MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG Department of Computer Applications

for

Undergraduate Programme

Bachelor of Computer Applications

From the Academic Year 2024-25

CONTENT

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION

1. Preamble

The Department of Computer Applications started a programme as Specialization on BCA-1998 MCA-2002. As College is granted academic autonomy in the year 2024 it has the privilege of restructuring the syllabus and introducing new career oriented industry ready programs. Keeping an eye on the industry and to modernize the curriculum, the Board of Studies of the Department of Computer Applications, has initiated an industry collaboration to impart Bachelor of Computer Application, specialized in Mobile Applications and Cloud Technology. This programme comprises complementary course Mathematics and vocational course Cloud Technology.The main objective of this programme is to inculcate and horn up the skills of young minds in new generation technologies to compete in the knowledge era. This programme is designed in such a way that students can have a detailed knowledge of subjects as well as the knowledge of IT related applications. Throughout this programme the students will go through the IT scenario, its scope, career and the essentials of the IT world. This unique programme provides dual career options for the students in the latest and fast growing technology sectors of Mobile Applications and Cloud Technology.The syllabus aims to focus on enabling the students to familiarize with the new technologies, and at the same time enhance and strengthen the fundamental knowledge in Computer Applications, and related fields.

PROGRAMME OUTCOMES (PO)

Programme	**B.C.A**
Programme Code	**US02**
Duration	**3 Years**
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, synthesizing and articulating; Ability to recognize 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 / Teamwork:** 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.

Programme Specific Outcomes:	**PSO1 – Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions. **PSO2 - Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilitate startups and high potential organizations. **PSO3 – Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards Growth and development.

Eligibility for Admission:

Candidates for admission to the first year of the Bachelor of Computer Applications course shall be required to have passed the Higher Secondary Course Examination (Academic or Vocational) by the Government of Tamilnadu with Mathematics / Business Mathematics / Statistics / Computer Science / Commerce / Accountancy as a subject.

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
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 offbeat situations, Discussion, Debating or Presentations	

Semester – I						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA11	Tamil – 1	4	1	0	0	3
24UFEN11	English – 1	4	1	0	0	3
24UCAC11	CC – 1-Programming in C	3	1	2	0	5
24UCAC12P	CC – 2 Practical 1-Programming in C- Lab	0	0	4	0	3
24UMAA12	EC - 1 AL Statistical Methods and its Applications I	3	1	0	0	3
24UCAS11	SEC – 1 Computer Basis	1	0	1	0	2
24UCAS12	SEC – 2 Fundamental of Information Technology	1	0	1	0	2
24UCAF11	FC-Digital Computer Fundamental	1	1	0	0	2
					30	23

Semester - II						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA21	Tamil – 2	4	1	0	0	3
24UFEN21	English – 2	4	1	0	0	3
24UCAC21	CC – 3 Programming in C++	3	1	1	0	4
24UCAC22	CC - 4 Data Structure	3	1	1	0	4
24UMAA23	EC - 2 (Statistical Methods and Its Applications II)	3	1	0	0	3
24UMAA23P	EC - 3 Practical II- (Statistical Methods and its Applications I & II Practical	0	0	2	0	2
24UCAS21P	SEC – 3 Practical III- Data Structure using C++ Lab	0	0	2	0	2
24UAEC21	AEC – 1 Life Skill Through Yoga	1	1	0	0	2
					30	23

Semester – III						
24UFTA31	Tamil – 3	4	1	0	0	3
24UFEN31	English – 3	4	1	0	0	3
24UCAC31	CC – 5 Programming in Java	3	1	2	0	5
24UCAC32P	CC – 6 Practical IV-Programming in Java Lab	0	0	4	0	2
24UCAA31 / 24UCAA32	EC - 4 Web Technology/ Open Source Software	3	1	0	0	4
24UCAA33P / 24UCAA34P	EC - 5 AL Practical V-Web Technology Lab/ Open Source Software Lab	0	0	2	0	2
24UCAS31	SEC -4 Multimedia Systems	1	0	1	0	2
24UAEC31	AEC – 2 Human Values and Professional Ethics	1	1	0	0	2
					30	23

Semester – IV						
24UFTA41	Tamil – 4	4	1	0	0	3
24UFEN41	English – 4	4	1	0	0	3
24UCAC41	CC – 7 Python Programming	3	1	2	0	5
24UCAC42P	CC – 8 Practical VI-Python Programming Lab	0	0	4	0	2
24UCAA41 24UCAA42	EC - 6 AL Relational Database Management System/ Computer Graphics	3	1	0	0	4
24UCAA41P 24UCAA42P	EC - 7 AL Practical VII-Relational Database Management Systems Lab/Computer Graphics Lab	0	0	2	0	2
24UCAS41	SEC – 5 Data Mining	1	0	1	0	2
24UAEC41	AEC – 3 Environmental Studies and Disaster Management	1	1	0	0	2
					30	23

Semester – V						
24UCAC51	CC -9 Operating Systems	4	1	0	0	5
24UCAC52P	CC- 10 Practical VIII-Operating Systems Lab	0	0	4	0	3
24UCAC53	CC – 11 Mobile Application Development	2	1	1	0	4
24UCAC54P	CC - 12 Practical IX- Mobile Application Development Lab	0	0	3	0	2
24UCAE51 24UCAE52	EC –8 Social Media Analytics/ Big Data	4	1	0	0	4
24UCAE53 24UCAE54	EC – 9 Full Stack Development/ Software Project Management	4	1	0	0	4
24UAEC51	AEC – 4 Gender Equality and Social Inclusion	1	1	0	0	2
24UCAIN51	Internship					2
24UCSIK51	IKS-Exploring Game Design for Cultural Heritage				2	
					30	26

Semester – VI						
24UCAC61	CC – 13 Machine Learning	4	1	0	0	4
24UCAC62P	CC - 14 Practical -Machine Learning lab	0	0	5	0	3
24UCAC63P	CC - 15 – Project	0	0	5	0	4
24UCAE61 24UCAE62	EC – 10 IOT and its Applications/ Enterprise Resource Planning	4	1	0	0	4
24UCAE63 24UCAE64	EC – 11 Cloud Computing/ Natural Language Processing	4	1	0	0	4
24UCAP61	PEC – 1 Power BI	1	1	0	0	2
24UCAL61	SLC – 1 MongoDB				3	2
					30	23
					141+2*	

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Nanmudalvan within the fifth semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC11	PROGRAMMING IN C	Core	3	1	2	0	5	6	25	75	100

Learning Objectives	
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations.
LO2	To understand the concept using if statements and loops
LO3	To understand the concept of Arrays and Functions
LO4	Design programs involving decision structures, loops and functions.
LO5	To understand the concept of implementing pointers.

Unit	Content	Hours
1	**INTRODUCTION TO C PROGRAMMING** Introduction to Computing: Introduction, Art of Programming through Algorithms and Flowcharts Overview of C: History and importance of C, Basic structure of C program, executing a C program. Constants, Variable and Data Types: Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants. Managing Input and Output Operations:	14
2	**CONTROL STRUCTURES** Decision Making and Branching: Introduction, Decision Making with IF Statement, Simple IF Statement, the IF-ELSE Statement, Nesting of IF-ELSE Statements, The ELSE IF Ladder, The Switch statement, The ? : Operator, The goto statement. Decision Making and Looping: Introduction, The while Statement, The do statement, The for statement, Jumps in LOOPS.	14
3	**INTRODUCTION TO ARRAYS AND STRINGS** Arrays: One-dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Example programs- Bubble sort, Selection sort, Linear search, Binary search, Two-dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two-dimensional Arrays. Character Arrays and Strings: Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions	14

4	**FUNCTIONS AND INTRODUCTION TO POINTERS** User-defined Functions: Need for functions, Elements of User-defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions, No Arguments and no Return Values, Arguments but no Return values, Arguments with Return Values, No Arguments but Returns a Value, Passing Arrays to Functions, Recursion. Pointers: Introduction, Declaring Pointer Variables, Initialization of Pointer variables, accessing a Variable through its Pointer.	14
5	**STRUCTURES AND FILE MANAGEMENT** Structures: Introduction, Defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures. File Management in C: Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files.	14

CO	Course Outcomes
CO1	Describe the fundamentals of C programming Language.
CO2	Apply appropriate Control structures to solve problems.
CO3	Describe the concept of Arrays and Strings
CO4	Write User defined functions and apply concept of recursion to solve problems.
CO5	Describe the concept of Pointers and Structures

Textbooks:	
1	E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2	"Let us C", YashavantKanetkar, 13th Edition, BPB Publications.
3	Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017.
4	Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India
5	P.Rizwan Ahmed, Programming in C (ANSI), Margham Publications, 2020
Reference Books:	
1	Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
2	Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3	Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.
4	Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
5	Dr. Guruprasad Nagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1.

Web resources:	
1	https://codeforwin.org/
2	https://www.geeksforgeeks.org/c-programming-language/
3	http://en.cppreference.com/w/c
4	http://learn-c.org/
5	https://www.cprogramming.com/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC12P	PROGRAMMING IN C-LAB	Practical	0	0	4	0	3	4	25	75	100

Learning Objectives	
LO1	Understand the need for programming to solve computational problems.
LO2	Discover the basic programming constructs to prepare the program.
LO3	Analyze and interpret data using array, functions and pointers
LO4	Recognize the bugs in the C program.
LO5	Apply problem- solving skills to real-world scenarios

Programs	Content	Hours
1	Write a C program to find the sum of individual digits of a positive integer.	6
2	A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.	6
3	Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.	6
4	Write a C program to calculate the following Sum: Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10! ……	6
5	Write a C program to find the roots of a quadratic equation.	6
6	Write C programs that use both recursive and non-recursive functions to find the factorial of a given integer.	6
7	Write a C program to find both the larges and smallest number in a list of integers.	6
8	Write a C program that uses functions to perform the following: Addition of Two Matrices	6

9	Write a C program to determine if the given string is a palindrome or not.	6
10	Write a program which copies one file to another.	6

CO	Course Outcomes
CO1	Understand the logic for a given problem. Write the algorithm of a given problem.
CO2	Recognize and understand the syntax and construction of C programming code. Gain experience of procedural language programming. Know the steps involved in compiling, linking and debugging C code.
CO3	Understand using header files. Learn the methods of iteration or looping and branching. Make use of different data-structures like arrays, pointers, structures and files. Understand how to access and use library functions.
CO4	Understand function declaration and definition. Understand proper use of user defined functions. Write programs to print output on the screen as well as in the files.
CO5	Apply all the concepts that have been covered in the theory course, and Know the alternative ways of providing solution to a given problem.

Text books:	
1	E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2	"Let us C", Yashavant Kanetkar, 13th Edition, BPB Publications.
3	Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017.
4	Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India
5	P.Rizwan Ahmed, Programming in C (ANSI), Margham Publications, 2020
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1	Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
2	Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3	Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.
4	Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
5	Dr. Guruprasad Nagraj, "C Programming for Problem Solving", Himalaya Publishing House. ISBN-978-93-5299-361-1.

Web resources:	
1	https://codeforwin.org/
2	https://www.geeksforgeeks.org/c-programming-language/
3	http://en.cppreference.com/w/c
4	http://learn-c.org/
5	https://www.cprogramming.com/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	2	3	3
CO5	3	2	3	3	3	3	3	3	3	2	2
Total	15	12	15	15	13	15	15	13	13	12	12
Average	3	2	3	3	3	3	3	3	3	2	2

3 – Strong, 2- Medium, 1- Low

ALLIED SYLLABUS

1. STATISTICAL METHODS AND ITS APPLICATIONS -1

Subject Code	L	T	P	S	Credits	Inst.Hours	Marks		
							CIA	External	Total
24UMAA12	2	1	1	0	3	4	**25**	**75**	**100**

Learning Objectives	
LO1	Scope and diagrammatic representation of data
LO2	To know about Measures of Location
LO3	To gain knowledge on Measures of Dispersion
LO4	To understand the concept of Skewness
LO5	To understand the relationship between variables and forecasting the future values

Unit	Contents	No .of Hours
I	Introduction - Scope and Limitations of Statistical Methods - Classification of Data –Tabulation of Data- Diagrammatic and Graphical Representation of Data.	**10**
II	Measures of Location: Arithmetic Mean, Median, Mode, and Their Properties.	**10**
III	Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation.	**10**
IV	Measures of Skewness : Karl Pearson's, Bowley's, and Kelly's and Coefficient of Skewness .	**10**
V	Correlation: Karl Pearson – Spearman's Rank Correlation	**10**
	Total	**50**

COURSE OUTCOMES	
CO1	Understand the statistical methods measures of location
CO2	Understand the statistical methods measures of dispersion
CO3	Apply the statistical methods of dispersion and location
CO4	Understand the concept of Skewness.
CO5	Understand the relationship between variables and fore casting the futurevalues

TEXT BOOKS	
1	Fundamental of Mathematical Statistics - S. C. Gupta & V. K. Kapoor - Sultan Chand
2	Fundamental of Applied Statistics - S. C. Gupta & V. K. Kapoor - Sultan Chand
3	Statistical Methods - Snedecor G.W.& Cochran W. G. oxford & +DII
4	Elements of Statistics - Mode. E. B. - Prentice Hall
5	Statistical Methods- Dr. S. P. Gupta -Sultan Chand & Sons
REFERENCE BOOKS	
1	Gupta S.P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.
2	Gupta. S. C. and Kapoor. V. K. Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi
3	Pillai R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.
4	Sancheti D. C. And Kapoor. V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi.
5	Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi
Web Resources	
https://nptel.ac.in/courses/111107105	

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	3	2	2	3	3	2
CO2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	3	2	3	2	3	2	3	2	3	2
CO4	2	3	3	3	3	3	3	3	3	3	3
CO5	2	2	3	3	3	3	2	2	3	3	2
Total	13	13	14	15	13	14	12	13	14	15	12
Average	2.6	2.6	2.8	3	2.6	2.8	2.4	2.6	2.8	3	2.4

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAS11	**COMPUTER BASICS**	**NME**	**1**	**0**	**1**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Converse in basic computer terminology.
LO2	Possess the knowledge of basic hardware peripherals.
LO3	Possess the knowledge of basic Software and its features.
LO4	Build an understanding of the fundamental concepts of computer networking
LO5	It manages the computer's memory and processes, as well as all of its software and hardware.

