ANNAMALAI UNIVERSITY

221- B.Sc. Data Science

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Course Code	Part	Study Components & Course Title	Credit	Hours/Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
23UTAML11/ 23UHINL11/ 23UFREL11	I	Language– I: பொதுதமிழ்-I: **தமிழிலக்கியவரலாறு**-1/ Hindi-I/ French-I	3	6	25	75	100
23UENGL12	II	General English – I	3	6	25	75	100
23UDSCC13	III	Core – I:Python Programming	5	5	25	75	100
23UDSCP14		Core – II: Practical –I: Python Lab	5	4	25	75	100
23UMAFE15		Elective - I Mathematical Foundations-I	2	3	25	75	100
23UTAMB16 23UTAMA16	IV	Skill Enhancement Course – I* NME- I/ Basic Tamil – I / Advanced Tamil – I	1	2	25	75	100
23UDSCF17		Foundation Course**:** Problem Solving Technique	2	2	25	75	100
		Total	**23**	**30**			**700**
		SEMESTER – II					
23UTAML21/ 23UHINL21/ 23UFREL21	I	Language– II: பொதுதமிழ் -II: **தமிழிலக்கியவரலாறு**-2/ Hindi-II/ French-II	3	6	25	75	100
23UENGL22	II	General English – II	3	6	25	75	100
23UDSCC23	III	Core – III: Data Structures and Algorithms	5	5	25	75	100
23UDSCP24		Core - IV: Practical II: Data Structures and Algorithms using Python Lab	5	5	25	75	100
23UMAFE25		Elective – II: Mathematical Foundations-II	3	4	25	75	100
23UTAMB26 23UTAMA26	IV	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**

Course Code	Part	Study Components & Course Title	Credit	Hours/Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – III					
23UTAML31/ 23UHINL31/ 23UFREL31	I	Language– III: பொதுதமிழ்-III: தமிழகவரலாறும், பண்பாடும்/ Hindi-III/ French-III	3	6	25	75	100
23UENGL32	II	General English – III	3	6	25	75	100
23UDSCC33	III	Core – V: Data Science	5	5	25	75	100
23UDSCP34		Core – VI: Practical –III: Data Science Lab	5	5	25	75	100
23UDSCE35		Elective – III: E-COMMERCE	3	4	25	75	100
23UDSCS36	IV	Skill Enhancement Course – IV: Organizational Behavior	1	1	25	75	100
23UDSCS37		Skill Enhancement Course – V: PHP Programming	2	2	25	75	100
		Environmental Studies	-	1	-	-	-
		Total	**22**	**30**			**700**
		SEMESTER – IV					
23UTAML41/ 23UHINL41/ 23UFREL41	I	Language– IV: பொதுதமிழ் -IV: **தமிழும்அறிவியலும்** / Hindi-IV/ French-IV	3	6	25	75	100
23UENGL42	II	General English – IV	3	6	25	75	100
23UDSCC43	III	Core – VII: Object Oriented Programming with Java	5	5	25	75	100
23UDSCP44		Core - VIII: Practical IV: Object Oriented Programming with Java Lab	5	4	25	75	100
23UDSCE45		Elective – IV: Big Data Technologies	3	4	25	75	100
23UDSCS46	IV	Skill Enhancement Course – VI: Software Testing	2	2	25	75	100
23UDSCS47		Skill Enhancement Course-VII: Multimedia Systems	2	2	25	75	100
23UEVSG48		Environmental Studies	2	1	25	75	100
		Total	**25**	**30**			**800**

Course Code	Part	Study Components & Course Title	Credit	Hours/Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – V					
23UDSCC51	III	Core – IX: Relational Database Management System	4	5	25	75	100
23UDSCP52		Core – X: RDBMS Lab using ORACLE	4	5	25	75	100
23UDSCC53		Core – XI: Machine Learning	4	5	25	75	100
23UDSCD54		Core – XII: Project with Viva Voce	4	5	25	75	100
23UDSCE55-1 23UDSCE55-2 23UDSCE55-3		**Elective – V:** Social Network Analysis Social Media Management Social Media Marketing	3	4	25	75	100
23UDSCE56-1 23UDSCE56-2 23UDSCE56-3		**Elective – VI:** Cloud Computing Fundamentals Cloud Services Interfacing with Virtualization	3	4	25	75	100
23UVALG57	IV	Value Education	2	2	25	75	100
23UDSCI58		Summer Internship^{++}	2	-	25	75	100
		Total	**26**	**30**			**800**
		SEMESTER – VI					
23UDSCC61	I	Core – XIII: IoT and Cloud Technologies	4	6	25	75	100
23UDSCP62	II	Core – XIV: IoT and Cloud Technologies Lab	4	6	25	75	100
23UDSCC63	III	Core – XV: Artificial Intelligence	4	6	25	75	100
23UDSCE64-1 23UDSCE64-2		Elective – VII: Network Technologies Data Security	3	5	25	75	100
23UDSCE65-1 23UDSCE65-2	IV	Elective – VIII: Data Mining and Warehousing (or) Master Web Designing in Photoshop	3	5	25	75	100
23UDSCF66		Professional Competency Skill: Quantitative Aptitude	2	2	25	75	100
23UDSCX67	V	Extension Activity	1	-	100		100
		Total	**21**	**30**			**700**
		Grand Total	**142**				**4500**
NME courses offered to other Department							
Semester – I	23UDSCN16	Fundamentals of Information Technology	2	2	25	75	100
Semester - II	23UDSCN26	Computer Fundamentals	2	2	25	75	100

* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)
Students who have not studied Tamil upto12th 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 upto10th& 12thStandardand 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 Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

	PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one"s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO 3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO 5:** Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

FIRST YEAR –SEMESTER- I

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC13	PYTHON PROGRAMMING	**CCI**	5	-	-	I	5	25	75	100

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	Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2	Dr. R. Nageswara Rao, "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

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCP14	**PYTHON LAB**	**CCII**	**-**	**-**	**5**	**I**	**5**	**25**	**75**	**100**

Course Objectives:

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. 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.	**75**

Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of
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 MATHEMATICAL FOUNDATIONS – I	CREDIT: 3 HOURS: 4/W

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

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCF17	PROBLEM SOLVING TECHNIQUE	FC	2	-	-	I	2	25	75	100

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
	Determine the various operators.	PO1, PO2,

CO3	Explain about the structures. Illustrate the concept of Loops	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

FIRST YEAR –SEMESTER- II

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC23	**DATA STRUCTURES AND ALGORITHMS**	**CC III**	**5**	**-**	**-**	**II**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand the meaning asymptotic time complexity analysis and various data structures
LO2	To enhancing the problem solving skills and thinking skills
LO3	To write efficient algorithms and Programs
LO4	To make the students learn best practices in PYTHON programming
LO5	To understand how to handle the files in Data Structure

UNIT	Contents	No. Of. Hours
I	**Arrays and ordered Lists** Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions	**15**
II	**Trees and Graphs** Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs	**15**
III	**Searching and Sorting** Sorting – Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Selection Sort. Searching – Linear search, Binary search	**15**
IV	**Greedy Method and Dynamic programming** Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components	**15**
V	**Backtracking** General Method – 8-Queen‟s – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To understand the asymptotic notations and analysis of time and space complexity To understand the concepts of Linked List, Stack and Queue.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To understand the Concepts of Trees and Graphs Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To apply searching and sorting techniques	PO1, PO2, PO3, PO4, PO5, PO6

CO4	To understand the concepts of Greedy Method To apply searching techniques.	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	Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill publications.
2	Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd.
3	Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018)

Reference Books

1.	Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.
2.	A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication.
3.	Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd.

