legal and Ethical issues

CO4: A clear evaluation of the e payment systems

CO5: Improve the expertise in mobile commerce and apply knowledge in development of E- Business portals

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**History of E-commerce and Indian Business Context**: E-Commerce –Emergence of the Internet –Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition Challenges for Indian Corporate. **Business Models for E- commerce:** Business Model – E-business Models Based on the Relationship of Transaction Parties - E-business Models Based on the Relationship of Transaction Types.	12
II	**Enabling Technologies of the World Wide Web:** World Wide Web – Internet Client-Server Applications –Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. **e-Marketing :**Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.	12

III	**E-Security:** Information system Security – Security on the Internet – E-business Risk Management Issues – Information Security Environment in India. **Legal and Ethical Issues :** Cybers talking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.	**12**
IV	**e-Payment Systems:** Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e-payment Systems – Digital Signature – Online Financial Services in India - Online Stock Trading.	**12**
V	**Information systems for Mobile Commerce:** What is Mobile Commerce? – Wireless Applications –Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies –Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. **Portals for E-Business:** Portals – Human Resource Management – Various HRIS Modules.	**12**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	

Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. P.T.Joseph, S.J., "E-Commerce - An Indian Perspective", PHI 2012, 4th Edition
- **Reference Books**
  1. David Whiteley , "E-Commerce Strategy, Technologies and Applications", Tata McGrawHill, 2001.
  2. Ravi Kalakota, Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson 2006,12th Impression.
- **Web resources**

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: 23UCSCF66	Big Data Analytics		Credits: 1
Lecture Hours: (L) 2 per week	Tutorial Hours : (T) per week	Lab Practice Hours: (P)per week	Total: (L+T+P) per week: 2
Course Category : Professional Competency Skill	Year & Semester: III Year V I Semester		Admission Year:2023
Pre-requisite	Basic knowledge on Data handlings		

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with big data.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Work with big data tools and its analysis techniques.

CO2: Analyze data by utilizing clustering and classification algorithms.

CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.

CO4: Perform analytics on data streams.

CO5: Learn NoSQL databases and management.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**INTRODUCTION TO BIG DATA :** Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model	5
II	**CLUSTERING AND CLASSIFICATION :**Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision	5

	Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier	
III	**ASSOCIATION AND RECOMMENDATION SYSTEM:**Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation-Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches	**5**
IV	**STREAM MEMORY:** Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	**5**
V	**NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION :**NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	**5**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- **Reference Books**
  1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.
  2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

Course Code: 23UCSCX67	**EXTENSION ACTIVITY**		**Credits: 1**
Lecture Hours: (L) per week: -	**Tutorial Hours : (T) per week**	**Lab Practice Hours: (P)per week**	**Total: (L+T+P) per week: -**
Course Category :-	**Year & Semester: III Year VI Semester**		**Admission Year:2023**

Refer to the Regulations