Unit	Content	Hours
1	**Introduction to Computers** Introduction, Characteristics of computers, Evolution of computers, Generation of Computers, Classification of Computers, The Computer System, Applications of Computers.	6
2	**Input / Output devices and Memory** Introduction, Keyboard, Pointing Devices, Speech Recognition, Digital Camera, Scanners, Optical Scanners. Classification of Output, Printers, Plotters, Computer Output Microfilm (COM), Monitors, Audio Output, Projectors. Random Access Memory (RAM), Read Only Memory (ROM),Types of ROM. Classification of Secondary Storage Devices, Magnetic Tape, Magnetic Disk, Optical Disk, Magneto Optical disk.	**6**
3	**Software Concepts** Introduction to Software, Relationship between Software and Hardware, System Software, Application Software Algorithm, Flowchart, Program, Pseudocode (P-Code).Features of a Good Programming Language. Operating Systems: History & Evolution, Functions of an Operating System, A Brief History of MS-DOS, Linux, Windows System. Database Management System	**6**
4	**Data Communication and Computer Network** Introduction, Data Communication, Transmission Media, Multiplexing, Switching, Computer Network, Network Topologies, Communication Protocols, Network devices.	

	World Wide Web, Hypertext, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Services Providers, Internet Security, Internet Requirements, Web Search Engine, Net Surfing, Internet Services, Case Study, Intranet.	**6**
5	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**

CO	**Course Outcomes**
CO1	Understand the fundamentals of computer, hardware, software and Programming.
CO2	Identify the hardware components of a computer and its usages.
CO3	Ability to develop the appropriate program, analyze and interpret data
CO4	Independently understand basic computer network technology.
CO5	Understand the use of Operating system, commands and shell script.

Textbooks:	
1	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2	Computer Fundamentals, A. Goel, 2010, Pearson Education.
3	Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPB Publishers.
4	Anoop Mathew, S. Kavitha Murugeshan (2009), "Fundamental of Information Technology", Majestic Books.
5	Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.
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
4	Fundamentals of Computers and Information Technology, M.N Doja, 2005
5	Fundamentals of Information Technology, Alexis Leon And Mathews Leon, Vikas Publishing House Pvt. Ltd, 2009
Web resources:	
1	https://testbook.com/learn/computer-fundamentals 2.
2	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html 3.
3	https://www.javatpoint.com/computer-fundamentals-tutorial 4.
4	https://www.tutorialspoint.com/computer_fundamentals/index.htm 5.
5	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAS12	FUNDAMENTAL OF INFORMATION TECHNOLOGY	SEC	1	0	1	0	2	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	Content	Hours
1	**Introduction to Computers** Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices — Types of Operating System.	**6**
2	**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**
3	**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**
4	**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**
5	**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**

CO	Course Outcomes
CO1	Understand basic concepts and terminology of information technology.
CO2	Have a basic understanding of personal computers and their operations.
CO3	Be able to identify issues related to information security.
CO4	Develop MS Office applications knowledge and skills
CO5	To use the Internet safely, legally, and responsibly

Textbooks:	
1	Introduction of Information System ALEXISLEON,
2	Computer Fundamentals-Nasib Singh Gill.
3	"Microsoft Excel 2019 Step by Step" by Curtis Frye
4	"Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach
5	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
Reference Books:	
1	Computer Basics Absolute Beginner's Guide, Windows 11 Edition: Now Covers Windows 11 Paperback – Import, 4 August 2022
2	Computer Basics: For A Literate Living Paperback – 1 January 2017by Bittu Kumar
3	Computer Fundamentals, A. Goel, 2010, Pearson Education.
4	Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPB Publishers.
5	Computer Basics Absolute Beginner's Guide, Windows 11 Edition: Now CoversWindows 11 Paperback – Import, 4 August 2022
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 and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1ST YEAR: FIRST SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAF11	**DIGITAL COMPUTER FUNDAMENTALS**	**FC**	**1**	**1**	**0**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Identify the logic gates and their functionality.
LO2	Perform number conversions from one system to another system.
LO3	Design basic electronic circuits (combinational circuits).
LO4	Understand the fundamental concepts of computers, algorithms, flowcharts and problem solving techniques.
LO5	Apply the basic knowledge of mathematical factoring methods to model an algorithm, flowchart for a given problem.

Unit	**Content**	**Hours**
1	Divisibility, LCM, HCF- Numbers, Decimals, Fractions, Powers -Profit, Loss -Simple interest and Compound interest -Speed, Distance, Time.	**6**
2	Coding Decoding, Series-missing number, odd one out, Cause and Effect, Direction and Ranking, Blood relations.	**6**
3	NUMBER SYSTEM AND CODES: Decimal Numbers, Binary Numbers, Decimal to Binary Conversions, Binary Arithmetic, 1's and 2's complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed numbers, Hexadecimal Numbers, Octal Numbers, Digital Codes, Error Detection Codes.	**6**
4	LOGIC GATES: The Inverter, The AND gate, The OR gate, The NAND gate, NOR gate, The Exclusive–OR gate and Exclusive-NOR gate; Boolean Algebra and Logic Simplification – Boolean Operations and Expressions, Laws and Rules, DeMorgan's Theorems, Boolean Expressions and Truth Tables, The Karnaugh Map, SOP minimizations.	**6**
5	Factoring Methods: Finding the square root of a number, the smallest Divisor of an integer, the greatest common divisor of two integers, computing the prime factors of an integer, raising a number to a large power.	**6**

CO	Course Outcomes
CO1	Appreciate and understand the differences between hardware and software.
CO2	Analyze a given problem and develop an algorithm to solve the problem.
CO3	Improve upon a solution to a problem.
CO4	An ability to understand and appreciate Boolean algebraic expressions to digital design
CO5	Know and use different number systems and the basics of programming

Textbooks:	
1	Quantitative Aptitude For All Competitive Exams by Dr. R.S. Aggarwal.
2	R.G.Dromey, "How to Solve it by Computer", Pearson Education India, 2008.
3	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press Cambridge, Massachusetts London, England,2008.
4	Floyd, Thomas L, "Digital Computer Fundamentals", 10 th Edition, University Book Stall, 1997.
5	Malvino, Paul Albert and Leach, Donald P, "Digital Computer Fundamentals", 3 rd Edition, TMH, 1995.
Reference Books:	
1	Steven S. Skiena, "The Algorithm Design Module", 2nd Edition, Springer-Verlag LondonLimited, 2008.
2	Donald E. Knuth, The Art of Computer Programming", Volume 1: FundamentalAlgorithms, 3rd Edition, Addison Wesley Longman, 1997.
3	Donald E. Knuth, The Art of Computer Programming", Volume 2: SeminumericalAlgorithms, 3rd Edition, Addison Wesley Longman, 1998.
4	Greg Perry and Dean Miller, "C programming Absolute Beginner's Guide", 3rd edition,Pearson Education, Inc, 2014.
5	Bartee, Thomas C, "Digital Computer Fundamentals", 6th Edition, TMH, 1995.
Webresources:	
1	http://algorithmsforinterviews.com "Algorithms for Interviews"
2	https://www.geeksforgeeks.org/computer-fundamentals-tutorial/
3	https://www.tutorialspoint.com/computer_fundamentals/computer_websites.html
4	https://www.indiabix.com/
5	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_useful_resources.html

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC21	PROGRAMMING IN C++	Core	3	1	2	0	5	6	25	75	100

Learning Objectives

LO1	Learn the fundamentals of input and output using the C++
LO2	Design a class that serves as a program module or package
LO3	Learn how inheritance promotes code reuse and how to reuse properties of the base class in the derived classes
LO4	It provides all techniques of software development in the C++ Programming Language.
LO5	Demonstrates these techniques by the solution of a variety of problems

Unit	Content	Hours
1	**Introduction to Object Oriented Programming-**Basic Concepts of OOP, **Basic Elements of C++:**Tokens, Keywords, Identifiers, Variables, Basic Data Types in C++, Operators in C++.**Decision and Control Structures:** if Statement, if-else Statement, switch Statement, while, do-while, for.	14
2	**Functions in C++:**The Main Function, Function Prototyping, Call by Reference, Call by Value, Inline Function, Function Overloading- Classes **and Objects:** Specifying a Class, Defining Member functions, Nesting of Member Functions, Static Data Member and Member Function, Friend Function.	14
3	**Constructors and Destructors:** Constructors, Default Constructor, Parameterized Constructor, Constructor Overloading, Copy Constructor, and Destructor. **Operator Overloading:** Defining Operator Overloading, Overloading Unary Operators and Overloading Binary Operators.	14
4	**Inheritance:** Introduction, Defining Derived Class, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance. **Virtual Functions:** Virtual Function, Pure Virtual Functions.	14
5	**Working with Files:** Introduction, Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command Line Arguments.	14

CO	Course Outcomes
CO1	Understand object oriented features and C++ concepts.
CO2	Create class hierarchies using the object-oriented design process
CO3	Identify difference between types of inheritance
CO4	Understand the concepts of polymorphism and Exceptional Handling
CO5	Implement Object Oriented Programs concepts
Textbooks:	
1	E.Balagurusamy Object Oriented Programming with C++ Tata Mc Graw Hill Publications, 6th Edition. 2013
2	Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
3	Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.
4	C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010. (Units III, VI & V)
5	"Introduction to C++" by Paul Deitel and Harvey Deitel
Reference Books:	
1	Bjarne Stroustrup The C++ Programming Language Pearson Education, 4th Edition. 2014
2	Mt Somashekara, Ds Guru, Hs Nagendra swamy, ented Programming With C++ Prentice Hall Of India 2014
3	https://notalentgeek.github.io/note/note/project/project-independent/pi-brp-beginning-c-programming/document/20170807-1504-cet-1-book-and-source-1.pdf
4	https://gacbe.ac.in/pdf/ematerial/18BCS33C-U2.pdf
5	C++ The Complete Reference, Herbert Schildt, Tata McGraw Hill, 4th Edition, 2003.
Web resources:	
1	https://www.tutorialspoint.com/cplusplus/index.htm
2	www.cplusplus.com
3	www.codecademy.com
4	https://www.youtube.com/watch?v=-TkoO8Z07hI
5	https://www.youtube.com/watch?v=EPwK6D9zY0E

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC22	**DATA STRUCTURE**	Core	5	-	-	-	5	5	25	75	100

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To understand various sorting and searching

Unit	Content	Hours
1	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists- All operations-Insertion-Deletion-Merge - Polynomial Manipulation.	15
2	Stack ADT-Operations- Applications- Evaluating arithmetic expressions– Conversion of infix to postfix expression-Queue ADT-Operations- Circular Queue- Priority Queue- deQueue applications of queues.	15
3	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Heap-Applications of heap.	15
4	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal- Applications of graphs.	15
5	Searching: Linear search-Binary search- Sorting: Bubble sort-Selection sort-Insertion sort- Hashing: Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing.	15

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

Textbooks:	
1	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition
3	Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
4	C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010.
5	Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison Wesley Longman Inc., 2nd Edition, 1999.
Reference Books:	
1	Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
3	P Rizwan Ahmed, C++ and Data Structure , Margham Pubications, 2015
4	**Data Structures and Algorithms in C++ Paperback – 1 January 2007** by Michael T. Goodrich (Author), Roberto Tamassia (Author), David Mount (Author)
5	Data Structures And Algorithms Made Easy: Data Structures And Algorithmic Puzzles Paperback – 21 July 2023 by Narasimha Karumanch
Web resources:	
1	https://www.youtube.com/watch?v=7hNxbV8Ab4Q
2	https://www.geeksforgeeks.org/learn-dsa-in-cpp/
3	https://www.codechef.com/roadmap/cpp-dsa
4	https://www.youtube.com/watch?v=B31LgI4Y4DQ
5	https://www.udemy.com/course/data-structures-algorithms-using-c-zero-to-mastery/?srsltid=AfmBOoqBZzyvIZ0t8Hbxk1HjHsXzB3o4LTSMc1I2xG4lfh8FjofZ59hg

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- Low

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAS21P	**DATA STRUCTURE USING C++ LAB**	core	-	-	2	-	5	2	25	75	100

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To understand various sorting and searching

Unit	Content	Hours
1	Create a C++ Program to Implement Singly Linked List	30
2	Create a C++ Program to Implement Doubly Linked List	
3	Create a C++ Program for Stack Implementation	
4	Create a C++ Program for Queue Implementation	
5	Create a C++ Program to implement tree traversal techniques	
6	Write a C++ program to demonstrate Breadth first search (BFS) algorithm	
7	Write a C++ program to demonstrate Depth first search (DFS) algorithm	
8	Write a C++ program to demonstrate Binary Search	
9	Write a C++ Program to demonstrate the Bubble Sort	
10	Write a C++ Program to demonstrate the Insertion Sort, Quick Sort	

CO	Course Outcomes
CO1	Understand the concept of Dynamic memory management, data types and algorithm
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues
CO3	Describe the hash function and concepts of collision andits resolution methods
CO4	Solve problem involving graphs, trees andheaps
CO5	Apply Algorithm for solving problems likesorting, searching, insertion and deletion of data

Textbooks:

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

3	Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
4	C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010.
5	Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison Wesley Longman Inc., 2nd Edition, 1999.
Reference Books:	
1	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
3	P Rizwan Ahmed, C++ and Data Structure , Margham Pubications, 2015
4	**Data Structures and Algorithms in C++ Paperback – 1 January 2007** by Michael T. Goodrich (Author), Roberto Tamassia (Author), David Mount (Author)
5	Data Structures And Algorithms Made Easy: Data Structures And Algorithmic Puzzles Paperback – 21 July 2023 by Narasimha Karumanch
Web resources:	
1	https://www.youtube.com/watch?v=7hNxbV8Ab4Q
2	https://www.geeksforgeeks.org/learn-dsa-in-cpp/
3	https://www.codechef.com/roadmap/cpp-dsa
4	https://www.youtube.com/watch?v=B31LgI4Y4DQ
5	https://www.udemy.com/course/data-structures-algorithms-using-c-zero-to-mastery/?srsltid=AfmBOoqBZzyvIZ0t8Hbxk1HjHsXzB3o4LTSMc1I2xG4lfh8FjofZ59hg

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	3	3	2	3	2	2
CO3	3	3	3	3	3	3	3	2	3	2	3
CO4	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	12	15	12	12
Average	3	3	3	3	3	3	3	2	3	2	2

3 – Strong, 2- Medium, 1- low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC31	**Programming in Java**	**Core**	**3**	**1**	**2**	**0**	**5**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	Learn about the history and evolution of Java and its core features.
LO2	Implement Inheritance, method overloading and method overriding, polymorphism and Importing Packages.
LO3	Understand the concept of streams and their role in input/output operations.
LO4	Explore the events and their role in interactive GUI applications using AWT.
LO5	Explore the hierarchy of Swing components and their relationship with AWT.