Web Resources

1.	https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2.	https://www.programiz.com/dsa
3.	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	3	3	3	3
CO 3	3	3	3	3	1	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	15	15	15	13	14

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

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCP24	**DATASTRUCTURES ANDALGORITHMS USING PYTHON LAB**	**CC IV**	5	-	5	II	5	25	75	100

Objectives

To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

LIST OF PROGRAMS	Required Hour
1. Perform stack operations 2. Perform queue operations 3. Perform tree traversal operations 4. Search an element in an array using linear search. 5. Search an element in an array using binary search 6. Sort the given set of elements using Merge Sort. 7. Sort the given set of elements using Quick sort. 8. Search the Kth smallest element using Selection Sort 9. Find the Optimal solution for the given Knapsack Problem using Greedy Method. 10. Find all pairs shortest path for the given Graph using Dynamic Programming method 11. Find the Single source shortest path for the given Travelling Salesman problem using Dynamic Programming method 12. Find all possible solution for an N Queen problem using backtracking method 13. Find all possible Hamiltonian Cycle for the given graph using backtracking method	**75**

Course Outcomes	
CO	On completion of this course, students will
CO1	To understand the concepts of Linked List, Stack and Queue.
CO2	Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.
CO3	To apply searching and sorting techniques
CO4	To determine the concepts of Greedy Method To apply searching techniques.
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

LearningResources:

- **RecommendedTexts**
  1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press
  2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press
- **ReferenceBooks**
  3. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.
  4. R.Krishnamoorthy and G.IndiraniKumaravel, Data Structures using C, Tata McGrawHill – 2008.
  4. A.K.Sharma, Data Structures using C , Pearson Education India,2011.

5. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.
6. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer
7. Algorithms”, Addison Wesley, Boston, 1974
8. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
9. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Course Outcomes

CO	On completion of this course, students will
CO1	Implement data structures using C
CO2	Implement various types of linked lists and their applications
CO3	Implement Tree Traversals
CO4	Implement various algorithms in C
CO5	Implement different sorting and searching algorithms

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

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

SEMESTER: II ELECTIVE- II	23UMAFE25 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

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCN16	**FUNDAMENTALS OF INFORMATION TECHNOLOGY**	**NME-1**	2	-	-	I	2	25	75	100

Learning Objectives	
LO1	Understand basic concepts and terminology of information technology.
LO2	Have a basic understanding of personal computers and their operation
LO3	Be able to identify data storage and its usage
LO4	Get great knowledge of software and its functionalities
LO5	Understand about operating system and their uses

UNIT	Contents	No. Of. Hours
I	**Introduction to Computers:** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer	**6**
II	**Basic Computer Organization:** Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	**6**
III	**Storage Fundamentals:** Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	**6**
IV	**Software:** Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	**6**
V	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**
	TOTAL HOURS	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Anoop Mathew, S. Kavitha Murugeshan (2009), " Fundamental of Information Technology", Majestic Books.	
2	Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.	
3	S. K Bansal, "Fundamental of Information Technology".	
Reference Books		
1.	Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"	
2.	GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell	
3.	A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing	
Web Resources		
1.	https://testbook.com/learn/computer-fundamentals	
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html	
3.	https://www.javatpoint.com/computer-fundamentals-tutorial	
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm	
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf	

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

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

Course Code	Title of the Course	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCN26	**COMPUTER FUNDAMENTALS**	**NME-II**	2	-	-	II	2	25	75	100

Learning Objectives	
LO1	Discuss the Introduction about Computer and its Components.
LO2	To Perform the Microsoft Word, Excel, PowerPoint and its operations.
LO3	To get Knowledge about the Internet and Intranet
LO4	Insert heading levels within a web page.
LO5	Insert ordered and unordered lists within a web page. Create a web page.

UNIT	Contents	No. Of. Hours
I	**Introduction to Computers** - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices — Types of Operating System.	**6**
II	**MS Word**: Introduction – Elements of Window – Files, Folders and Directories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background) – Alignment - Bullets and Numbering - Header and footer-watermark – inserting objects (images, other application document) – Table creation – Mail merge.	**6**
III	**Ms Excel**: Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series - Functions in excel – Creation of Chart – Inserting objects – Filter – Sorting – Inserting worksheet.	**6**
IV	**MS PowerPoint**: Introduction – Slides Manipulation (Inserting new, Copy, paste, delete and duplicate slides) – Slide show– Types of Views – Types of Animations – Inserting Objects – Implementing multimedia (Video and Audio) – Templates (Built-in and User-Defined).	**6**
V	**Internet**: Introduction to Internet and Intranet – Services of Internet - Domain Name – URL – Browser – Types of Browsers – Search Engine - E-Mail – Basic Components of E-Mail –.How to send group mail. **E-Commerce**: Digital Signature – Digital Currency – Online shopping and transaction.	**6**
	TOTAL HOURS	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand the basics of Computer and its Generations. Be able to understand the components of computer.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To Understand the introduction about MS Word. Be able to perform the Elements of window, Text Formatting, Text Manipulating options in MS Word.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To Understand the introduction about MS Excel. Be able to inserting and sizing the cells Implementing formulas and inserting worksheet.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To Understand the introduction about MS PowerPoint Be able to perform the slides manipulation. Implementing Multimedia and templates.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	To Understand the introduction about Internet and Intranet. Be able to access the browsers. To get knowledge about basic components of E-Mail and E-Commerce	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	G. Manjunath, “Computer Basics”, Vasan Publications, 2010.
2	Pradeep K. Sinha&PritiSinha, “Computer Fundamentals”, 6th Edition, BPB Publications, 2004.
Web Resources	
1.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
2.	https://www.tutorialspoint.com/basics_of_computers/index.htm
3.	https://www.tutorialspoint.com/word/index.htm
4.	https://www.tutorialspoint.com/excel/index.htm
5.	https://www.tutorialspoint.com/powerpoint/index.htm

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

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

SECOND YEAR –SEMESTER- III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC33	**DATA SCIENCE**	**CORE -V**	5	-	-	III	5	25	75	100

Learning Objectives	
LO1	To understand the basic concepts of Data Science
LO2	To understand the principles of algorithms, flowchart and source code
LO3	To acquire a solid foundation in Python.
LO4	To visualize data using plots in python
LO5	To understand and handle database and visualize.

UNIT	Contents	No. Of. Hours
I	**Introduction to Data Science** Introduction: Data Science - Big Data and Data Science hype – getting past the hype - Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle - Machine Learning	**15**
II	**Introduction to Python** Features of Python - How to Run Python – Identifiers- Reserved Keywords- Variables - Comments in Python - Indentation in Python - Multi-Line Statements- Input, Output and Import Functions- Operators. Data Types and Operations: Numbers - Strings -List -Tuple - Set -Dictionary - Mutable and Immutable Objects - Data Type Conversion. Flow Control: Decision Making- Loops-Nested Loops-Control Statements- Types of Loops-List Comprehensions-Set Comprehensions-Dictionary Comprehensions-Nested Dictionaries.	**15**
III	**Functions** Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions - Modules and Packages: Built-in Modules - Creating Modules - import Statement- Namespaces and Scope - The dir() function - The reload() function -Packages in Python - Date and Time Modules – Numpy Libraries and Data Manipulation Using Pandas	**15**
IV	**File Handling and Object Oriented Programming** Opening a File- Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Regular Expressions. Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding – Inheritance-Method Overriding – Polymorphism - Exception Handling	**15**

V	**Database Programming and Visualizations** Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control -Disconnecting from a Database - Exception Handling in Databases - GUI Programming - CGI Programming- Data Visualizations using Matplotlib – histograms, bar charts, pie charts.	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To explain the basic concepts of data science and its application	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To explain the Features of Python To demonstrate Control Statements and Looping Statements	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To understand Python Functions To create and illustrate Numpy Libraries To perform Data Manipulation using Pandas.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To understand the File Concepts Apply Exception Handling Techniques	PO1, PO2, PO3, PO4, PO5, PO6
CO5	To Create and manipulate Database To create Data Visualization using Mat plot lib	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Doing Data Science**,** Straight Talk From The Frontline**, Cathy O'Neil and Rachel Schutt, O'Reilly** (2014)
2	Big Data Analytics, paperback 2nd ed., **Seema Acharya, SubhasiniChellappan, Wiley**
3	**Dr. Jeeva Jose (2018) ,**Taming Python By Programming, Khanna Publishers
4	**Jake Vanderplas,** Python Data Science Handbook: Essential Tools for Working with Data 1st Edition.