Unit	Content	Hours
1	**Introduction:** Review of Object Oriented concepts – History of Java – Java buzzwords JVM architecture – Data types - Variables - Scope and life time of variables - arrays - operators – control statements - simple java program - constructors - methods - Static block - Static Data – Static Method String and String Buffer Classes.	14
2	Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes. Packages: Definition-Access Protection Importing Packages. Interfaces: Definition Implementation- Extending Interfaces. Exception Handling: try – catch- throw - throws – finally – Built-in exceptions.	14
3	Multithreaded Programming: Thread Class - Runnable interface –Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication. I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	14
4	AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. Event Handling: Events - Event sources - Event Listeners - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	14
5	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel, JTextField - JTextArea - JList - JComboBox - JScrollPane.	14

CO	Course Outcomes- On completion of this course, students will be
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3	Implement multi-threading and I/O Streams of Core Java
CO4	Implement AWT and Event handling.
CO5	Use Swing to create GUI.
Textbooks:	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999
3	"Java: How to Program" – Paul Deitel & Harvey Deitel, Pearson Education
4	"Java Programming for Beginners" – Mark Lassoff, LearnToProgram Media
5	"Head First Java" – Kathy Sierra & Bert Bates, O'Reilly Media 2017
Reference Books:	
1	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010
2	P.Rizwan Ahmed, Java Programming, 3rd Edition, Margham Publications, 2017
3	"Core Java Volume I – Fundamentals"&"Core Java Volume II – Advanced Features" Cay S. Horstmann, Pearson Education
4	"Java Network Programming" (4th Edition) Elliotte Rusty Harold, O'Reilly Media
5	"Java Performance: The Definitive Guide", Scott Oaks, O'Reilly Media
Web resources:	
1	https://javabeginnerstutorial.com/core-java-tutorial
2	http://docs.oracle.com/javase/tutorial/
3	https://www.coursera.org/
4	https://docs.oracle.com/en/java/
5	https://www.programiz.com/java-programming

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	1	1	3	1	2
CO2	3	3	3	2	2	2	1	2	3	2	3
CO3	2	3	3	3	2	1	2	2	2	3	3
CO4	2	2	3	2	2	1	1	3	2	2	2
CO5	2	3	3	3	3	2	1	3	3	3	3
Total	12	13	15	12	10	8	6	11	13	11	13
Average	2	3	3	2	2	2	1	2	3	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC32P	Programming in Java Lab	Practical-IV	0	0	4	0	2	4	25	75	100

Learning Objectives

LO1	To provide fundamental knowledge of object-oriented programming.
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to know about Event Handling.
LO4	To enable the students to use String Concepts.
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.

Unit	Content	Hours
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer	60
2	Write a Java program to multiply two given matrices.	
3	Write a Java program that displays the number of characters, lines and words in a text	
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.	
5	Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position	
6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring	
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception	
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13	Write a Java program that handles all mouse events and shows the event name at the	

	center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.	

CO	Course Outcomes-On completion of this course, students will be
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3	Implement multi-threading and I/O Streams of Core Java
CO4	Implement AWT and Event handling.
CO5	Use Swing to create GUI.
Text books:	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999
3	"Java: How to Program" – Paul Deitel & Harvey Deitel, Pearson Education
4	"Java Programming for Beginners" – Mark Lassoff, LearnToProgram Media
5	"Head First Java" – Kathy Sierra & Bert Bates, O'Reilly Media 2017
Reference Books:	
1	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010
2	P.Rizwan Ahmed, Java Programming, 3rd Edition, Margham Publications, 2017
3	"Core Java Volume I – Fundamentals"&"Core Java Volume II – Advanced Features" Cay S. Horstmann, Pearson Education
4	"Java Network Programming" (4th Edition) Elliotte Rusty Harold, O'Reilly Media
5	"Java Performance: The Definitive Guide", Scott Oaks, O'Reilly Media
Web resources:	
1	https://javabeginnerstutorial.com/core-java-tutorial
2	http://docs.oracle.com/javase/tutorial/
3	https://www.coursera.org/
4	https://docs.oracle.com/en/java/
5	https://www.programiz.com/java-programming

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	1	2	3	1	2
CO2	3	3	3	2	2	2	1	2	3	2	3
CO3	2	3	3	3	2	1	2	3	2	3	3
CO4	2	2	3	2	2	1	1	3	2	2	2
CO5	2	3	3	3	3	2	1	3	3	3	3
Total	12	13	15	12	10	8	6	13	13	11	13
Average	2	3	3	2	2	2	1	3	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA31	**Web Technology**	**Elective -IV**	**3**	**1**	0	**0**	**4**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand the basic concepts of the Internet, web technologies, and client-server architecture.
LO2	Learn the structure and syntax of HTML and CSS for creating and styling web pages.
LO3	Develop interactivity using client-side scripting languages like JavaScript.
LO4	Gain knowledge of server-side programming concepts using PHP (or similar).
LO5	Learn to define custom tags, attributes, and elements using XML and purpose of XML in web technologies.

Unit	Content	Hours
1	**Introduction to Internet and Web Technologies:** History and evolution of the Internet and World Wide Web, Understanding URLs, web pages, and web browsers. **Overview of web protocols:** HTTP, FTP, SMTP, etc, Client-server architecture and web server basics, Search engines and their functionalities.	12
2	**HTML and CSS:** HTML basics: tags, elements, attributes, and document structure, Creating forms, tables, and lists in HTML. **Introduction to Cascading Style Sheets (CSS)**, CSS Basics: Syntax, Comments, Selectors, Declarations, Types and Comments, Linking Style Sheet to HTML. Creating CSS File. CSS Box Model.	12
3	**Client-Side Scripting with JavaScript:** JavaScript syntax and data types, Variables, operators, and control structures, Functions and event handling, Form validation techniques. Introduction to Document Object Model (DOM) manipulation.	12
4	**Server-Side Scripting (e.g., PHP):** Basics of server-side scripting languages, Handling form data on the server, Session management and cookies, Connecting to databases and performing CRUD operations, Security considerations in server-side scripting.	12
5	**XML:** Introduction to XML, XML Specification , XML Syntax, Defining XML tags, their attributes and values, Structure of XML, XML Elements, Naming Rules XML Element Content Models, XML DTD (Document Type Declaration), XML Schema.	12

CO	Course Outcomes- On completion of this course, students will be
CO1	Describe the functioning of the Internet, web protocols, and client-server model.
CO2	Design structured and visually styled web pages using HTML and CSS.
CO3	Implement interactive features in web pages using JavaScript.
CO4	Develop dynamic websites with server-side scripting and database connectivity.
CO5	Design XML documents with appropriate elements, attributes, and hierarchical structure.

Textbooks:	
1	Thomas A. Powell: HTML & XHTML"Fourth Edition, The Complete Reference
2	Ivan Bay ross:Web enabled commercial application development using HTML,JavaScript,DHTMLandPHP"4th Edition
3	Robert W.Sebesta: Programming the World WideWeb,Eighth Edition, Pearson education,2015.
4	Dayley Brad, Dayley Brendan,"AngularJS,JavaScript,and jQuery All in One",Sams Teach Yourself 1st Edition,Kindle Edition,2015.
5	Deitel,nieto,Lin,Sandhu-"XML How to program"-Pearson.

Reference Books:	
1	M. Srinivasan:Web Programming Building Internet Applications,3rd Edition,Wiley India,2009.
2	JeffreyC.Jackson:Web Technologies-A Computer Science Perspective, Pearson Education,7th Impression,2012.
3	Chris Bates: Web Technology Theory and Practice,Pearson Education,2012.
4	Raj Kamal: Internet and Web Technologies, McGraw Hill Education.
5	Ryan Benedetti, Ronan Cranley, Head First jQuery- A Brain-Friendly Guide,O'ReillyMedia

Web resources:	
1	https://www.studocu.com/in/document/mangalore-university/web-technology/unit-1-part-a/92991233/
2	https://www.studocu.com/in/document/anna-university/web-technologies/wt-unit-ii-web-technologies-notes/102028957/download/wt-unit-ii-web-technologies-notes.pdf/
3	https://www.studocu.com/in/document/anna-university/internet-programming/unit-iii-server-side-programming-final/92812518/download/unit-iii-server-side-programming-final.pdf/
4	https://www.studocu.com/in/document/anna-university/internet-programming/cs8651-ip-notes-unit-4/41046757/
5	https://www.studocu.com/in/document/anna-university/web-technology/unit-v-introduction-to-angular-and-web-applications-frameworks/67820610

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	1	2	3	1	2
CO2	3	3	3	2	2	2	2	2	3	2	3
CO3	2	3	3	3	2	1	2	3	2	3	3
CO4	2	2	3	2	3	2	1	3	2	2	3
CO5	2	3	3	3	3	1	2	3	3	3	3
Total	12	13	15	12	11	8	8	13	13	11	14
Average	2	3	3	2	2	2	2	3	3	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA33P	**Web Technology Lab**	**Practical-V**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To understand various sorting and searching

Unit	Content	Hours
1	Create a web page having suitable background color and text color with title "My First Web Page" using all the attributes of the Font tag.	20
2	Create a web page with Frames and Tables	
3	Create HTML for demonstration of cascading style sheets. A. Embedded style sheets. B. External style sheets. C. Inline styles.	
4	Create a personal portfolio web page Using HTML for structure and CSS for styling.	
5	Writing scripts for form validation using JavaScript. Example: Check if email, phone number, and password fields are correctly filled.	
6	Build a simple calculator using JavaScript.	
7	Create a PHP program to check whether given number is String palindrome or not.	
8	Create a simple dynamic web page using PHP. Accept form data and display output (e.g., feedback form processing).	
9	Create an external Document Type Definition to validate XML for CUSTOMER DETAILS.	
10	Design an XML document and validate it using XML Schema.	

CO	Course Outcomes
CO1	Construct a basic web site using HTML and Cascading Style Sheets
CO2	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO3	Develop server side programs using Servlets and JSP.
CO4	Construct simple web pages in PHP and to represent data in XML format.
CO5	Develop interactive web applications.
Textbooks:	
1	Deitel and Deitel and Nieto,Internet and World Wide Web-How to Program, Prentice Hall, 5th Edition, 2011.
2	Jeffrey C and Jackson,Web Technologies A Computer Science Perspective,Pearson Education, 2011.
3	Angular 6 for Enterprise-Ready Web Applications,Doguhan Uluca,1stedition,Packt Publishing
Reference Books:	
1	Stephen Wynkoop and John Burke"Running a Perfect Website",QUE,2nd Edition,1999.
2	Chris Bates,Web Programming–Building Intranet Applications,3rd Edition,Wiley Publications, 2009.
3	Gopalan N.P.and Akil and eswari J.,"Web Technology",Prentice Hall of India,2011.
4	Uttam K.Roy,"Web Technologies",Oxford University Press,2011.
5	Angular: Up and Running: Learning Angular,Step by Step,Shyam Seshadri,1st edition,O 'Reilly
Web resources:	
1	https://mrcet.com/pdf/Lab%20Manuals/WT%20LAB%20MANUAL.pdf
2	https://www.studocu.com/in/document/anna-university/web-technologies/wt-unit-ii-web-technologies-notes/102028957/download/wt-unit-ii-web-technologies-notes.pdf
3	https://www.studocu.com/in/document/anna-university/internet-programming/unit-iii-server-side-programming-final/92812518/download/unit-iii-server-side-programming-final.pdf
4	https://www.studocu.com/in/document/anna-university/internet-programming/cs8651-ip-notes-unit-4/41046757
5	https://www.studocu.com/in/document/anna-university/web-technology/unit-v-introduction-to-angular-and-web-applications-frameworks/67820610

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	2	2	3	1	2
CO2	3	3	3	2	2	2	2	2	3	2	3
CO3	2	3	3	3	2	1	1	3	2	3	3
CO4	2	2	3	2	3	2	2	3	2	2	3
CO5	2	3	3	3	3	3	2	3	3	3	3
Total	12	13	15	12	11	9	9	13	13	11	14
Average	2	3	3	2	2	2	2	3	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA32	Open Source Software	Elective- IV	3	1	0	0	4	4	25	75	100

Learning Objectives

LO1	Understand the basic structure and functionality of HTML and HTML5.and also Applies CSS for styling web pages, including layout, colors and fonts.
LO2	Understand essential Linux commands for system navigation and management.
LO3	To Learn about the fundamentals of JavaScript and MySQL.
LO4	Learn the fundamentals of PHP and its syntax.
LO5	To Learn the fundamentals and background of Perl.

Unit	Content	Hours
1	**Unit-1:INTRODUCTION TO HTML, HTML5, CSS:** Need and Applications of Open Source -Introduction to HTML-HTML Tags and Structure-Dynamic Web Content -Introduction to HTML5-HTML5 Canvas-HTML5 Audio and Video-Introduction to CSS-CSS Rules and Selectors-CSS Style Types and Colors	12
2	**Unit-2:LINUX:** Linux Essential Commands-Kernel Model and User Mode-File System Concepts-The Linux Security Model-Vi Editor Basics-Shell Introduction--Managing Processes -Installing Applications in Linux	12
3	**Unit-3:JAVASCRIPT AND MYSQL**: JavaScript: Introduction of JavaScript - JavaScript Syntax-Data Types and Variables-Arrays-Operators and Expressions-Loops-Functions-Dialog Boxes **MySQL:**Introduction to MySQL-SHOW Databases and Tables-USE Command-Creating Databases and Tables-Describing Tables-SELECT, INSERT, UPDATE, and DELETE Statements	12
4	**Unit-4:PHP:**Introduction to PHP-PHP Syntax and Scripting- -PHP Variables, Operations, and Expressions-Control Statements -Basic Form Processing-File and Folder Access-Cookies and Sessions-Database Access with PHP	12
5	**Unit 5 PERL:** Introduction to Perl and Its Background-Perl Features-Perl Parsing Rules-Variables and Data Types-Statements and Control Structures-Subroutines, Packages, and Modules-Working with Files in Perl-Data Manipulation in Perl	12

CO	Course Outcomes- On completion of this course, students will be
CO1	To Understand about the Design structured web pages using HTML and HTML5.Create responsive designs using CSS techniques.
CO2	Apply knowledge of the Linux file system for system organization.
CO3	Implement JavaScript-based dynamic content with MySQL databases.
CO4	Implement PHP operations, expressions, and control structures.
CO5	Understand about basic conceptof PERL
Text books:	
1	"The Complete Reference Linux", Peterson, Tata McGrawHILL–2010
2	"Perl: The Complete Reference", Martin C. Brown, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2009.
3	"MYSQL: The Complete Reference", Vikram Vaswani, 2nd Edition, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2009
4	"PHP: The Complete Reference", Steven Holzner, 2nd Edition, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009.
5	"Complete Reference HTML", T.A. Powell,3rd Edition, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2002.
Reference Books:	
1	"Fundamentals of Open Source Software", by M. N. Rao, PHI publishers.
2	"MySQLBible", Steve Suchring, JohnWiley,2002
3	"The Linux Kernel Book", Remy Card, Eric Dumas and Frank Mevel, Wiley Publications, 2003
4	Ivan By Ross, HTML, DHTML, Javascript, Perl, BPB Publication, "PHP: The Complete Reference" – Steven Holzner
5	" Learning Perl" – Randal L. Schwartz, Tom Phoenix, Brian D. Foy,"Programming Perl" – Larry Wall, Tom Christiansen, Jon Orwant,"Perl Cookbook" – Tom Christiansen, Nathan Torkington
Web resources:	
1	https://www.w3schools.com/html/,https://www.w3schools.com/css/
2	https://www.geeksforgeeks.org/linux-tutorial/
3	https://developer.mozilla.org/en-US/docs/Web/JavaScript,https://www.w3schools.com/MySQL/default.asp
4	https://www.w3schools.com/php/
5	https://www.tutorialspoint.com/perl/index.htm

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	2	2	2	1	2
CO2	2	3	3	2	3	1	2	2	3	2	3
CO3	2	3	3	3	2	2	2	3	3	2	2
CO4	2	2	3	3	2	3	3	3	3	3	3
CO5	2	3	3	3	3	2	2	3	3	3	3
Total	11	13	14	13	12	10	11	13	14	11	13
Average	2	3	3	3	2	2	2	3	3	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA34P	**Open Source Software Lab**	**Practical- V**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives

LO1	To understand the basic HTMLTags.
LO2	To understand the types of CSS.
LO3	To learn Javascript functions.
LO4	To know about PHP form elements.
LO5	To learn PHP with MYSQL database connectivity.

Unit	Content	Hours
1	Create a web page with Frames and Tables.	20
2	Create a webpage in Corporating CSS(Cascading Style Sheets).	
3	Develop a shell program to find the factorial of an integer positive number.	
4	Develop a shell program to find the details of a user session.	
5	Create a simple calculator in JavaScript	
6	Develop a JavaScript program to scroll your name in the scrollbar.	
7	Develop a program and check message passing mechanism between pages	
8	Application for Email Registration and Login using PHP and MySQL.	
9	Program to Create a File and write the Data into it using PHP	
10	Program to perform the String Operation using Perl	

CO	Course Outcomes- On completion of this course, students will be
CO1	The student will be able to design static web pages.
CO2	The student will be able to link common style to the web pages using CSS.
CO3	The student will be able to validate form controls using javascript.
CO4	The student will be able to design dynamic web pages using tags.
CO5	The student will be able to develop PHP program with MYSQL database connection.
Textbooks:	
1	"The Complete Reference Linux", Peterson, Tata McGrawHILL–2010
2	"Perl: The Complete Reference", Martin C. Brown, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2009.
3	"MYSQL: The Complete Reference", Vikram Vaswani, 2nd Edition, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2009
4	"PHP: The Complete Reference", Steven Holzner, 2nd Edition, Tata McGraw Hill Publishing Company Limited, Indian Reprint 2009.
5	"Complete Reference HTML", T.A. Powell,3rd Edition, Tata Mc Graw Hill Publishing Company Limited, Indian Reprint 2002.
Reference Books:	
1	"Fundamentals of Open Source Software", by M. N. Rao, PHI publishers.
2	"MySQLBible", Steve Suchring, JohnWiley,2002
3	"The Linux Kernel Book", Remy Card, Eric Dumas and Frank Mevel, Wiley Publications, 2003
4	Ivan By Ross, HTML, DHTML, Javascript, Perl, BPB Publication, "PHP: The Complete Reference" – Steven Holzner
5	" Learning Perl" – Randal L. Schwartz, Tom Phoenix, Brian D. Foy,"Programming Perl" – Larry Wall, Tom Christiansen, Jon Orwant,"Perl Cookbook" – Tom Christiansen, Nathan Torkington
Web resources:	
1	https://www.w3schools.com/html/,https://www.w3schools.com/css/
2	https://www.geeksforgeeks.org/linux-tutorial/
3	https://developer.mozilla.org/en-US/docs/Web/JavaScript,https://www.w3schools.com/MySQL/default.asp
4	https://www.w3schools.com/php/
5	https://www.tutorialspoint.com/perl/index.html/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	2	-	2	3	2	2
CO2	2	2	-	3	-	2	-	2	2	2	3
CO3	2	2	2	3	2	2	2	-	2	2	3
CO4	3	3	3	3	-	3	3	2	3	3	3
CO5	2	3	3	3	3	2	3	2	3	3	3
Total	12	12	10	15	5	11	8	8	13	12	14
Average	2	2	2	3	1	2	2	2	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: THIRD SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAS31	Multimedia Systems	SEC-IV	1	0	1	0	2	2	25	75	100

Learning Objectives

LO1	Understand the fundamental concepts of multimedia and its various components.
LO2	Explore tools and techniques for an integrating multimedia elements such as text, images, audio, video, and animation.
LO3	Apply design principles to develop multimedia content for practical applications .
LO4	Gain hands-on experience with industry-standard multimedia software.
LO5	Understanding the concept of cost involved in multimedia, planning, designing, and producing.

Unit	Content	Hours
1	**Introduction to Multimedia:** Definition and elements of multimedia, Types of multimedia : Linear vs. Non-linear, Multimedia applications (education, entertainment, business), Multimedia system architecture and requirements.	6
2	**Text and Image in Multimedia:** Types of text and fonts, Image file formats: BMP, JPEG, PNG, GIF. Basics of image editing: cropping, resizing, layers. Tools: Adobe Photoshop / GIMP.	6
3	**Audio and Video Technology:** Characteristics of sound: frequency, amplitude. Audio file formats: WAV, MP3, OGG. Basics of video: frame rate, resolution, aspect ratio.Video formats: AVI, MP4, MOV. Tools: Audacity (audio), Adobe Premiere Pro / Shotcut (video).	6
4	**Animation in Multimedia:** Principles of animation (keyframes, tweening, morphing). Types: 2D vs. 3D animation. Animation tools: Adobe Animate / Blender. Applications of animation: advertising, web, games.	6
5	**Multimedia Authoring and Tools:** Types of authoring tools: Icon-based, Time-based, Card-based. Multimedia project planning and design. Integrating text, images, audio, and video. Building multimedia presentations (e.g., in Adobe Flash, PowerPoint).	6

CO	Course Outcomes- On completion of this course, students will be
CO1	Understand the concepts, importance, application and the process of developing multimedia
CO2	To have basic knowledge and understanding about Image related processing's
CO3	To understand the framework of frames and bit Images to animations
CO4	Speaks about the multimedia projects and stages of Requirement in phases of project
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing.
Text books:	
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill, 2001.
2	Fundamentals of multimedia Book by Ze-Nian Li, 2004
3	Introduction to Multimedia and its Applications, V.K.Jain, Khanna Publishing House,2012
Reference Books:	
1	Ralf Steinmetz & Klara Nahrstedt"Multimedia Computing, Communication& Applications", Pearson Education, 2012.
Web resources:	
1	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/
2	https://www.geeksforgeeks.org/multimedia-tutorial/
3	https://www.javatpoint.com/Planning/-tutorial
4	https://www.tutorialspoint.com/Designing_and_producing/index.html
5	https://www.tutorialspoint.com/software_needs/.html

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	2	2	2	2	-
CO2	2	2	2	3	2	2	1	2	3	2	2
CO3	2	2	3	3	2	2	1	3	2	-	3
CO4	2	2	3	3	2	3	2	3	3	2	3
CO5	2	2	3	3	2	2	3	3	3	3	3
Total	11	10	13	14	11	9	9	13	13	9	11
Average	2	2	3	3	2	2	2	3	3	2	2

3 – Strong, 2- Medium, 1- low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC41	**Python Programming**	**Core**	**3**	**1**	**2**	**0**	**5**	**6**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the basic building blocks for PYTHON programming.
LO2	To Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.
LO3	To understand the concept of arrays and their role in storing collections of data.
LO4	To perform list creation and use list elements through indexing and iteration.
LO5	To understand the objects in Python, including creating object instances and accessing attributes and methods.

Unit	Content	Hours
1	**Unit-1: INTRODUCTION** Identifiers – Keywords - Statements and Expressions – Variables – Operators – Arithmetic operators – Assignment operators – Comparison operators – Logical operators – Bitwise operators - Precedence and Associativity – Data types - Number – Booleans – Strings - Indentation – Comments – Single line comment – Multiline comments - Reading Input – Print Output – Type Conversions – int function – float function – str() function – chr() function – complex() function – ord() function – hex() function – oct() function - type() function and Is operator – Dynamic and Strongly typed language.	**15**
2	**Unit-2: CONTROL FLOW STATEMENTS** Control Flow Statements – If statement – If else statement – If elif else statement – nested if statement - while loop – for loop – continue and break statements – catching exceptions using try and except statement – syntax errors – exceptions – exception handling – Strings – str() function - Basic string operations – String comparison – Built in functions using strings – Accessing characters in string – String slicing – String joining – split() method – string traversing.	**13**
3	**Unit-3:ARRAYS AND FUNCTIONS** Arrays-Types-Functions – Built in functions – function definition and calling - return statement – void function – scope and lifetime of variables – args and kwargs – command line arguments - Tuples – creation – basic tuple operations – tuple() function – indexing – slicing – built-in functions used on tuples – tuple methods – packing – unpacking – traversing of tuples – populating tuples – zip() function - Sets – Traversing of sets – set methods – frozenset.	**15**
4	**Unit-4: LISTS** Using List- List Assignment and Equivalence – List Bounds- Slicing - Lists and Functions- Prime Generation with a List. List Processing: Sorting-Flexible Sorting- Search- List Permutations- Randomly Permuting a List- Reversing a List. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods Difference between Lists and Dictionaries.	**13**

5	**Unit-5: OBJECTS** Using Objects- String Objects- List Objects. Custom Types: Geometric Points- Methods- Custom Type Examples- Class Inheritance. Handling Exceptions: Motivation- Exception Examples- Using Exceptions - Custom Exceptions.	**14**

CO	**Course Outcomes- On completion of this course, students will be**
CO1	To understand the basic building blocks for creating PYTHON programming in details.
CO2	To understand the control statements and basic methods used in PYTHON programming
CO3	To understand and apply the concepts of arrays, functions, tuples, and sets to store, access, and manipulate data efficiently.
CO4	To manage key-value data structures using dictionaries and differentiate between lists and dictionaries based on structure, access method, and application.
CO5	To effectively by using exception handling mechanisms and design custom exceptions for robust and safe program execution.
Textbooks:	
1	Gowrishankar S, Veena A, "Introduction to Python programming", 1st Edition, CRC Press/Taylor & Francis.
2	Learn to Program with Python, 3th Edition, Richard L. Halterman, Southern Adventist University.
3	Reema Thareja, —Python Programming using problem solving approach, First Edition, 2017, Oxford University Press.
4	Dr. R. Nageswara Rao, —Core Python Programming , First Edition, 2017, Dream tech Publishers.
Reference Books:	
1	Core Python Programming, 2nd Edition, Wesley J. Chun, Prentice Hall.
2	Jake VanderPlas," Python Data Science Handbook: Essential Tools for working with Data",1st edition, O'Reilly Media, 2016.
3	Adam Stewarts, "Python Programming", Online.
4	Fabio Nelli, "Python Data Analytics", A Press.
5	KennethA. 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://wiki.python.org/moin/BeginnersGuide/Programmers

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	2	3	3	1	1	2
CO2	2	2	2	2	3	2	3	3	2	2	3
CO3	2	3	3	3	3	2	2	3	3	3	3
CO4	3	3	3	1	3	3	3	3	3	2	2
CO5	3	2	3	2	3	3	3	3	2	3	3
Total	12	13	13	10	15	12	14	15	11	11	13
Average	**2**	**2.6**	**2.6**	**2**	**3**	**2**	**2.8**	**3**	**2**	2	3

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC42P	**Python Programming Lab**	**Practical-IV**	**0**	**0**	**4**	**0**	**2**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand and use various operators (arithmetic, relational, logical, and bitwise) to perform operations on variables and string operation in Python.
LO2	To apply conditional statements to make decisions based on input values (e.g., check odd or even numbers) and list operations.
LO3	To use functions to compute results such as the sum of elements in an array, promoting modular programming.
LO4	To define and create classes and objects, illustrating object-oriented programming concepts such as attributes and encapsulation.
LO5	To handle the multiple exceptions in Python to ensure robust and error-free file handling.