Reference Books

1.	LjubomirPerkovic(2012),Introduction to Computing Using Python: An Application DevelopmentFocus, John Wiley & Sons
2.	John V Guttag(2013), Introduction to Computation and Programming Using Python‟, Revised and expanded Edition, MIT Press.
3	Kenneth A. Lambert(2012), Fundamentals of Python: First Programs, Cengage Learning

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	2	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	14	15	15	15	15

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCP34	**DATA SCIENCE LAB**	**Core - VI**	-	-	4	III	5	25	75	100

OBJECTIVES:
To build websites and software, automate tasks, and conduct data analysis.Open Source and Community Development.

	Required Hours
LIST OF PROGRAMS 1. Demonstrate the working of "id" and "type" functions. 2. Find all prime numbers within a given range. 3. Print n terms of Fibonacci series using iteration. 4. Demonstrate use of slicing in string. 5. Compute the frequency of the words from the input. The output should output after sorting thekey alphanumerically. 6. Write a program that accepts a comma separated sequence of words as input and prints thewords in a comma-separated sequence after sorting them alphabetically. 7. Demonstrate use of list & related functions. 8. Demonstrate use of Dictionary & related functions. 9. Demonstrate use of tuple & related functions. 10. Implement stack using list. 11. Implement queue using list. 12. Read and write from a file. 13. Copy a file. 14. Demonstrate working of classes and objects. 15. Demonstrate class method & static method. 16. Demonstrate constructors. 17. Demonstrate inheritance. 18. Demonstrate aggregation/composition. 19. Create a small GUI application for insert, update and delete in a table. 20. Bar charts, histograms and pie charts	**60**

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
23UDSCE35	**E-COMMERCE**	**Elective - III**	4	-	-	III	3	25	75	100

Learning Objectives	
LO1	Understanding of the foundations and importance of E-commerce
LO2	Understanding of retailing in E-commerce by in terms of branding and pricing strategies and determining the effectiveness of market research.
LO3	Assess the Internet trading relationships including Business to Consumer, Business- to-Business, Intra-organizational.
LO4	Knowing key features of Internet, Intranets and Extranets and how they relate to each other.
LO5	Understanding legal issues and privacy in E-Commerce.

UNIT	Contents	No. Of. Hours
I	**E-Commerce:** E-Commerce Framework – E-Commerce and Media Convergence – The anatomy of E-commerce applications - E-Commerce Consumer Applications - E- Commerce Organization Applications.	**6**
II	**The Internet:** The Internet Terminology – NSFNET – Architecture and Components– National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/Online companies - National Independent ISPs – Regional level ISPs – Local level ISPs.	**6**
III	**E-Commerce and the World Wide Web:** Architectural Framework for E-commerce – WWW as the architecture – Technology behind the web – Security and the web.	**6**
IV	**Electronic Payment Systems:** Types of Electronic Payment Systems – Digital token Electronic Payment Systems – Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems. Electronic Data Interchange: Legal, Security and Privacy issues.	**6**
V	**Advertising and Marketing on the Internet:** E-Commerce Catalogs – Information Filtering – Consumer Data Interface – Emerging tools. Software Agents: Characteristics and Properties of Software Agents – Technology behind Software Agents - Applets, Browsers, and Software Agents.	**6**
	TOTAL HOURS	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	

CO1	Demonstrate E-Commerce Frameworks. Distinguish E-Commerce and media Convergence. Illustrate E-Commerce Applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Describe the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Evaluate the E-Commerce how incorporate the Internet, Construct the Web Security	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Distinguish the different payment system. Illustrate the data interchange	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understanding the Advertising and Marketing on the Internet, Describe Software Agents	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	**Ravi Kalakota& Andrew Whinston,** "*Frontiers of Electronic-Commerce*", Addison Wesley.
Reference Books	
1.	**EfraimTurvanJ.Lee, David Kug andChung**, "Electronic Commerce", Pearson Education, Asia.
2.	**Manlyn Greenstein and Miklos**, "Electronic Commerce", TMH.
Web Resources	
1.	https://www.the-reference.com/en/expertise/creation-and.../e-commerce
2.	https://en.wikipedia.org/wiki/E-commerce
3.	https://www.tutorialspoint.com/e_commerce/index.htm

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

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

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
23UDSCS36	**Organizational Behavior**	S EC -4 (NME-1)	Y	-	-	-	2	2	25	75	100

Learning Objectives	
CLO1	To have extensive knowledge onOB and the scope of OB.
CLO2	To create awareness of Individual Benaviour.
CLO3	To enhance the understanding of Group Behavior
CLO4	To know the basics of Organisaitonal Culture and Organisational Structure
CLO5	To understand Organisational Change, Conflict and Power

UNIT	Details	No. of Hours	Learning Objectives
I	INTRODUCTION : Concept of Organizational Behavior (OB): Nature, Scope and Role of OB: Disciplines that contribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance, people skills, positive work environment, ethics)	6	CLO1
II	INDIVIDUAL BEHAVIOUR: 1. Learning, attitude and Job satisfaction: Concept of learning, conditioning, shaping and reinforcement. Concept of attitude, components, behavior and attitude. Job satisfaction: causation; impact of satisfied employees on workplace. 2. Motivation : Concept; Theories (Hierarchy of needs, X and Y, Two factor, McClelland, Goal setting, Self-efficacy, Equity theory); Job characteristics model; Redesigning jobs, 3. Personality and Values : Concept of personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance of values; Linking personality and values to the workplace (person-job fit, person-organization fit) 4. Perception, Decision Making : Perception and Judgements; Factors; Linking perception to individual decision making:	6	CLO2
III	GROUP BEHAVIOUR : 1. Groups and Work Teams : Concept : Five Stage model of group development; Group norms, cohesiveness ; Group think and shift ; Teams; types of teams; Creating team players from individuals and team based work(TBW) 2. Leadership : Concept; Trait theories; Behavioral theories (Ohio and Michigan studies); Contingency theories (Fiedler, Hersey and Blanchard, Path-Goal);	6	CLO3

IV	ORGANISATIONAL CULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creating and sustaining culture: Concept of structure, Prevalent organizational designs: New design options	6	CLO4
V	ORGANISATIONAL CHANGE, CONFLICT AND POWER: Forces of change; Planned change; Resistance; Approaches (Lewin's model, Organisational development);. Concept of conflict, Conflict process; Types, Functional/ Dysfunctional. Introduction to power and politics.	6	CLO5
		30	

Course Outcomes	On Completion of the course the students will	**Program Outcomes**
CO1	To define OrganisationalBehaviour, Understand the opportunity through OB.	PO1, PO2, PO6, PO7
CO2	To apply self-awareness, motivation, leadership and learning theories at workplace.	PO2,PO4. PO5, PO6
CO3	To analyze the complexities and solutions of group behaviour.	PO1, PO2, PO4, PO5, PO6
CO4	To impact and bring positive change in the culture of the organisaiton.	PO2, PO3, PO4 PO5, PO8
CO5	To create a congenial climate in the organization.	PO1, PO2, PO5 PO6, PO8

Reading List	
1.	NeharikaVohra Stephen P. Robbins, Timothy A. Judge , *Organizational Behaviour*, Pearson Education, 18th Edition, 2022.
2.	Fred Luthans, *Organizational Behaviour*, Tata McGraw Hill, 2017.
3.	Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, *Organizational Behaviour*, John Wiley & Sons, 2011
4.	Louis Bevoc, Allison Shearsett, Rachael Collinson, *Organizational Behaviour Reference*, Nutri Niche System LLC (28 April 2017)
5.	Dr. Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, *Organizational Behaviour: A Skill-Building Approach*, SAGE Publications, Inc; 2nd edition (29 November 2018).
References Books	
1.	Uma Sekaran, Organizational Behavior Text & cases, 2nd edition, Tata McGraw Hill Publishing CO. Ltd
2.	GangadharRao, Narayana, V.S.P Rao, Organizational Behavior 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1st edition
3.	S.S. Khanka, Organizational Behavior, S. Chand & Co, New Delhi.
4.	J. Jayasankar, Organizational Behavior, Margham Publications, Chennai, 2017.

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23UDSCS37	**PHP PROGRAMMING**	SEC-5	Y				2	2	25	75	100

Course Objective	
C1	To provide the necessary knowledge on basics of PHP.
C2	To design and develop dynamic, database-driven web applications using PHP version.
C3	To get an experience on various web application development techniques.
C4	To learn the necessary concepts for working with the files using PHP.
C5	To get a knowledge on OOPS with PHP.

UNIT	**Details**	**No. of Hours**	**Course Objectives**
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6	CO1
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6	CO2
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops -Grouping Form Selections with Arrays -Using Array Functions.	6	CO3
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6	CO4
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6	CO5
	Total	**30**	

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6,PO8.
2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
3	Create PHP Program using the concept of array.	PO3,PO6,PO8.
4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5,PO8.
5	Manipulate files and directories.	PO3,PO5,PO6.
Text Book		
1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.	
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes	
Reference Books		
1.	PHP: The Complete Reference-Steven Holzner.	
2.	DT Editorial Services (Author), "*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*", Paperback 2016, 2nd Edition.	
Web Resources		
1.	Refer MOOC Courses like NPTEL and SWAYAM	
2.	https://www.w3schools.com/php/default.asp	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S			S		M		L
CO 2		M			S		L	
CO 3			M			L		S
CO 4		M	S		L			S
CO 5			S		L	M		

S-Strong M-Medium L-Low

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC43	**OBJECT ORIENTED PROGRAMMING WITH JAVA**	**CC VII**	5	-	-	IV	5	25	75	100

Learning Objectives	
LO1	Object Oriented Programming with Java.
LO2	Apply the OOPs concept in JAVA programming.
LO3	Become proficient programmers through the java programming language.
LO4	Give insight into real world applications.
LO5	Get the attentions of users in user interface using graphics

UNIT	Contents	No. Of. Hours
I	**Introduction:** Introduction to Java-Features of Java-Object Oriented Concepts-Software Evolution – Software Development, SDLC Models – SDLC steps – Software Testing – Software Quality – Lexical Issues-Data Types – Variables – Arrays – Operators – Control Statements – Classes – Objects –Constructors – Overloading method – Access control – static and fixed methods – Inner classes –Inheritance-Overriding Methods-Using super-Abstract class.	**15**
II	**Packages & Threads:** Packages-Access Protection-Importing Packages-Interfaces-Exception Handling-Throw and Throws- Thread-Synchronization-Messaging- Runnable Interface-Inter thread communication-Deadlock-suspending, resuming and stopping threads-Multithreading	**15**
III	**Input/Output & Collection API:** I/O Streams-File Streams-String Objects-String Buffer-Char Array – Java Utilities-Collections interface – Collection classes-Enumeration – Vector –Stack –Hash tables – String class.	**15**
IV	**Networking:** Networking –Networking basics – java and the Net – InetAddress- TCP/IP Client Sockets –URL-URL Connection – TCP/IP Server Sockets – Datagrams.	**15**
V	**Graphical User Interface in Java:** Working with windows using AWT Classes – Class Hierarchy of Window and Panel –AWT controls – Layout Managers – Menus- Menu bars - Dialog Boxes- File Dialog- Applets-Lifecycle of Applet-Types of Applets-Event handling-Applet tags - JDBC and connecting to Databases – CRUD operations.	**15**
	TOTAL HOURS	**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Use the syntax and semantics of java programming language and basic concepts of OOP.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the concepts of Multithreading and Exception handling to Develop efficient and error free codes.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Design event driven GUI and web related applications which mimic the real word scenario	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Build the internet-based dynamic applications using the concept of applets	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	**P.Naughton and H.Schildt**(1999), Java 2 (The Complete Reference), Third Edition, Tata MCGraw Hill Edition
2	**K.K. Aggarwal &Yogesh Sing** (2008), Software Engineering, Revised Third Edition, New Age International Publishers.

Reference Books

1.	Cay S. Horstmann, Gary Cornell(2012), Core Java 2 Volume I, Fundamentals- Ninth Edition Addision Wesley
2.	K.Arnold and J.Gosling, The Java Programming Language- Second Edition, ACM Press/Addison- Wesley Publishing Co. New York

Web Resources

1.	https://www.w3schools.com/java/java_oop.asp#:~:text=OOP%20provides%20a%20clear%20structure,code%20and%20shorter%20development%20time
2.	https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/
3.	https://www.javatpoint.com/java-oops-concepts
4.	https://www.coursera.org/learn/object-oriented-java
5.	https://docs.oracle.com/javase/tutorial/java/concepts/index.html

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	3	2	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	2	3
Weightageof coursecontributedtoeachPSO	15	15	14	15	14	15

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter-	Total
23UDSCP44	**OBJECT ORIENTED PROGRAMMING WITH JAVA LAB**	**CC VIII**	-	-	5	IV	5	25	75	100

Learning Objectives:

1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
2. Read and make elementary modifications to Java programs that solve real-world problems.
3. Be able to create an application using string concept.
4. Be able to create a program using files in application.
5. Be able to create an Applet to create an application.

	Required Hour
Lab Exercises: 1. Program using Class and Object. 2. Program using Constructors. 3. Program using Command-Line Arguments. 4. Program using Random Class. 5. Program using Vectors. 6. Program using String Tokenizer Class. 7. Program using Interface. 8. Program using all forms of Inheritance. 9. Program using String class. 10. Program using String Buffer class. 11. Program using Exception Handling. 12. Implementing Thread based applications 13. Program using Packages. 14. Program using Files. **Applets:** 15. Working with Colors and Fonts. 16. Parameter passing technique. 17. Drawing various shapes using Graphical statements. 18. Usage of AWT components and Listener in suitable applications.	**60**

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	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	2	3	3	2	3
Weightageof coursecontributedtoeachPSO	15	14	14	15	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter -	Total
23UDSCE45	BIGDATA TECHNOLOGIES	SEC	4	-	-	-	3	25	75	100

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

- To use the Hadoop tools like Hive, and Hbase, which provide interface to relational databases, are also covered as part of this course work.
- To Analyze data with unix tools

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

CO1: Understand the fundamentals of Big cloud and data architectures.

CO2: Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power.

CO3: Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power.

CO4: Understand The Hive Shell.

CO5: Understand and Comparison with traditional databases.

Units	Contents	Required Hours
I	Introduction to Big Data. What is Big Data. Why Big Data is Important. Meet Hadoop. Data. Data Storage and Analysis. Comparison with other systems. Grid Computing. A brief history of Hadoop. Apache hadoop and the Hadoop EcoSystem	5
II	The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file write.	5
III	Introduction. Analyzing data with unix tools. Analyzing data with hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job.	6
IV	Classic Mapreduce. Job submission. Job Initialization. Task Assignment. Task execution .Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. MapReduce Types	6
V	The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. HiveQl. Hbasics. Concepts. Implementation. Java and Mapreduce clients. Loading data, web queries.	6

Learning Resources:

- **Recommended Texts**

1. Tom White, Hadoop, "The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Osborne Media; 1 edition, 2011

- **Reference Books**

1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
2. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.