Unit	Content	Hours
1	Write a Python program to demonstrate the use of various operators (arithmetic, relational, logical, bitwise) on variables.	40
2	Write a Python program to perform the string operations.	
3	Write a Python program to input a number and check whether it is odd or even using an if-else conditional statement.	
4	Write a Python program to demonstrate list operations like insertion, deletion, slicing, and concatenation.	
5	Develop a Python program to find the largest element in the array.	
6	Develop a Python program to find the sum of the elements in an array with functions	
7	Develop a Python program to store strings in a list and print them.	
8	Develop a Python program to find the length of a list, reverse it, copy it and then clear it.	
9	Write a Python program to define a Student class with attributes name, age, and grade. Create objects of this class and display their details.	
10	Develop a Python Program to read file with multiple Exceptions	

CO	Course Outcomes-On completion of this course, students will be
CO1	To apply Python operators and expressions to solve basic computational problems.
CO2	To perform string and list operations to manipulate data effectively.
CO3	To implement decision-making and control flow using conditional statements.
CO4	To use arrays/lists and functions to compute values such as largest element and sum of elements.
CO5	To demonstrate understanding of object-oriented programming by defining classes and creating objects.
Textbooks:	
1	Gowrishankar S, Veena A, "Introduction to Python programming", 1st Edition, CRC Press/Taylor & Francis.
2	Learn to Program with Python, 3th Edition, Richard L. Halterman, Southern Adventist University.
3	Reema Thareja, —Python Programming using problem solving approach, First Edition, 2017, Oxford University Press.
4	Dr. R. Nageswara Rao, —Core Python Programming , First Edition, 2017, Dream tech Publishers.
Reference Books:	
1	Core Python Programming, 2thEdition, Wesley J. Chun, Prentice Hall.
2	Jake VanderPlas," Python Data Science Handbook: Essential Tools for working with Data",1st edition, O'Reilly Media, 2016.
3	Adam Stewarts, "Python Programming", Online.
4	Fabio Nelli, "Python Data Analytics", A Press.
5	KennethA. 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://www.geeksforgeeks.org/python-programming-language/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	1	2	3	1	2
CO2	3	3	3	2	2	2	1	2	3	2	3
CO3	2	3	3	3	2	1	2	3	2	3	3
CO4	2	2	3	2	2	1	1	3	2	2	2
CO5	2	3	3	3	3	2	1	3	3	3	3
Total	12	13	15	12	10	8	6	13	13	11	13
Average	2	3	3	2	2	2	1	3	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA41	**Relational Database Management System**	**Elective -VI**	**3**	**1**	0	**0**	**4**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand database concepts and database management system software and have a high-level understanding of major DBMS components and their function.
LO2	To understand the E R model and relational model.
LO3	To describe and apply the steps of the normalization process, including 1NF, 2NF, 3NF, and BCNF.
LO4	To Use **SQL Data Definition Language (DDL)** commands to create, alter, and drop database objects and perform **Data Manipulation Language (DML)** operations such as inserting, updating, deleting, and retrieving data.
LO5	To understand **PL/SQL block structure**, variables, data types, and assignment statements.

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

CO	Course Outcomes- On completion of this course, students will be
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity- Relationship Model.
CO3	Analyze and normalize database tables to eliminate anomalies and improve data consistency.
CO4	Apply SQL functions and write efficient subqueries and correlated queries for advanced data handling.
CO5	Use cursors and exception handlers to process multiple records and manage runtime errors effectively in PL/SQL applications.
Textbooks:	
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
2	Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Publications
3	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition.
4	An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition.
5	Database Design and Modeling with PostgreSQL and MySQL (2024) — Alkin Tezuysal, Ibrar Ahmed & Peter Zaitsev
Reference Books:	
1	Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System Concepts", Seventh Edition, TMH.
2	The Relational Model for Database Management Version 2 – A Critical Analysis (2024) — Chris Date
3	Mastering SQL Server Database Administration (2024) — Michael E. Kirshteyn, Ph.D.
4	An Introduction to Database Systems — *Christopher J. Date*, currently in its 8th Edition
Web resources:	
1	DBMS Tutorial – Learn Database Management System - GeeksforGeeks
2	https://www.tutorialspoint.com/dbms/index.htm
3	nptel.ac.in/courses/106105175
4	https://www.w3schools.com/sql/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	3	2	3	3	2
CO2	3	2	3	3	3	3	2	3	2	3	3
CO3	3	3	2	3	3	3	3	3	3	2	3
CO4	3	2	3	3	2	3	3	2	2	3	2
CO5	3	2	3	2	3	3	2	3	3	3	3
Total	15	12	13	14	14	14	13	13	13	14	13
Average	3	2.4	2.6	2.8	2.8	2.8	2.6	2.6	2.6	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA41P	**Relational Database Management System Lab**	**Practical-VII**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Learn how to connect and disconnect from a database environment.
LO2	Analyze the real-world problem to identify entities, attributes, and relationships.
LO3	Learn syntax and usage of SQL DDL (CREATE, ALTER, DROP) and DML (INSERT, UPDATE, DELETE, SELECT).
LO4	Understand relational joins and their purpose in combining data from multiple tables.
LO5	Integrate conceptual, logical, and physical design concepts.

Unit	Content	Hours
1	Creating users, connecting to databases, and understanding schema.	20
2	Define tables using **appropriate data types and constraints** (PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, CHECK).	
3	Draw an ER diagram to Library management System.	
4	Draw an ER diagram to University Database.	
5	Give exercise on DDL and DML	
6	Use **aggregate functions** (SUM, AVG, COUNT, MIN, MAX).	
7	Implement **INNER JOIN**, **OUTER JOIN (LEFT, RIGHT)**	
8	Write queries using **IN**, **ANY**, **ALL**, and **EXISTS** operators.	
9	Write a PL/SQL block to fetch records using **CURSOR FOR LOOP**	
10	Design and implement a **complete database system** for Library Management System	

CO	Course Outcomes
CO1	Design and create database tables using proper data types and constraints to ensure data integrity.
CO2	Create ER diagrams for institutional databases demonstrating correct data relationships.
CO3	Apply aggregate and grouping functions to generate summarized data reports.
CO4	Write and execute subqueries with conditional operators to handle complex query requirements.
CO5	Design, build, and demonstrate a functional relational database project integrating all learned DBMS concepts.
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.
2	Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Publications
3	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition.
Reference Books:	
1	Abraham Silberschatz, Henry Korth, S. Sudarshan, Database Systems Concepts, Sixth Edition, McGraw Hill, 2010. 2. Raghu Ramakrishnan and Johannes Gehrke, Database management systems, Third Edition,2002.
2	The Relational Model for Database Management Version 2 – A Critical Analysis (2024) — Chris Date
3	Mastering SQL Server Database Administration (2024) — Michael E. Kirshteyn, Ph.D.
4	An Introduction to Database Systems — *Christopher J. Date*, currently in its 8th Edition
5	The Relational Model for Database Management Version 2 – A Critical Analysis (2024) — Chris Date
Web resources:	
1	DBMS Tutorial – Learn Database Management System - GeeksforGeeks
2	https://www.tutorialspoint.com/dbms/index.htm
3	nptel.ac.in/courses/106105175
4	https://www.w3schools.com/sql/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	2	2	3	1	2
CO2	3	3	3	2	2	2	2	2	3	2	3
CO3	2	3	3	3	2	1	1	3	2	3	3
CO4	2	2	3	2	3	2	2	3	2	2	3
CO5	2	3	3	3	3	3	2	3	3	3	3
Total	12	13	15	12	11	9	9	13	13	11	14
Average	2	3	3	2	2	2	2	3	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA42	**Computer Graphics**	**Elective -VI**	**3**	**1**	0	**0**	**4**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the concept of interactive computer graphics and its advantages.
LO2	To explain and apply clipping techniques for points, lines, and polygons.
LO3	To understand and apply 2D transformations such as translation, rotation, scaling, reflection, and shearing.
LO4	To understand and apply spline curves for shape and surface representation.
LO5	To understand keyframing, morphing, and motion specification techniques.

Unit	Content	Hours
1	Introduction: Interactive Computer Graphics, Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Conceptual Framework for Interactive Graphics, Classification of Application Development of Hardware and software for computer Graphics.	12
2	Scan Conversion: Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses. Clipping: point clipping, Cohen-Sutherland line clipping Algorithm, Midpoint Subdivision Algorithm, polygon clipping (Sutherland-Hodgeman)	12
3	Geometrical Transformation: 2D Transformation (translation, rotation, scaling, reflection and shearing), Homogeneous Coordinates and Matrix Representation of 2D Transformations, Successive and composite 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.	12
4	Curves & Surfaces: Polygon Surfaces and polygon meshes, Quadratic and super quadrics surfaces, Spline curve and representation.	12
5	Computer Animation: introduction, Application of animation, Morphing, Keyframe system, Motion specifications in Animation, Types of animation, Sequencing of Animation Design and Fundamental principles of animation.	12

CO	Course Outcomes- On completion of this course, students will be
CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3	Use of geometric transformations on graphics objects and their application in composite form.
CO4	Represent objects using polygon meshes, spline curves, and quadric surfaces effectively.
CO5	Design and demonstrate basic animation sequences using keyframing, morphing, and motion techniques along with animation principles.
Textbooks:	
1	Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000
2	D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment& Frame work, 2000
3	Ralf Skinmeiz and Klana Naharstedt, Multimedia: computing, Communication and Applications, Pearson, 2001
4	D. Haran & Baker. Computer Graphics Prentice Hall of India,1986.
5	D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008
Reference Books:	
1	Donald Hearn, M. Pauline Baker, Warren R. Carithers, Computer Graphics with OpenGL, Pearson / 4th Edition
2	Kommaraju S. Raghavendra, Computer Graphics, XiTech Publications / Latest Edition
3	Neumann, Sproull, Introduction to Computer Graphics, Addison-Wesley
4	Peter Shirley, Fundamentals of Computer Graphics, CRC Press / 4th Edition
Web resources:	
1	https://www.javatpoint.com/computer-graphics-tutorial
2	https://nptel.ac.in/courses/106/106/106106090/
3	https://www.programiz.com/computer-graphics
4	https://nptel.ac.in/courses/106/102/106102157/

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	3	2	3	3	2
CO2	3	2	3	3	3	3	2	3	2	3	3
CO3	3	3	2	3	3	3	3	3	3	2	3
CO4	3	2	3	3	2	3	3	2	2	3	2
CO5	3	2	3	2	3	3	2	3	3	3	3
Total	15	12	13	14	14	14	13	13	13	14	13
Average	3	2.4	2.6	2.8	2.8	2.8	2.6	2.6	2.6	2.8	2.8

3 – Strong, 2- Medium, 1- Low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAA42P	**Computer Graphics Lab**	**Practical-VII**	**0**	**0**	**2**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand the basic structure of a graphics program.
LO2	Implement DDA algorithm using incremental calculation
LO3	Understand the concept of mapping world coordinates to screen coordinates.
LO4	Learn about polygonal surface representation and mesh structures.
LO5	Integrate multiple graphics concepts (drawing, transformation, animation).

Unit	Content	Hours
1	Define the Setup and run a basic graphics program (using `graphics.h`, OpenGL, or Pygame).	20
2	Write a program to draw and color simple 2D shapes (line, triangle, rectangle, circle, ellipse).	
3	To implement the DDA (Digital Differential Analyzer) line drawing algorithm.	
4	Write a program to Implement Cohen–Sutherland Line Clipping Algorithm.	
5	To implement 2D Translation, Scaling, and Rotation of objects.	
6	To demonstrate window-to-viewport mapping for a given object and display area.	
7	Write a program to implement Bezier Curve generation using control points.	
8	Represent and display simple polygon meshes (cube, pyramid).	
9	Implement morphing between two 2D shapes.	
10	Develop a small animation combining learned concepts: • Example: Solar System, Moving Car, Flying Bird, Clock Simulation, or Logo Animation.	

CO	Course Outcomes
CO1	Apply knowledge of graphics libraries to initialize and execute a simple graphics application.
CO2	Implement and analyze line rasterization algorithms in computer graphics.
CO3	Demonstrate proper coordinate mapping between window and viewport systems.
CO4	Design smooth morphing transitions between 2D objects using animation techniques.
CO5	Design and develop an animated graphical application combining multiple computer graphics concepts
Textbooks:	
1	Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000
2	D.J. Gibbs & D.C. Tsichritzs: Multimedia programming Object Environment& Frame work, 2000
3	Ralf Skinmeiz and Klana Naharstedt, Multimedia: computing, Communication and Applications, Pearson, 2001
4	D. Haran & Baker. Computer Graphics Prentice Hall of India,1986.
5	D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008
Reference Books:	
1	Donald Hearn, M. Pauline Baker, Warren R. Carithers, Computer Graphics with OpenGL, Pearson / 4th Edition
2	Kommaraju S. Raghavendra, Computer Graphics, XiTech Publications / Latest Edition
3	Neumann, Sproull, Introduction to Computer Graphics, Addison-Wesley
4	Peter Shirley, Fundamentals of Computer Graphics, CRC Press / 4th Edition
Web resources:	
1	https://www.javatpoint.com/computer-graphics-tutorial
2	https://nptel.ac.in/courses/106/106/106106090/
3	https://www.programiz.com/computer-graphics
4	https://nptel.ac.in/courses/106/102/106102157/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	2	2	3	1	2
CO2	3	3	3	2	2	2	2	2	3	2	3
CO3	2	3	3	3	2	1	1	3	2	3	3
CO4	2	2	3	2	3	2	2	3	2	2	3
CO5	2	3	3	3	3	3	2	3	3	3	3
Total	12	13	15	12	11	9	9	13	13	11	14
Average	2	3	3	2	2	2	2	3	3	2	3

3 – Strong, 2- Medium, 1- low

2nd YEAR: FOURTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAS41	**DATA MINING**	**SEC-V**	**1**	**0**	**1**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To learn about the basics of data and data mining concepts.
LO2	To understand the fundamentals of analytical and data warehousing concepts
LO3	To understand the techniques that are followed in data mining.
LO4	To understand the basics of outlier detection and clustering concepts
LO5	To understand the tools that are used in data mining.