MAPPING TABLE

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	2
CO2	2	3	2	3	2	2
CO3	3	2	2	3	3	3
CO4	2	2	2	2	2	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	12	12	13	12	12

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23UDSCS46	**Software Testing**	SEC-6	Y	-	-	-	2	2	25	75	100

Course Objective	
C1	To study fundamental concepts in software testing
C2	To discuss various software testing issues and solutions in software unit test, integration and system testing.
C3	To study the basic concept of Data flow testing and Domain testing.
C4	To Acquire knowledge on path products and path expressions.
C5	To learn about Logic based testing and decision tables

UNIT	Details	No. of Hours	Course Objective
I	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging– Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6	C1
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6	C2
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6	C3
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting–Formats– Test Cases	6	C4
V	Logic Based Testing–Decision Tables– Transition Testing–States, State Graph, StateTesting.	6	C5
	Total	**30**	

Course Outcomes		**Program Outcomes**
CO	On completion of this course, students will	
1	Students learn to apply software testing knowledge and engineering methods	PO1
2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
3	Have an ability understand and identify various software testing problems, and solve these problems by designing and	PO4, PO6

	selecting software test models, criteria, strategies, and methods.	
4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8
Text Book		
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005	
Reference Books		
1.	I.Burnstein,2003,"PracticalSoftwareTesting",SpringerInternational Edn.	
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.	
3.	R. Rajani,andP.P.Oak,2004,"SoftwareTesting",TataMcgrawHill, New Delhi.	
Web Resources		
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23UDSCS47	**Multimedia Systems**	SEC-7	Y	-	-	-	2	2	25	75	100
Course Objective											
C1	Understand the definition of Multimedia										
C2	To study about the Image File Formats,SoundsAudio File Formats										
C3	Understand the concepts of Animation and DigitalVideoContainers										
C4	To study about the Stage of Multimedia Project										
C5	Understand the concept of OwnershipofContentCreatedforProjectAcquiringTalent										

UNIT	Details	No. of Hours	Course Objective
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	C1
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project	12	C2
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	C3
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	C4
V	Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	12	C5
	Total	**60**	

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	understand the concepts, importance, application and the process of developing multimedia	PO1
2	to have basic knowledge and understanding about image related processings	PO1, PO2
3	To understand the framework of frames and bit images to animations	PO4, PO6
4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8
Text Book		
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.	
Reference Books		
1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.	
Web Resources		
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

THIRD YEAR –SEMESTER- V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC51	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**CC IX**	5	-	-	V	4	25	75	100

Learning Objectives	
LO1	To understand the different issues involved in the design and implementation of a database system.
LO2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
LO3	To understand and use data manipulation language to query, update, and manage a database
LO4	To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency,
LO5	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT	Contents	No. Of. Hours
I	**Introduction:** Database System-Characteristics of Database Management Systems- Architecture of Database Management Systems-Database Models-System Development Life Cycle-Entity Relationship Model.	**18**
II	**Relational Database Model:** Structure of Relational Model-Types of keys. Relational Algebra: Unary operations-Set operations-Join operations. Normalization: Functional Dependency- First Normal form-Second Normal Form-Third Normal form- Boyce-Codd Normal Form-Fourth Normal Form.	**18**
III	**SQL:** Introduction. Data Definition Language: Create, alter, drop, rename and truncate statements. Data Manipulation Language: Insert, Update and Delete Statements. Data Retrieval Language: Select statement. Transaction Control Language: Commit, Rollback and Savepoint statements. Single row functions using dual: Date, Numeric and Character functions. Group/Aggregate functions: count, max, min, avg and sum functions. Set Functions: Union, union all, intersect and minus. Subquery: Scalar, Multiple and Correlated subquery. Joins: Inner and Outer joins.Defining Constraints: Primary Key, Foreign Key, Unique, Check, Not Null.	**18**

IV	**PL/SQL:** Introduction-PL/SQL Basic-Character Set-PL/SQL Structure-SQL Cursor-Subprograms-Functions-Procedures.	**18**
V	**Exception Handling:** Introduction-Predefined Exception-User Defined Exception-Triggers-Implicit and Explicit Cursors-Loops in Explicit Cursor.	**18**
	TOTAL HOURS	**90**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database. To impart the concepts of System Development Life Cycle and E-R Model.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal Forms Classification of Dependency.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To elaborate the different types of Functions and Joins and their applications. Introduction of Views, Sequence, Index and Procedure.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Representation of PL-SQL Structure. To impart the knowledge of Sub Programs, Functions and Procedures.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Representation of Exception and Pre-Defined Exception. To Point out the Importance of Triggers, Implicit and Explicit Cursors.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1 **Pranab Kumar Das Gupta and P. Radha Krishnan,** "Database Management System Oracle SQL and PL/SQL", Second Edition, 2013, PHI Learning Private Limited.

Reference Books

1 **RamezElmasri and Shamkant B. Navathe**, "*Fundamentals of Database Systems*", Seventh Edition, Pearson Publications.

2 **Abraham Silberschatz, Henry Korth, S. Sudarshan**, "*Database System Concepts*", Seventh Edition, TMH.

Web Resources

1 http://www.amazon.in/DATABASE-MANAGEMENT-SYSTEM-ORACLE-SQLebook/dp/B00LPGBWZ0#reader_B00LPGBWZ0

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	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	15	15	14	15	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter -	Total
23UDSCP52	**RDBMS LAB USING ORACLE**	**CC X**	-	-	5	V	4	25	75	100

Learning Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations
3. Describe the basics of SQL and construct queries using SQL.
4. To emphasize the importance of normalization in databases
5. To facilitate students in Database design

LAB EXERCISES:

SQL:

1. DDL commands.
2. Specifying constraints-Primary Key, Foreign Key, Unique, Check, Not Null.
3. DML commands.
4. Set Operations.
5. Joins.
6. Sub-queries.

PL/SQL:

7. Control Constructs.
8. Exception Handlers.
9. Implicit Cursor.
10. Explicit Cursor.
11. Procedures.
12. Functions.
13. Triggers.
14. TCL Commands usage (Commit, Rollback, Savepoint)

Course Outcomes	
CO	On completion of this course, students will
CO1	To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database. To impart the concepts of System Development Life Cycle and E-R Model.
CO2	To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal Forms Classification of Dependency.

CO3	To elaborate the different types of Functions and Joins and their applications. Introduction of Views, Sequence, Index and Procedure.
CO4	Representation of PL-SQL Structure. To impart the knowledge of Sub Programs, Functions and Procedures.
CO5	Representation of Exception and Pre-Defined Exception. To Point out the Importance of Triggers, Implicit and Explicit Cursors.

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC53	**MACHINE LEARNING**	**CCXI**	5	-	-	V	4	25	75	100

Learning Objectives	
LO1	To Learn about Machine Intelligence and Machine Learning applications
LO2	To implement and apply machine learning algorithms to real-world applications
LO3	To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems
LO4	To create instant based learning
LO5	To apply advanced learning

UNIT	**Contents**	**No. Of. Hours**
I	**Introduction Machine Learning -** Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines	**15**
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptions – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	**15**
III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	**15**
IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	**15**
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	**15**
	TOTAL HOURS	**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theor	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.	
2	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press	
Reference Books		
1.	EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.	
2	Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.	

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	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to eachPSO	15	15	14	15	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCD54	**PROJECT WITH VIVA-VOCE**		5	-	-	-	4	25	75	100

(Refer to the regulations)

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE55-1	SOCIAL NETWORK ANALYSIS	SEC	4	-	-	-	3	25	75	100

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

- Analyze and mining communities in web social networks
- Visualize social networks.

Course Outcomes: (for students: To know what they are going to learn)
CO1: Understanding the concept of Network Mining, Graph Models
CO2: Learning about Social-Network Graph.
CO3: Evaluating Social-Network Graph as well as properties
CO4: Learning the Information Diffusion in Social Network
CO5: Analyzing Social Networks Applications and Research Trends.

Units	Contents	Required Hours
I	**Introduction to Social Network Mining, Graph Models and Node Metrics:** Introduction to social network mining-Social Networks as Graphs.-Random graph models/ graph generators (preferential attachment, small world).	6
II	**Social-Network Graph Analysis:** Social network exploration/ processing: graph kernels, graph classification, clustering of social	5
III	**Social-Network Graph Analysis and Properties :** Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs.	5
IV	**Information Diffusion in Social Network:** Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection	6
V	**Dynamic Social Networks, Applications and Research Trends :** Dynamic social networks, Link prediction, Social learning on networks.- Special issues in Information and Biological networks.	6

Learning Resources:

- **Recommended Texts**

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition,2014

- **Reference Books**

1. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling‖, IGI Global Snippet, 2009.
2. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web‖, Springer, 2009.