Unit	Content	Hours
1	**INTRODUCTION** What is Data Mining– Kinds of Data – Kinds of patterns – Technologies used for Data Mining– Major Issues in Data Mining– Data –Data Objects and Attribute types– Data Visualization– Measuring Data Similarity and Dissimilarity-Data Preprocessing-overview-Data Cleaning-Data integration-Data Reduction	6
2	**CONCEPTS OF DATA WAREHOUSE** Data Warehouse– Basic concepts–Data Warehouse Modelling: Data Cube and OLAP– Data Warehouse Design and Usage– Data Warehouse Implementation– Data Generalization by Attribute–Oriented Induction– Data Cube Technology– Data Cube Computation Methods– Exploring Cube Technology–Multidimensional Data Analysis in cube space-Tools for Data warehouse development	6
3	**CONCEPTS OF PATTERN** Patterns– Basic concepts– Pattern Evaluation Methods–Pattern Mining: Pattern Mining in Multilevel– Multidimensional space–Constraint–Based Frequent Pattern Mining– Mining High Dimensional Data and Colossal patterns Classification– Decision tree Induction– Bayes Classification methods– Rule based Classification.	6
4	**CLUSTERS** Cluster Analysis– Partitioning Methods – Hierarchical Methods – Density – Based Methods– Grid – Based Methods – Evaluation of Clustering – Clustering High – Dimensional Data–Clustering Graph and Network Data.	6
5	**DATA MINING METHODOLOGIES** Methodologies of Data Mining – Data Mining Applications – Data Mining Trends – Recent Data Mining Tools – Rapid miner – Orange – Weka–Knime–Sisense –Ssdt (SQL Server Data Tools) – Oracle – Rattle – Data melt – Apache Mahout,Tools for Meta data Management	6

CO	Course Outcomes- On completion of this course, students will be
CO1	To understand about the basics of data mining and data.
CO2	To understand about the methods of Data Warehousing
CO3	To understand about the techniques of Data Mining
CO4	To understand about the importance of Cluster and outlier detection
CO5	To improve the student's knowledge with recent trends and tools
Textbooks:	
1	"Data Warehousing Fundamentals", Paulraj Ponnaiah, Wiley Publishers, 2001.
2	"Data Mining: Concepts and Techniques", Jiawei Han, MichelineKamber, Morgan Kaufman Publishers, 2006.
3	"Introduction to Data mining with case studies", G.K. Gupta, PHI Private limited, New Delhi, 2008. 2nd Edition, PHI, 2011
4	Data Mining: Concepts and Techniques – Jiawei Han, Jian Pei, Hanghang Tong
5	Data Mining: Essential Concepts for Analytics – Dr. K. Seefeld (2024)
Reference Books:	
1	"Advances in Knowledge Discover and Data Mining", Usama M. Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth RamasamyUthurusamy, the M.I.T. Press, 2007.
2	"The Data Warehouse Toolkit", Ralph Kimball, Margy Ross, John Wiley and Sons Inc., 2002
3	"Building Data Mining Applications for CRM", Alex Berson, Stephen Smith, Kurt Thearling, Tata McGraw Hill, 2000.
4	"Data Mining: Introductory and Advanced Topics", Margaret Dunham, Prentice Hall, 2002.
5	"Discovering Knowledge in Data: An Introduction to Data Mining", Daniel T.Larose John Wiley & Sons, Hoboken, New Jersey, 2004
Web resources:	
1	https://www.geeksforgeeks.org/data-mining/
2	https://www.tutorialspoint.com/data_mining/index.htm
3	https://nptel.ac.in/courses/106106224
4	https://www.coursera.org/specializations/data-mining
5	https://www.edx.org/learn/data-mining

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	3	1	2	3
CO2	3	3	2	2	3	2	3	3	3	1	2
CO3	2	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	1	3	3	3	3	2	3	3
CO5	3	3	2	2	3	3	3	3	2	3	2
Total	14	15	13	10	15	13	14	15	11	12	13
Average	2.8	3	2.6	2	3	2.6	2.8	3	2.2	2.4	2.6

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC51	Operating Systems	CC-9	4	1	0	0	5	5	25	75	100

Learning Objectives	
LO1	Understand OS concepts, structures, services, and process management basics.
LO2	To Explore CPU scheduling algorithms and process synchronization mechanisms.
LO3	To Learn deadlock handling methods and memory management techniques.
LO4	Describe virtual memory concepts and file system structures and implementations.
LO5	Understand computer system architecture and mass storage management techniques.

Unit	Content	Hours
1	**Introduction:** Operating system Concepts – Types of Operating Systems- Operating system Services-Processes: Process Concept-Process State –PCB- Process Scheduling – Operations on processes – Cooperating processes. Interrupts- Interrupts Processing.	15
2	**CPU Scheduling**: Basic concepts – Scheduling criteria – Scheduling algorithms: First Come First Served Scheduling – Shortest Job First Scheduling – Priority Scheduling – Round Robin Scheduling. Process Synchronization: Background – The Critical-Section Problem – Semaphores.	15
3	**Deadlocks**: System model – Deadlock Characterization – Methods for handling Deadlocks - Deadlock prevention– Deadlock avoidance, Deadlock detection – Recovery from deadlock. Memory Management: Background – Swapping – Contiguous memory Allocation– Segmentation-Paging (Basic method, Protection)	15
4	**Virtual Memory:** Background – Demand paging- Page replacement. File-System Interface: Directory structure: single Level Directory – Two Level Directory – Tree Structured Directories. File-System Implementation: Directory implementation – Allocation methods (Contiguous, Linked and Indexed Allocation methods)	15

5	**Mass Storage Structure:** Overview of mass Storage structure- Mass-Storage Structure: Disk structure – Disk scheduling, Disk management, Swap space management-RAID Structure.	**15**

CO	**Course Outcomes- On completion of this course, students will be**
CO1	Explain operating system components, services, and process scheduling concepts.
CO2	Apply scheduling algorithms and synchronization techniques to solve process issues.
CO3	Analyze deadlock situations and implement memory management strategies.
CO4	Evaluate virtual memory techniques and design file system structures.
CO5	Explain system structures and apply disk scheduling and storage management methods.
Text Books:	
1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. (2018). Operating System Concepts, Windows XP Update, 11thEdition. Wiley India (P.) Ltd.
2	William Stallings. (2012). Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India.
Reference Books:	
1	Andrew S. Tanenbaum, Herbert Bos. (2014). *Modern Operating Systems*, Fourth Edition, Pearson Education
2	H. M. Deitel, P. J. Deitel, D. R. Choffnes. (2015). *Operating Systems*, Third Edition, Pearson Education
3	Andrew S. Tanenbaum, Albert S. Woodhull. (2006). *Operating Systems: Design and Implementation*, Third Edition, Pearson Education
4	D. M. Dhamdhere. (2011). *Operating Systems: A Concept-Based Approach*, Third Edition, McGraw-Hill Education (India).
5	Achyut S. Godbole. (2017). *Operating Systems*, Third Edition, McGraw-Hill Education (India).
Web Resources:	
1	https://alison.com/tag/operating-systems
2	https://www.tutorialspoint.com/operating_system/index.htm
3	https://nptel.ac.in/courses/106106144
4	https://www.geeksforgeeks.org/blogs/operating-systems/

Mapping with Programme Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	2	3	3	2
CO2	3	3	3	3	2	3	2	2	2	3	2
CO3	3	3	3	3	2	2	2	2	3	2	3
CO4	3	3	3	3	2	3	2	2	3	2	2
CO5	3	2	3	3	3	3	2	2	3	3	2
Total	15	14	15	15	13	14	10	10	14	13	11
Average	3	2.8	3	3	2.6	2.8	2	2	2.8	2.6	2.1

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC52P	**Operating Systems Lab**	**CC-10**	**0**	**0**	**4**	**0**	**3**	**4**	**25**	**75**	**100**

Learning Objectives	
LO1	**Explain and demonstrate** process management concepts
LO2	**Implement and analyze** synchronization problems
LO3	**Apply** deadlock handling techniques including Banker's algorithm and deadlock detection methods.
LO4	**Evaluate and simulate** memory management techniques
LO5	**Demonstrate** file allocation methods, disk scheduling algorithms, and RAID levels for efficient storage management.

Sno	Content	Hours
1	Implement a program to **display process IDs (PID) and parent process IDs (PPID)**.	**60**
2	Write a program to demonstrate **process states and process control operations**.	
3	Implement the following CPU Scheduling algorithms **a)** FCFS b) SJF c) Round Robin d) Priority	
4	Write a program to solve the **Producer–Consumer problem using Semaphores**.	
5	Write a program to implement **Banker's Algorithm for Deadlock Avoidance**.	
6	Write a program to **detect deadlock in a system**.	
7	Implement **Page Replacement Algorithms** (FIFO, LRU, Optimal)	
8	Write a program to simulate **File Allocation Methods (Linked, Indexed).**	
9	Write a program to simulate different **disk scheduling algorithms** such as: • FCFS (First Come First Serve) • SSTF (Shortest Seek Time First) • SCAN (Elevator Algorithm)	
10	Write a program to simulate basic working of **RAID levels (RAID 0, RAID 1, RAID 5)**. The program should: • For RAID 1: Show mirroring • For RAID 5: Implement simple parity calculation	

CO	Course Outcomes-On completion of this course, students will be
CO1	Implement programs using fork(), and analyze PID, PPID, and process states.
CO2	Apply FCFS, SJF, Priority, and Round Robin scheduling to compute waiting and turnaround times.
CO3	Implement Producer–Consumer and critical section problems using semaphores/mutex.
CO4	Apply Banker's Algorithm and deadlock detection methods in practical scenarios.
CO5	Implement memory allocation, paging, page replacement, and file allocation methods.

Textbooks:

1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. (2018). Operating System Concepts, Windows XP Update, 11thEdition. Wiley India (P.) Ltd.
2	William Stallings. (2012). Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India.

Reference Books:

1. Andrew S. Tanenbaum, Herbert Bos. (2014). *Modern Operating Systems*, Fourth Edition, Pearson Education
2. H. M. Deitel, P. J. Deitel, D. R. Choffnes. (2015). *Operating Systems*, Third Edition, Pearson Education
3. Andrew S. Tanenbaum, Albert S. Woodhull. (2006). *Operating Systems: Design and Implementation*, Third Edition, Pearson Education
4. D. M. Dhamdhere. (2011). *Operating Systems: A Concept-Based Approach*, Third Edition, McGraw-Hill Education (India).
5. Achyut S. Godbole. (2017). *Operating Systems*, Third Edition, McGraw-Hill Education (India).

Web Resources:

1. https://alison.com/tag/operating-systems
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://nptel.ac.in/courses/106106144
4. https://www.geeksforgeeks.org/blogs/operating-systems/

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	2	3	3	2
CO2	3	3	3	3	2	3	2	2	3	3	2
CO3	2	3	3	3	2	2	3	3	3	3	2
CO4	3	3	3	2	2	3	3	3	3	3	2
CO5	2	2	3	3	3	3	2	3	3	3	2
Total	13	14	15	14	13	14	12	13	15	15	10
Average	2.6	2.8	3	2.8	2.6	2.8	2	2.6	3	3	2

3 – Strong, 2- Medium, 1- low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC53	Mobile Application Development	CC-11	2	1	1	0	4	4	25	75	100

Learning Objectives	
LO1	Understand Android basics, tools, activities, fragments, intents, and notifications.
LO2	Understand Android UI components and screen handling techniques.
LO3	Understand various views and components for designing screen interfaces
LO4	Understand usage of image views, menus, and advanced UI components.
LO5	Understand data persistence techniques in Android applications.

Unit	Content	Hours
1	**Getting Started with Android Programming**: What is Android - Obtaining the Required Tools – Activities, Fragments and Intents: Understanding Activities - Linking Activities using Intents – Fragments – Calling Built-in Applications using Intents - Displaying Notifications.	12
2	**Getting to know the Android User Interface**: Understanding the Components of a screen - Adopting to Display Orientation - Managing Changes to Screen Orientation – Utilizing the Action Bar – Creating the User Interface Programmatically - Listing for UI Notifications.	12
3	**Designing your screen interface using Views**: Using Basic Views – Using Picker Views – Using List Views to display Long Lists – Understanding Specialized Fragments	12
4	**Displaying Picture and Menus with Views**: Using Image Views to display pictures - Using Menu with Views - Some Additional Views	12
5	**Data Persistence in iOS Applications** Introduction – Need for persistent storage. Saving and Loading User Preferences: User Defaults – Storing and retrieving data. Persisting Data to Files: iOS File System – File Manager – Reading and writing files – JSON. Creating and Using Databases: Core Data – Entities and attributes – Basic CRUD operations.	12

CO	Course Outcomes- On completion of this course, students will be
CO1	Develop basic Android apps using activities, intents, fragments, and notifications.
CO2	Design responsive user interfaces adapting to screen orientation and user interactions.
CO3	Implement UI using basic, picker, list views, and specialized fragments.
CO4	Develop interactive apps incorporating images, menus, and additional views.
CO5	Implement data storage using preferences, files, and databases.
Text Books:	
1	WeiMeng Le. (2012). Beginning Android Application Development, Wrox Publications (John Wiley, New York)
2	Ed Burnette. (2010). Hello Android: Introducing Google's Mobile Development Platform, 3rd Edition, The Pragmatic Publishers
Reference Books:	
1	Reto Meier. (2012). Professional Android 4 Application Development, Wrox Publications (John Wiley, NewYork).
2	Dawn Griffiths, David Griffiths. (2017). *Head First Android Development: A Brain-Friendly Guide*, Second Edition, O'Reilly Media
3	Bill Phillips, Chris Stewart, Kristin Marsicano. (2019). *Android Programming: The Big Nerd Ranch Guide*, Fourth Edition, Big Nerd Ranch Guides
4	John Horton. (2018). *Android Programming with Kotlin for Beginners*, First Edition, Packt Publishing.
5	Frank Ableson, Robi Sen, Chris King. (2011). *Android in Action*, Second Edition, Manning Publications.
Web Resources:	
1	https://developer.android.com/guide/components/activities/intro-activities
2	https://developer.android.com/guide/topics/ui/controls
3	https://developer.android.com/guide/topics/ui/menus

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	1	2	1	1
CO2	3	3	2	1	2	1	1	1	2	2	1
CO3	3	3	3	2	3	1	1	1	3	2	2
CO4	3	3	2	2	3	1	1	1	2	2	2
CO5	3	3	3	2	3	1	1	1	3	3	3
Total	**15**	**14**	**11**	**8**	**13**	**5**	**5**	**5**	**12**	**10**	**9**

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC54P	**Mobile Application Development Lab**	**CC-12**	**0**	**0**	**3**	**0**	**2**	**3**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand basic UI components like Radio Button, Auto Complete Text View, Seek Bar, and Rating Bar
LO2	Understand image handling, transitions, gradients, and UI customization.
LO3	Understand implementation of logical and mathematical computations in apps.
LO4	Understand dialogs, notifications, and animation techniques in Android.
LO5	Understand data storage and database handling in Android applications.

Unit	Content	Hours
1	Create an application to send and receive data between Activities using Intents	45
2	Implement an application to generate and display notifications using Notification Manager.	
3	Develop an application that utilizes the Action Bar with menu options and handles user selections.	
4	Implement an application that adapts to both portrait and landscape modes and preserves user data during orientation changes.	
5	Develop an application that uses Date Picker and Time Picker to allow users to select date and time and display the selected values.	
6	Develop an application using specialized fragments (e.g., List Fragment) to display and manage list-based UI components.	
7	Develop an Android application to display images using Image View. Load images from drawable resources and adjust properties such as scale type and layout.	
8	Implement a popup menu in an Android application and handle user interactions.	
9	Develop an application to store and retrieve structured data using Property List (Plist) or JSON format.	
10	Implement Create, Read, Update, and Delete operations on a dataset using Core Data framework.	