MAPPING TABLE

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	2
CO2	3	3	3	3	3	2
CO3	2	2	2	2	3	3
CO4	3	2	3	3	3	3
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	14	12	13	14	14	13

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE55-2	SOCIAL MEDIA MANAGEMENT	SEC	4	-	-	-	3	25	75	100

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

- Develop social media marketing strategies
- Predict and test human behavior in social web and related communities

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

CO1: Understanding the concept of Social media basic management.
CO2: Learning about Social media strategy development ideas
CO3: Evaluating the advertisements via Social Media
CO4: Learning the community management.
CO5: Analyzing n and reporting Social media.

Units	Contents	Required Hours
I	**Introduction to Social Media Management:** Overview of Social Media Platforms- Evolution of Social Media- Importance of Social Media for Businesses- Key Concepts: Engagement, Reach, Impressions	6
II	**Social Media Strategy Development:**Target Audience Identification Setting SMART Goals for Social Media- Content Planning and Creation- Social Media Calendar Management- Analytics and Measurement Tools.	5
III	**Social Media Advertising:** Paid vs. Organic Social Media- Advertising on Facebook, Instagram, Twitter, LinkedIn, etc.- Budgeting and Bidding Strategies- Ad Copywriting and Visual Design- Performance Metrics and ROI Analysis.	5
IV	**Community Management and Customer Service:** Building and Managing Online Communities- Crisis Management on Social Media -Responding to Customer Feedback- Monitoring and Moderation - Tools for Community Engagement.	6
V	**Social Media Analytics and Reporting:** Data Analysis for Social Media- Key Performance Indicators (KPIs)- Creating Comprehensive Social Media Reports- Adjusting Strategies Based on Analytics- Emerging Trends in Social Media.	6

Learning Resources:

- **Recommended Texts**

1. Dave Evans, "Social Media Marketing: An Hour a Day" Wiley Publisher, 2020.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition,2014

- **Reference Books**

1. Guy Kawasaki and Peg Fitzpatrick, "The Art of Social Media: Power Tips for Power Users", Publisher: Portfolio, Year: 2014.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

MAPPING TABLE

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	2
CO2	2	3	2	3	2	2
CO3	3	2	2	3	3	3
CO4	2	2	2	2	2	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	12	12	13	12	12

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE55-3	SOCIAL MEDIA MARKETING	SEC	4	-	-	-	3	25	75	100

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

- Understand what social media is, the various channels through which it operates, and its role in marketing strategy.
- Develop social media marketing goals, objectives and content.

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

CO1: Preparing Facebook Ads and Instagram Ads and understand how to effectively brand their Social Media Pages.

CO2: Establish a Video Marketing Strategy and learn YouTube Advertising.

CO3: Demonstrate how to effectively brand their Twitter profile and use Twitter Ads.

CO4: Understand how Consumer Generated Content and New Technologies are changing the Future of Social Media Marketing.

CO5: Designing and developing an effective Blog..

Units	Contents	Required Hours
I	Introduction - Introduction to Social Media, What is Social Media? - How Social Media developed, Managing Information – Aggregators, Google Alerts, Blogs. Getting your company ready for Social Media Content Management – Touch point analysis, Scheduling, Creating content, Managing content programs, Planning Worksheets.	6
II	Blogs – Blogger, Tumblr, Wordpress, Influencers Who are they? How to find them How to use them to benefit your brand.	5
III	YouTube Long - form video platforms, Setting up a channel, Managing content - Video Flow - Google Pages for YouTube Channel - Verify Channel Webmaster Tool – Adding Asset - Associated Website Linking - Custom Channel URL - Channel ART - Channel Links - Channel Keywords - Branding Watermark - Featured Contents on Channel - Channel Main Trailer	7
IV	Twitter - Set-up and usage Tips. LinkedIn - Tips and Guides Review of profiles. Pinterest - Visual social media and bookmarking, Set-up and management	5
V	Collaborative Marketing & Crowd sourcing - Consumer-generated content (Encouraged Organic), New Technologies – Chat Bots/Messenger Bots and Artificial Intelligence.	5

Learning Resources:

- **Recommended Texts**
  1. Social Marketing in India 1st Edition (Sameer Deshpande, Philip Kotler, Nancy R. Lee)
  2. Marketing with Social Media (Linda Coles)

- **Reference Books**
  1. Social Media Marketing 1st Edition (Michael R. Solomon, Tracy Tuten)
  2. The Art of Social Media: Power Tips for Power Users (Guy Kawasaki, Peg Fitzpatrick

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**2**
CO2	**2**	**3**	**2**	**3**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**13**	**12**	**12**	**13**	**12**	**12**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE56-1	**CLOUD COMPUTING FUNDAMENTALS**	**SEC**	4	-	-	-	3	25	75	100

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

- Analyze and mining communities in web social networks
- Visualize social networks.

Course Outcomes: (for students: To know what they are going to learn)
CO1: Understanding the concept of Network Mining, Graph Models
CO2: Learning about Social-Network Graph.
CO3: Evaluating Social-Network Graph as well as properties
CO4: Learning the Information Diffusion in Social Network
CO5: Analyzing Social Networks Applications and Research Trends.

Units	Contents	Required Hours
I	**Cloud Computing Overview Origins of Cloud computing** – Cloud components - Essential characteristics – On-demand self service, Broad network access, Location independent	**5**
II	**Resource pooling:** Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.	**6**
III	**Cloud Insights** Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development	**5**
IV	**Cloud Architecture- Layers:** Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.	**7**
V	**Cloud deployment model:** Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	**5**

Learning Resources:

- **Recommended Texts**
  1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
  2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

- **Reference Books**

3. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010 Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg,
4. Andrzej Goscinski, John Wiley & Sons, Inc. 2011

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**2**
CO2	**2**	**3**	**2**	**3**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**13**	**12**	**12**	**13**	**12**	**12**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE56-2	CLOUD SERVICES	SEC	4	-	-	-	3	25	75	100

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

- Express the Cloud service called platform as a service
- Analyze the Amazon & Google Web Services.

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

CO1: Illustrate and apply Cloud Computing and categories the different Cloud services and deployment models

CO2: Identify and analyse the key components of Amazon web Service

CO3: Explore platform as a service in cloud computing

CO4: Analyze the components of open stack & Google Cloud platform and understand Cloud Computing

CO5: Apply the cloud concepts in real time in order to handle the storage

Units	Contents	Required Hours
I	**Platform as a Service:** Defining Services – Using PaaS Application Frameworks – Using Google web services: Exploring Google Applications - Using Amazon Web Services - Using Microsoft Cloud Services, Defining the Windows Azure Platform.	6
II	**Cloud Infrastructures:** Administrating the cloud – Understanding Cloud Security: Securing the cloud - Securing data - Establishing Identity and presence	5
III	**Introducing Service Oriented Architecture** – Defining SOA Communication – Managing and monitoring SOA.	5
IV	**Working with Cloud based storage**: Cloud storage definition – Provisioning Cloud storage – Exploring cloud backup solutions – Using Webmail services: Exploring Cloud mail Services – Exploring Instant messaging – Collaboration Technologies – Using Media and Streaming	6
V	**Introduction to VMWare Simulator**: Basics of VMWare, advantages of VMware virtualization, using Vmware workstation-understanding virtual machines.	6

Learning Resources:

- **Recommended Texts**

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Data and Computer Communications, W. Stallings, Prentice Hall of India, 2013.

- **Reference Books**

1. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India
2. Jason Venner, ―Pro Hadoop- Build Scalable, Distributed Applications in the Cloud‖, A Press, 2009.

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**2**	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**12**	**14**	**14**	**14**	**13**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE56-3	INTERFACING WITH VIRTUALIZATION	SEC	4	-	-	-	3	25	75	100

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

- Understand what social media is, the various channels through which it operates, and its role in marketing strategy.
- Develop social media marketing goals, objectives and content.

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

CO1: Preparing Facebook Ads and Instagram Ads and understand how to effectively brand their Social Media Pages.

CO2: Establish a Video Marketing Strategy and learn YouTube Advertising.

CO3: Demonstrate how to effectively brand their Twitter profile and use Twitter Ads.

CO4: Understand how Consumer Generated Content and New Technologies are changing the Future of Social Media Marketing.

CO5: Designing and developing an effective Blog..

Units	Contents	Required Hours
I	**Introduction to Virtualization** Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations	6
II	**Types of hardware virtualization:** Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization	5
III	**Hypervisors and Virtual machinesServer Virtualization:** Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types	5
IV	**Migrating into a Cloud Introduction:** Challenges while migrating to Cloud, Broad approaches to migrating into the cloudwhy migrate - deciding on cloud migration, the Seven-step model of migration into a cloud.	6
V	**Migration Risks and Mitigation**: Enterprise cloud computing paradigm, relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, issues for enterprise applications on the cloud.	6

Learning Resources:

- **Recommended Texts**

1. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

- **Reference Books**

2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

3. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,-TATA McGraw- Hill , New Delhi – 2010

MAPPING TABLE

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	2
CO2	2	3	2	3	2	2
CO3	3	2	2	3	3	3
CO4	2	2	2	2	2	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	12	12	13	12	12

THIRD YEAR –SEMESTER- V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCI58	**SUMMER INTERNSHIP**		-	-	-	VI	2	25	75	100

(Refer to the Regulations)

THIRD YEAR –SEMESTER- VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC61	**IOT AND CLOUD TECHNOLOGIES**	**CC XIII**	6	-	-	VI	4	25	75	100

Learning Objectives	
LO1	Learn basic concepts of Cloud Computing.
LO2	To get an overview of MapReduce Concepts.
LO3	To learn about infrastructure security, Data Security and Privacy.
LO4	To understand access based on access management in data security
LO5	To generate security and privacy access for the end user

UNIT	Contents	No. Of. Hours
I	**IoT Introduction:** Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU - Protocols for IoT.	**18**
II	**Introduction to Cloud Computing** Cloud Computing – Definition – SPI Framework – Software Model – Cloud Services Delivery Model – Deployment Models – Key drivers – Impact on Users – Governance in the cloud – Barriers to Cloud Computing Adoption in the enterprise. Examples of Cloud Service Providers: Amazon Web services – Google – Microsoft Azure Services Platform – Sun Open Cloud Platform.	**18**
III	**Virtual Machines Provisioning and Migration Services** Introduction and Inspiration -Background and Related Work- Virtual Machines Provisioning and Manageability-Virtual Machine Migration Services- VM Provisioning and Migration in Action -Provisioning in the Cloud Context - Future Research Directions- The Anatomy of Cloud Infrastructures -Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- Capacity Management to meet SLA Commitments.	**18**
IV	**Data Security, Identity and Access Management Data security and storage:** Aspects of Data Security -Data Security Mitigation -Provider Data and Its Security. Identity and Access Management: Trust Boundaries and IAM -Why IAM? - IAM Challenges- IAM Definitions- IAM Architecture and Practice- Getting Ready for the Cloud - Relevant IAM Standards and Protocols for Cloud Services - IAM Practices in the Cloud-Cloud Authorization Management- Cloud Service Provider IAM Practice.	**18**

V	**Security and Privacy Security Management: Standards** – Security Management in the Cloud – Availability Management – Access Control. Privacy: What is Privacy – Data Life Cycle – Key Privacy Concerns – Who is responsible for protecting Privacy – Privacy Risk Management – Legal and Regulatory Implications. IoT and Cloud Integration: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment.	**18**
	TOTAL HOURS	**90**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Design an IoT system with cloud infrastructure.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Implement the M2M Communication protocols in a prototype	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the basic concepts of the main sensors used in electromechanical systems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Understand/implement computer models of common engineering information types.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand storage mechanisms / analysis algorithms for data management in distributed & data intensive applications	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	"The Internet of Things: Enabling Technologies, Platforms, and Use Cases"**, by Pethuru Raj and Anupama C. Raman ,CRC Press.**
2	**Adrian McEwen,** Designing the Internet of Things, Wiley, 2013.
3	**Tim Mather, Subra Kumaraswamy, ShahedLatif (2010),** Cloud Security and Privacy, OREILLY Media.
4	**RajkumarBuyya, James Broberg, AndrzejGoscinski(2011),**CLOUD COMPUTING Principles and Paradigms, John Wiley & Sons, Inc., Hoboken, New Jersey
Reference Books	
1.	**Ronald L. Krutz and Russell Dean Vines(2010),** Cloud Security, Wiley – India

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	2
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3

CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	15	14	15	15	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter -	Total
23UDSCP62	**IOT AND CLOUD TECHNOLOGIES LAB**	**CC XIV**	6	-		6	4	25	75	100

Objectives

To improve efficiency and bringing important information to the surface more quickly than a system depending on human intervention, provide easy, scalable access to computing resources and IT services.

LIST OF PROGRAMS

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature andhumidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when “1”/”0” is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thing speak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thing speak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Course Outcomes	
CO	On completion of this course, students will
CO1	Design an IoT system with cloud infrastructure.
CO2	Implement the M2M Communication protocols in a prototype
CO3	Understand the basic concepts of the main sensors used in electromechanical systems
CO4	Understand/implement computer models of common engineering information types.
CO5	Understand storage mechanisms / analysis algorithms for data management in distributed & data intensive applications

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	2	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	2	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	15	14	14	13	14	15

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCC63	**ARTIFICIAL INTELLIGENCE**	**CC XV**	6	-	-		4	25	75	100

Learning Objectives	
LO1	Describe the concepts of Artificial Intelligence
LO2	Understand the method of solving problems using Artificial Intelligence
LO3	Understand natural language processing
LO4	Introduce the concept of Expert system, Fuzzy logic
LO5	Understand about operating system and their uses

UNIT	**Contents**	**No. Of. Hours**
I	**Introduction to Artificial Intelligence** What is Artificial Intelligence? AI Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics – Issues in the design of search programs, Heuristic Search Techniques - Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means-End Analysis	**15**
II	**Knowledge Representation** Approaches and issues in knowledge representation –Using Predicate Logic – Representing simple facts in logic – Representing Instance and ISA relationship – Computable functions and predicates – resolution – Natural deduction - Representing knowledge using rules –Procedural versus declarative knowledge – Logic programming - Forward versus backward reasoning – Matching – Control Knowledge - Symbolic reasoning under uncertainty - Logics for Nonmonotonic reasoning – Implementation Issues – Augmenting a problem solver – Implementation: Depth first search, Breadth first search	**15**
III	**Statistical Reasoning** Probability and Bayes‟ Theorem - Certainty factors and rule-based systems- Bayesian networks – Dempster - Shafer Theory - Weak slot-filler structure - Semantic nets – frames. Strong slot-filler structure- Conceptual dependency – Scripts – CYC – Syntatic – Semantic spectrum of Representation – Logic and slot-and-filler structure – Other representational Techniques	**15**
IV	**Game Playing, Planning & NLP** Minimax search procedure- Adding alpha-beta cutoffs- Additional Refinements – Iterative Deepening – Reference on specific games Planning - Components of a Planning system – Goal stack planning – Nonlinear planning using constraint posting- Hierarchical planning – Reactive systems.Natural Language Processing -	**15**

	Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing – Statistical Natural Language processing	
V	**Learning & Advanced Topics in AI** What is learning? – Rote learning – Learning by taking advice – Learning in problem solving – Learning from examples: Induction – Explanation based learning – Discovery – Analogy – Formal learning theory - Neural Net learning and Genetic learning - Expert System: Representation-Expert System shells-Knowledge Acquisition. Fuzzy logic system – Crisp sets – Fuzzy sets – Fuzzy terminology – Fuzzy logic control – Sugeno style of Fuzzy inference processing – Fuzzy Hedges – Neuro Fuzzy systems.	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Design user interfaces to improve human–AI interaction and real-time decision-making. Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Extract information from text automatically using concepts and methods from natural language processing (NLP), including stemming, n-grams, POS tagging, andparsing	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	**Elaine Rich, Kevin Knight** (2008), Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication

Reference Books	
1.	**Russel S, Norvig P** (2010), Artificial Intelligence : A Modern approach,Third Edition, Pearson Education
2.	**Dan W Patterson** (2007), Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc.
3.	**Jones M**(2006), Artificial Intelligence application Programming, Second Edition, Dreamtech Press
4.	**Nilsson** (2000), Artificial Intelligence : A new synthesis, Nils J Harcourt Asia PTE Ltd.