CO	Course Outcomes
CO1	Develop Android apps using interactive UI components for user input and display.
CO2	Design visually appealing apps with image gallery, transitions, and UI styling features.
CO3	Develop apps for NCR calculation and Fibonacci series using programming logic.
CO4	Implement animations, alerts, notifications, and date-time picker dialogs in apps.
CO5	Develop applications using SQLite for data persistence and management.
Text Books:	
1	Ed Burnette. (2010). *Hello Android: Introducing Google's Mobile Development Platform*, Third Edition, The Pragmatic Publishers.
2	Reto Meier. (2012). *Professional Android 4 Application Development*, Fourth Edition, Wrox Publications.
Reference Books:	
1	Reto Meier. (2012). Professional Android 4 Application Development, Wrox Publications (John Wiley, NewYork).
2	Dawn Griffiths, David Griffiths. (2017). *Head First Android Development: A Brain-Friendly Guide*, Second Edition, O'Reilly Media
3	Bill Phillips, Chris Stewart, Kristin Marsicano. (2019). *Android Programming: The Big Nerd Ranch Guide*, Fourth Edition, Big Nerd Ranch Guides
4	John Horton. (2018). *Android Programming with Kotlin for Beginners*, First Edition, Packt Publishing.
5	Frank Ableson, Robi Sen, Chris King. (2011). *Android in Action*, Second Edition, Manning Publications.
Web Resources:	
1	https://developer.android.com/guide/components/activities/intro-activities
2	https://developer.android.com/guide/topics/ui/controls
3	https://developer.android.com/guide/topics/ui/menus

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	1	2	1	1
CO2	3	3	3	2	3	1	1	1	3	2	2
CO3	3	3	2	2	3	1	1	1	2	2	2
CO4	3	3	3	2	3	1	1	1	3	3	2
CO5	3	3	3	2	3	1	1	1	3	3	3
Total	15	14	12	9	14	5	5	5	13	11	10
Average	3.0	2.8	2.4	1.8	2.8	1.0	1.0	1.0	2.6	2.2	2.0

3 – Strong, 2- Medium, 1- low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE51	Social Media Analytics	EC-8	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	Understand the importance of marketing analytics for forward looking and systematic allocation of marketingresources2.
LO2	Know how to use marketing analytics to develop predictive marketing dashboard for organization
LO3	Recognize challenges in dealing with data sets in marketing.
LO4	Identify and apply appropriate algorithms for analyzing the social media and web data
LO5	Make choices for a model for new machine learning tasks.

Unit	Content	Hours
1	**Marketing Analytics**: Introduction to marketing research, Research design setup, Qualitative research, Quantitative research, Concept development, scale development, Exploring Data, Descriptive Statistics. Product analytics- features, attributes, benefits, Price analytics, Promotion analytics, Channel analytics, Multiple Discriminate analysis.	15
2	**Customer Analytics:** Customer Analytics, Analyzing customer satisfaction, Prospecting and Targeting the Right Customers, Covariance and Correlation analysis, Developing Customers, Retaining Customers, Customer lifetime value case, Factor analysis. Market Segmentation & Cluster Analysis, Scatterplots & Correlation Analysis, Linear Regression, Model Validation & Assessment, Positioning analytics, Cross tabulation.	15
3	**Social Media Analytics (SMA) Modules1**: Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective-nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks-Information visualization.	15
4	**Social Media Analytics (SMA) Modules2**: Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis.	15
5	**Web Analytics and making connections**: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools: Click stream analysis, A/ B testing, online surveys, Web crawling and Indexing.	15

CO	Course Outcomes- On completion of this course, students will be
CO1	Critically evaluate the key analytical frameworks and tools used in marketing. Apply key marketing theories, frameworks and tools to solve marketing problems.
CO2	Utilize information of a firm's external and internal marketing environment to identify and prioritize Appropriate marketing strategies.
CO3	Exercise critical judgment through engagement and reflection with existing marketing literature and new developments in the marketing environment.
CO4	Critically evaluate the marketing function and the role it plays in achieving organizational success both in commercial and non- commercial settings.
CO5	Evaluate and act upon the ethical and environmental concerns linked to marketing activities.
Text Books:	
1	Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World, Chuck Hemann& Ken Burbary, Pearson, ISBN 9780789750303
2	Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Eric Siegel, Pearson.
Reference Books:	
1	Marketing Analytics: A practical guide to real marketing science, Mike Grigs by, Kogen Page, ISBN 9780749474171
2	Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Handson Learning,Raj Kumar Venkatesan, Paul Farris, RonaldT. Wilcox.
3	MarketingMetrices3e,Bendle,Farris,Pferfery,Reibstein
Web Resources:	
1	https://www.coursera.org/learn/uva-darden-market-analytics
2	https://www.wrike.com/marketing-guide/marketing-analytics/

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	2	3	3	2
CO2	3	3	2	3	2	2	3	2	3	3	2
CO3	3	2	3	3	3	2	3	3	3	3	2
CO4	3	2	3	2	3	3	3	3	3	3	2
CO5	2	3	3	3	3	3	3	3	3	3	3
Total	14	13	14	14	14	13	14	13	15	15	10
Average	2.8	2.6	2.8	2.8	2.8	2.6	2.8	2.6	3	3	2.2

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE52	**Big Data**	**EC – 8**	**4**	**1**	**0**	**0**	**4**	**5**	**25**	**75**	**100**

Learning Objectives

LO1	To understand the basics of Big Data,its characteristics, and applications.
LO2	To learn analytical methods like clustering and classification.
LO3	To apply association rules and recommendation.
LO4	To understand stream data processing and real-time analytics.
LO5	To learn NoSQL databases and big data applications.

Unit	Content	Hours
1	Introduction to Big Data Analytics: Big data characteristics, Designing data architecture, Data Sources, Preprocessing, Data storage and analysis, Big data analytics Applications. Introduction to Hadoop: Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and programming model, Hadoop YARN.	15
2	NoSQL Database: Data store, Data architecture patterns, Managing big data, Shared-nothing architecture for big data tasks, MongoDB Database - Features, Dynamic schema, Auto sharing, Query language and commands. MapReduce: Map tasks, Reduce tasks, Execution, Composing MapReduce for calculations, Matrix vector multiplication by MapReduce, Relational algebra operations, Matrix multiplication	15
3	Hive: Architecture, Data types, Formats, Data model, Integration and workflow steps Builtin functions, Data definition language, Data manipulation language Aggregation, Join, Group by clause. Spark: Spark SQL, Data analysis operations, Programming using RDDs, Data ETL process,	15
4	Data Stream Mining: Data stream concepts, Model, Architecture, Data stream management system, stream queries, Stream processing issues, Stream computing, Sampling data, Filtering, Estimating moments, Decaying windows, Frequent itemsets - Finding frequent itemsets, Limited passes algorithm, Counting frequent itemsets in a stream; Apache Spark streaming architecture.	15
5	Graph Model: Representing graph as triples, Resource description framework for graph databases, Naïve DB graph database, Property graph model, Probabilistic Graphical Network Organization - Bayesian and Markov networks. Graph Analytics: Use cases, Stats Model and Probabilistic based analytics, Technical complexity in analyzing graphs; Spark GraphX platform – Features of graph analytics platform. Text Mining: What is Text Mining? Web mining- Web Content Mining, Web Usage mining	15

CO	Course Outcomes The Student will be able to
CO1	Explain big data characteristics and implement basic Hadoop and MapReduce concepts.
CO2	Apply NoSQL concepts and perform data processing using MapReduce techniques.
CO3	Use Hive and Spark for data querying, analysis, and ETL operations.
CO4	Analyze streaming data and implement stream processing using Spark Streaming.
CO5	Apply graph analytics and text mining methods for big data applications.
Textbooks:	
1	Seema Acharya & Subhasini Chellappan, *Big Data and Analytics*, Wiley, 2020.
2	Michael Minelli, Michelle Chambers, and Ambiga Dhiraj (2013), Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, John Wiley & Sons
Reference Books:	
1	Jeffrey Aven, (2018), Data Analytics with SPARK using Python, Pearson, Addison-Wesley Data & Analytics Series.
2	Tom White (2014), Hadoop: The Definitive Guide, O'Reilly Publications, 4th Edition
3	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence – Pramod J. Sadalage & Martin Fowler, Addison-Wesley, 2013.
4	Learning Spark: Lightning-Fast Big Data Analysis – Holden Karau et al., O'Reilly Media, 2nd Edition, 2020.
Web Resources:	
1	NPTEL: https://nptel.ac.in/courses/106104189
2	https://spark.apache.org/docs/latest/
3	https://hadoop.apache.org/docs/
4	https://hadoop.apache.org/docs/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3
CO3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	15	15	15	15	14	14	15	15
Average	3	2.8	2.8	3	3	3	3	2.8	2.8	3	3

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE53	Full Stack Development	EC-9	4	1	0	0	4	5	25	75	100

Learning Objectives

LO1	Learn web development basics, MERN stack, and JavaScript.
LO2	To Work with Node.js, npm, and server creation.
LO3	Understand MongoDB, CRUD operations, and Mongoose.
LO4	To Use Express.js for routing, middleware, and APIs.
LO5	Build frontend applications using React components and hooks.

Unit	Content	Hours
1	Understanding Web Development – Client–Server Architecture – User, Browser, Web Server, Backend Services – HTTP/HTTPS – MVC Architecture – Introduction to Full Stack Development – Overview of MERN Stack – Basics of JavaScript (ES6+) – Introduction to Asynchronous Programming (Promises, Async/Await).	15
2	Introduction to Node.js – Installation and Setup – Node.js Modules – Node Package Manager (npm) – File System (Basic I/O) – Creating Simple Node.js Applications – Events and Event Loop (overview) – Creating Basic HTTP Server – Handling Requests and Responses.	15
3	Introduction to NoSQL and MongoDB – MongoDB Atlas Setup – Database, Collections, Documents – Basic CRUD Operations – Introduction to Mongoose – Schema and Model – Connecting MongoDB with Node.js – Simple Database Applications.	15
4	Introduction to Express.js – Setting up Express Application – Routing (GET, POST, PUT, DELETE) – Middleware (basic concept) – Handling Request and Response – Building Simple REST APIs – Connecting Express with MongoDB.	15
5	Introduction to React – Creating React Applications – Components – Props and State – React Hooks (useState, useEffect) – Handling Forms – Fetching Data from APIs – Basic Routing (React Router) – Integration with Backend APIs	15

CO	Course Outcomes- On completion of this course, students will be
CO1	Explain full stack concepts and implement asynchronous programming using JavaScript.
CO2	Develop basic server-side applications using Node.js and handle HTTP requests/responses.
CO3	Build database-driven applications by integrating MongoDB with Node.js.
CO4	Develop RESTful APIs and connect Express applications with MongoDB.
CO5	Develop dynamic frontend applications and integrate them with backend services.
Text Books:	
1	Alex Banks & Eve Porcello, *Learning React*, 3rd Edition, O'Reilly, 2023.
2	Ethan Brown, Web Development with Node and Express, O'Reilly Media, Second Edition, 2019.
Reference Books:	
1	Mario Casciaro & Luciano Mammino, *Node.js Design Patterns*, 3rd Edition, Packt, 2020.
2	Kristina Chodorow & Shannon Bradshaw, *MongoDB: The Definitive Guide*, 3rd Edition, O'Reilly, 2019.
3	Vasan Subramanian, *Pro MERN Stack*, Apress, 2019.
4	David Flanagan, *JavaScript: The Definitive Guide*, 7th Edition, O'Reilly, 2020.
Web Resources:	
1	https://nodejs.org/en/docs
2	https://expressjs.com/
3	https://developer.mozilla.org/en-US/docs/Web/JavaScript
4	https://www.mongodb.com/docs/

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2	2	2	2	1	1
CO2	3	3	3	2	3	2	2	2	3	2	2
CO3	3	3	3	2	3	2	2	2	3	3	2
CO4	3	3	3	2	3	2	2	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	**15**	**14**	**13**	**10**	**14**	**11**	**11**	**11**	**14**	**12**	**10**
Average	3	2.8	2.6	2	2.8	2.1	2.1	2.1	2.8	2.2	2

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE54	**Software Project Management**	**Elective-9**	**4**	**1**	**0**	**0**	**4**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	To define and highlight importance of software project management.
LO2	To formulate and define the software management metrics & strategy in managing projects
LO3	To familiarize in Software Project planning
LO4	Understand to apply software testing techniques in commercial environment
LO5	To define and highlight importance of Quality requirements

Unit	Content	Hours
1	**Unit-1:** Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	15
2	**Unit-2:** Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	15
3	**Unit-3:** Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	15
4	**Unit-4:** Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	15

5	**Unit-5:** Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	15

CO	Course Outcomes- On completion of this course, students will be
CO1	Knowledge gained to train software project managers
CO2	Apply software project management methodologies.
CO3	Able to create comprehensive project plans
CO4	Evaluate and mitigate risks associated with software development process
CO5	Understand the principles and concepts of project management
Text books:	
1	Software Project Management, 6th Edition, Bob Hughes, Mike Cotterel, Rajib Mall, McGraw-Hill, 2018
2	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, "Quality Software Project management", Pearson Education Asia 2002.
Reference Books:	
1	PankajJalote, "Software Project Management in Practice", Addison Wesley 2002.
2	Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.
Web resources:	
1	https://www.geeksforgeeks.org/software-engineering/software-engineering-software-project-management-spm/
2	https://onlinecourses.nptel.ac.in/noc19_cs70/preview

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	2	2	2	3
CO2	3	3	2	2	3	3	3	2	2	3	3
CO3	3	3	2	3	3	2	2	3	2	3	3
CO4	3	2	3	2	2	3	2	3	3	2	3
CO5	3	2	2	2	3	3	3	3	2	2	3
Total	15	12	11	11	14	13	12	13	11	12	15
Average	3	2.4	2.2	2.2	2.8	2.6	2.4	2.6	2.2	2.4	3

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UAEC51	**Gender Equality and Social Inclusion**	**AEC**	**2**	**-**	**-**	**-**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand the introduction to Gender and Social Inclusion
LO2	To acquire knowledge on Gender inequality in society
LO3	To equip Social Exclusion and Marginalized Group
LO4	To understand Legal Frameworks and Policies
LO5	To assimilate knowledge about Strategies for Promoting Equality and Inclusion