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
23UDSCE64-1	NETWORK TECHNOLOGIES	SEC	4	-	-	-	3	25	75	100

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

- To use the Hadoop tools like Hive, and Hbase, which provide interface to relational databases, are also covered as part of this course work.
- To Analyze data with unix tools

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

CO1: Understand the fundamentals of Big cloud and data architectures.

CO2: Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power.

CO3: Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power.

CO4: Understand The Hive Shell.

CO5: Understand and Comparison with traditional databases.

Units	Contents	Required Hours
I	**Networking fundamentals:** Internet, Circuit switching vs Packet switching, ISPs, Delay and Loss in Packet Switched Networks	5
II	**Physical Network Design:** Core- Distribution Layer -Access Layer - Data Flow - Selecting the Media- IP Subnet Design-VLAN Network.	5
III	**Advanced Router Configuration I:** Configuring Static Routing - Dynamic Routing Protocols - Configuring RIPv2 – TFTP—Trivial File Transfer Protocol	6
IV	**Network Security:** Denial of Service-Firewalls and Access Lists-Router Security-Switch Security-Wireless Security-VPN Security.	6
V	**Introduction to VoIP**: The Basics of Voice over IP- Voice over IP Networks- VoIP Security	6

Learning Resources:

- **Recommended Texts**

1. Jeffrey S. Beasley, PiyasatNilkaew - **"A Practical Guide to Advanced Networking"**,2015, Pearson
2. Shaikh Farhan, Shaikh MohdAshfaque "**Advanced Networking Technologies**" Tech-Neo Publications LLP,2019

- **Reference Books**

1. Alberto Leon-Garcia, IndraWidjaja "**Communication Networks**", Second Edition,

McGraw-Hill Education,2003
2. R. J. Cesarone, R. C. Hastrup, David Bell and G. Nelson**"Architectural Design for a Mars Communications & Navigation Orbital Infrastructure "**Jan 2000

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**3**	**2**	**2**	**3**
CO2	**3**	**3**	**2**	**3**	**3**	**2**
CO3	**2**	**2**	**3**	**2**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**14**	**13**	**13**	**13**	**13**	**14**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE64-2	DATA SECURITY	SEC	4	-	-	-	3	25	75	100

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

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- To understand the basics of Data and Network Security

Course Outcomes: (forstudents: To know what they are going to learn)
CO1: Understanding the concept of Network security
CO2: Learning about Program and Application security.
CO3: Evaluating Database security
CO4: Learning the Network Security
CO5: Developing secure software and systems

Units	Contents	Required Hours
I	Security in hardware and operating systems: Effect of hardware on security. Process and memory protection. Virtualization. Vulnerabilities. Unix, Linux,Windows. Hardened operating systems. Authentication.	6
II	Program and Application security : Malicious software. Language problems, buffer overflow, Java security. Application/content firewalls. Components. Security in .NET and Sun ONE.	5
III	Database security: Using views for authorization in relational databases. Authorization systems in Oracle and similar systems. SQL injection and other attacks. NoSQL databases. Data intensive systems security	5
IV	Network Security: Attacks. Secure layers. SSL/TLS, Kerberos, VPNs, Firewalls. Intrusion Detection. Wireless systems	6
V	Developing secure software and systems: Secure system design methodology. Use of patterns. Formal methods, model checking. Code-based secure lifecycles. Evaluation of security.	6

Learning Resources:

- **Recommended Texts**

1. E.B.Fernandez, Ehud Gudes, Martin Olivier, “The design of secure systems”, to appear W. Stallings and L. Brown, Computer Security: Principles and practice (2nd Ed.), Pearson 2012
2. Behrouz Forouzan "Data Communication Networking". 4th Edition

- **Reference Books**

1. Michael W Lucas Networking for Systems Administrator Snippet, 2009.
2. Andrew S. Tanenbaum Computer Networks- 5th Edition.

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**3**	**2**	**2**	**3**
CO2	**3**	**3**	**2**	**3**	**3**	**2**
CO3	**2**	**2**	**3**	**2**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**14**	**13**	**13**	**13**	**13**	**14**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23UDSCE65-1	**DATA MINING AND WAREHOUSING**	**SEC**	2	-	-	-	2	25	75	100

Learning Objectives:

- 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:

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 analyze 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:(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe course)[Thisisdoneduring2Tutorialhours)

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.	**6**
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.	**6**
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases,	**6**

	Multilevel Association Rules from transaction databases.	
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation.	**6**
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods- Density Based Methods	**6**

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

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**14**	**14**	**14**	**14**	**13**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter.	Total
23UDSCE65-2	**MASTER WEB DESIGNING IN PHOTOSHOP**	**SEC**	4	-	-	-	3	25	75	100

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

- Understand and Demonstrate contested definitions of the adobe Illustrator user interface
- Exploring debates about the Adobe via tools within the emerging field

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

CO1: Identify and adapt the elements of the adobe Illustrator user interface and demonstrate knowledge of their functions.

CO2: Demonstrate knowledge of how to work with brushes,symbols, graphic styles, and patterns.

CO3: Analyse the usage of Color Tools and Shape tools

CO4: Demonstrate knowledge of how to use drawing and shape tools

CO5: Apply the knowledge of painting practically

Units	Contents	Required Hours
I	**Workspace:** Workspace Basics-Workspace overview-Customizing the workspace	**6**
II	**Tools**: Tool Panel Overview-Improved User Interface -Tool Galleries-Files and Templates-Using multiple- Artboards- Viewing Artwork.	**5**
III	**Drawing Basics**-Drawing simple lines and shapes-Drawing Pixel aligned paths for web Workflows-Drawing with the pen, Pencil or Flare tool-Editing Paths-Adjust Path Segments- Symbolism tools and symbol sets-Symbols.	**5**
IV	**Selecting Colors**-Using and creating swatches-Color groups-Create color themes with kuler-Adjusting Colors.	**6**
V	**Painting**: Painting with fills strokes-Live Paint groups-Brushes-Gradients- Meshes-Patterns.	**6**

Learning Resources:

- **Recommended Texts**
  1. Adobe Illustrator CC Classroom in a Book, 1 edition, Pearson Education India.
  2. Adobe Illustrator CC Classroom in a Book (2017 release) 1st Edition, Kindle Edition
- **Reference Books**
  1. Adobe Illustrator CS6 Classroom in a Book by adobe create team

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**
CO3	**3**	**2**	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**12**	**14**	**14**	**14**	**13**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
23UDSCF66	**QUANTITATIVE APTITUDE**	**SEC**	2	-	-	-	2	25	75	100

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)

- To improve the quantitative skills of the students
- To prepare the students for various competitive exams

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

CO1: To gain knowledge on LCM and HCF and its related problems

CO2: To get an idea of age, profit and loss related problem solving.

CO3: Able to understand time series simple and compound interests

CO4: Understanding the problem related to probability, and series

CO5: Able to understand graphs, charts

Units	Contents	Required Hours
I	Numbers- HCF and LCM of numbers-Decimal fractions- Simplification- Square roots and cube roots- Average- problems on Numbers	**6**
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership- Chain rule	**6**
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area –Volume and surface area-races and Games of skill.	**6**
IV	Permutationandcombination-probability-TrueDiscount-BankersDiscount - Height and Distances-Odd man out & Series.	
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Piecharts-Linegraphs	**6**

Learning Resources:

- **Recommended Texts**

1. "Quantitative Aptitude", R.S. AGGARWAL., S. Chand&CompanyLtd.,

- **Webresources: Authentic** Web resources related to Competitive examinations

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**2**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**2**	**2**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**13**	**13**	**13**	**14**	**15**

THIRD YEAR –SEMESTER- V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter-	Total
23UDSCX67	**EXTENSION ACTIVITY**		-	-	-	-	1	100	-	100

(Refer to the Regulations)