Unit	Content	Hours
1	Introduction to Gender and Social Inclusion: Concepts Gender-Gender roles, stereotypes, and socialization - Meaning and importance of social inclusion-Intersectionality (gender, caste, class, disability, etc.) - Historical perspectives on gender inequality	6
2	Gender Inequality in Society: Forms of gender discrimination (education, health, employment) - Gender-based violence and its types - Wage gap and economic inequality - Representation of gender in media and culture - Case studies on gender inequality (local and global).	6
3	Social Exclusion and Marginalized Groups: Understanding social exclusion - Marginalized communities (women, LGBTQ+ individuals, persons with disabilities, minorities) - Barriers to inclusion (social, economic, political) - Role of culture, tradition, and norms in exclusion - Impact of exclusion on development.	6
4	Legal Frameworks and Policies: National and international laws promoting gender equality - Human rights perspective on inclusion - Government policies and welfare programs - Role of institutions (NGOs, UN, civil society).	6
5	Strategies for Promoting Equality and Inclusion: Gender mainstreaming and inclusive development - Education and awareness programs - Role of media and technology - Empowerment approaches (economic, social, political) - Community participation and leadership - Measuring progress (indicators like SDGs)	6

CO	Course Outcomes- On completion of this course, students will be
CO1	Understand the introduction to Gender and Social Inclusion
CO2	Acquire knowledge on Gender inequality in society
CO3	Equip the knowledge on Social Exclusion and Marginalized Group
CO4	Understand Legal Frameworks and Policies towards gender Equality
CO5	Gain knowledge about Strategies for Promoting Equality and Inclusion
Text books:	
1	Development as Freedom, Amartya Sen, Publisher: Oxford University Press (1999).
Reference Books:	
1	Gender Trouble: Feminism and the Subversion of Identity, 2 nd Edition (1999 revised edition) Publisher: Routledge, London & New York.
2	David E. Newton, Gender Inequality: A Reference Handbook, Bloomsbury Academic, 2019.
3	Gender Inequality: A Reference Handbook, by David E. Newton ABC-CLIO, 2019.
Web resources:	
1	https://amrut.mohua.gov.in/uploads/GESI-Traning-Module.pdf
2	Gender Equality_and_Social_Inclusion WV.pdf
3	https://integrityaction.org/media/4702/integrity-action-gesi-strategy-version-2.pdf
4	https://urbanstudies.institute/development-issues-and-perspectives/major-marginalized-groups-overview/
5	https://content.unops.org/publications/UNOPS-GESI-Mainstreaming-in-Projects-Strategy_EN.pdf

Mapping with Programme Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	2	3	3	2	2	2
CO2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	3	3	2	3	2	3	3	3	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2
CO5	3	3	3	2	3	2	3	3	3	2	2
Total	11	12	13	10	13	10	13	13	12	10	10
Average	2.2	2.4	2.6	2	2.6	2	2.6	2.6	2.4	2	2

3 – Strong, 2- Medium, 1- Low

3rd YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAIN51	**Internship**		**0**	**0**	**0**	**0**	**2**	**0**	**25**	**75**	**100**

Learning Objectives	
LO1	Understand professional work ethics, performance, and adaptability in a work environment.
LO2	Understand organizational and time management skills required in professional settings.
LO3	Understand interpersonal relationships and teamwork in an organization.
LO4	Understand documentation and presentation of internship work.
LO5	Exercise computational thinking over the entire software life cycle

Internship / Industrial Training:

The students to undergo 2 weeks of Internship / Industrial Training in the Industry

Sno	Area of Work	Maximum Marks
1	a) Work Related performance – Work Attitude/ Academic preparation/ problem solving ability/ Adaptability / Overall Attendance / Progress towards learning goals	**10**
	b) Organizational skills – Time management skills / Planning skills/ communication skills	**20**
	c) Relationship with others – Willingness to cooperate with co-works/ Ability to work with supervisor / Acceptance of constructive comments / Ability to take direction	**20**
2	Internship Report / Viva Voce Examination	**25**
	Total	75

* CIA Marks =25 marks (Internship Review 1, Review2 and Review 3)

CO	Course Outcomes- On completion of this course, students will be
CO1	Demonstrate effective work attitude, problem-solving ability, and progress toward learning goals.
CO2	Apply planning, communication, and time management skills in completing assigned tasks.
CO3	Exhibit teamwork, cooperation, and ability to accept feedback and guidance.
CO4	Prepare and present internship reports effectively and perform well in viva voce examination.
CO5	Apply best practices of IT industries by working in the Product or service domain.

Guidelines for internship

• Internship should be of 2 weeks duration.

• A student is expected to find internship by himself or herself. However, the institution should assist their students in getting internship in good organizations.

• The home institution cannot be taken as the place of internship.

• Internship can be on any topic covered in the syllabus mentioned in the syllabus, not restricted to the specialization.

• Internship can be done, in one of the following, but not restricted to, types of organizations:

o Software development firms

o Hardware/ manufacturing firms

o Any small scale industries, service providers like banks

o Clinics/ NGOs/professional institutions like that of CA, Advocate etc

o Civic Depts like Ward office/post office/police station/ punchayat.

Guidelines for making Internship Report

A student is expected to make a report based on the internship he or she has done in an organization. It should contain the following:

 Certificate: A certificate in the prescribed Performa (given in appendix 1) from the organization where the internship done.

 Evaluation form: The form filled by the supervisor or to whom the intern was reporting,

in the prescribed Performa (given in appendix 2).

- **Title:** A suitable title giving the idea about what work the student has performed during the internship.
- **Description of the organization**: A small description of 1 to 2 pages on the organization where the student has interned
- **Description about the activities done by the section where the intern has worked**: A description of 2 to 4 pages about the section or cell of the organization where the intern actually worked. This should give an idea about the type of activity a new employee is expected to do in that section of the organization.
- **Description of work allotted and actually done by the intern:** A detailed description of the work allotted and actual work performed by the intern during the internship period. Intern may give a weekly report of the work by him or her if needed. It shall be of around 7 to 10 pages.

- **Self assessment**: A self assessment by the intern on what he or she has learnt during the internship period. It shall contain both technical as well as inter personal skills learned in the process. It shall be of around 2 to 3 pages.

The internship report may be around 20 to 30 pages and this needs to be submitted to the external examiner at the time of examination.

Appendix 1

(Proforma for the certificate for internship in official letter head)

This is to certify that Mr / Ms_____ of College/Institution worked as an intern as part of her BCA course in Computer Applications. The particulars of internship are given below:

Internship starting date:

Internship ending date:

Actual number of days worked:

Tentative number of hours worked: Hours

Broad area of work: _____

A small description of work done by the intern during the period:

_____

_____

_____

_____

Signature:

Name:

Designation:

Contact number:

Email:

(Seal of the organization)

Appendix 2

(Proforma for the Evaluation of the intern by the supervisor/to whom the intern was reporting in the organization)

Professional Evaluation of intern

Name of intern:

College/institution:

[Note: Give a score in the 1-5 scale by putting √ in the respective cells]

SNo	Particular	Excellent	Very Good	Good	Moderate	Satisfactory
1	Attendance					
2	Punctuality					
3	Adaptability					
4	Ability to shoulder responsibility					
5	Ability to work in a team					
6	Written and oral communication skills					
7	Problem solving skills					
8	Ability to grasp new concepts					
9	Ability to complete task					
10	Quality of work done					

Comments:

Signature:

Name:

Designation:

Contact number:

Email:

(Seal of the organization)

3RD YEAR: FIFTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCSIK51	Exploring Game Design for Cultural Heritage	IKS	0	0	0	2	-	2	25	75	100

Learning Objectives	
LO1	To Learn about the Game Design and Development
LO2	To know how to integrate Indian Culture into Game
LO3	To Explore and Develop 2D or 3D environment in Indian Culture
LO4	To get knowledge in Testing and Development in games
LO5	To create a Prototype for Gaming Techniques

Unit	Content	Hours
1	**Introduction to Game Design and Development** - Game Design Fundamentals - Key concepts game mechanics, storylines, player interaction, and aesthetics - Introduction to game engines (Unity, Godot, Unreal Engine): Choosing the right tool for your project. The Game Development Process - Game Genres and Their Application to Cultural Narratives - Exploring different game genres: action, adventure, puzzle, RPG	6
2	**Integrating Indian Culture into Game Design:** Storytelling in Games - integrate Indian mythology, history, and folklore into compelling game narratives - Designing interactive storylines - Creating playable characters inspired by mythological figures (e.g., warrior avatars, gods, or sages) - Designing NPCs (non-playable characters) to represent cultural heroes, historical figures, or deities.	6
3	**Game Development Tools and Techniques:** Introduction to Unity, Godot, or Unreal Engine - Setting up your game engine - Building basic 2D or 3D environments based on Indian cultural themes - Art and Audio for Cultural Representation - Designing textures, models, and animations inspired by Indian visual art.	6
4	**Testing and Deployment:** Debugging and testing games - Exporting Games for PC, Console and Mobile Platforms-Publishing on app stores and gaming platforms.	6

5	**Prototyping and Playtesting:** Prototyping and Iteration -Creating a simple game prototype that incorporates Indian cultural elements. Polishing the Prototype - Final touches: UI/UX design, animations, sound, and improving gameplay flow	6

CO	Course Outcomes
CO1	Understand the fundamentals of game design and development.
CO2	Create interactive digital experiences that integrate aspects of Indian culture.
CO3	Develop a simple game prototype using game engines like Unity or Godot.
CO4	Exploring the games in mobile Platforms
CO5	Explore the role of video games in UI/UX Design, animations
Textbooks:	
1	The Art of Game Design: A Book of Lenses by Jesse Schell,3rd Edition 2019
2	Rules of Play: Game Design Fundamentals by Katie Salen and Eric Zimmerman,2004
Reference Books:	
1	Indian Mythology: A Captivating Guide to the Myths of India by M. K. Ghosh,2020
2	The Penguin History of Early India: From the Origins to AD 1300 by Romila Thapar,2002
Web resources:	
1	NPTEL: https://nptel.ac.in/courses/
2	https://learn.unity.com/
3	https://www.interaction-design.org/literature/topics/ui-design

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	2	2	3	3	3	3	3
CO4	3	3	3	3	2	3	3	2	3	3	3
CO5	3	2	3	3	3	3	3	2	3	3	3
Total	15	14	15	15	12	14	15	13	15	15	15
Average	3	2.8	3	3	2.4	2.8	**3**	2.6	3	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC61	**Machine Learning**	**CC- 13**	**4**	**1**	**0**	**0**	**4**	**5**	**75**	**25**	**100**

Learning Objectives

LO1	Understand fundamentals of AI, Machine Learning, and basic supervised/unsupervised models.
LO2	Understand neural networks, backpropagation, and genetic algorithms.
LO3	To Learn about Bayesian learning, probabilistic models, and hypothesis evaluation.
LO4	To Explore instance-based learning methods and function approximation techniques.
LO5	Understand advanced learning techniques including recommendation systems and reinforcement learning.

Unit	Content	Hours
1	**Introduction Machine Learning -** Machine Learning Concepts. Supervised and unsupervised learning, parametric vs nonparametric 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**
2	**Neural networks and genetic algorithms :** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	**15**
3	**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**
4	**Instant based learning** K- Nearest Neighbour Learning, Distance- Weighted NEAREST NEIGHBOUR Algorithm, Remarks on K- NEAREST NEIGHBOUR Algorithm. A Note on Terminology – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	**15**

5	**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**

CO	**Course Outcomes** **The Students will be able to**
CO1	Apply classification and regression algorithms like Linear Regression, Logistic Regression, Naïve Bayes, KNN, and SVM.
CO2	Implement neural network models and apply genetic algorithms for optimization problems.
CO3	Apply Bayesian techniques and learning models for decision making and prediction.
CO4	Implement KNN, locally weighted regression, and radial basis function methods.
CO5	Apply rule-based learning, sentiment analysis, and reinforcement learning algorithms.
Textbooks:	
1	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning-Pearson Education , Limited,2025.
2	Tom M. Mitchell, — Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
3	Machine Learning: A Probabilistic Perspective, MIT Press,2012.
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.
3	Pattern Recognition and Machine Learning – Christopher Bishop
4	Deep Learning – Goodfellow, Bengio, Courville
Web resources:	
1	https://nptel.ac.in/courses/106106139
2	https://nptel.ac.in/courses/106105152
3	https://www.geeksforgeeks.org/data-science/bayes-theorem-in-machine-learning/

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3
CO3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	15	15	15	15	14	14	15	15
Average	3	2.8	2.8	3	3	3	3	2.8	2.8	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC62P	Machine Learning Lab	CC-14	0	0	5	0	3	5	75	25	100

Learning Objectives	
LO1	To understand core concepts and models in machine learning.
LO2	To analyze the nature of problems that can be solved using machine learning techniques.
LO3	To design and implement suitable machine learning techniques for a given application.
LO4	To apply distance based learning models
LO5	To implement and evaluate rule based and tree based models

Sno	Content	Hours
	1. Design Logistic Regression for binary classification.	75
	2. Implement K-Nearest Neighbour (KNN) classifier	
	3. Implement Backpropagation algorithm (basic demonstration)	
	4. Write a simple Genetic Algorithm for optimization (e.g., function maximization)	
	5. Implement Bayes Theorem using a real dataset	
	6. Implement Expectation-Maximization (EM) Algorithm (basic clustering example).	
	7. Implement Locally Weighted Regression (LWR)	
	8. Develop Radial Basis Function (RBF) Network	
	9. Construct Sequential Covering Algorithm (rule learning)	
	10. Implement a simple chatbot using rule-based learning	

CO	Course Outcomes The Students will be able to
CO1	Apply Logistic Regression and KNN for classification problems.
CO2	Demonstrate the Back propagation algorithm for neural networks.
CO3	Use Genetic Algorithms for solving optimization problems.
CO4	Apply Bayes Theorem and EM algorithm for probabilistic analysis and clustering.
CO5	Develop rule-based models and a simple chatbot.
Textbooks:	
1	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning-Pearson Education , Limited,2025.
2	Tom M. Mitchell, — Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
3	Machine Learning: A Probabilistic Perspective, MIT Press,2012.
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.
3	Pattern Recognition and Machine Learning – Christopher Bishop
4	Deep Learning – Goodfellow, Bengio, Courville
Web resources:	
1	NPTEL Practical: https://nptel.ac.in/courses/106106202
2	https://sklearn.org/stable/supervised_learning.html?utm_source=chatgpt.com#google_vignette
3	https://www.mygreatlearning.com/blog/perceptron-learning algorithm/?
4	https://www.geeksforgeeks.org/data-science/bayes-theorem-in-machine-learning/

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	2	2	3	3	3	3	2	2
CO3	2	2	1	3	3	3	2	2	1	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3	3
Total	14	14	13	14	14	12	14	14	13	14	14
Average	2.8	2.8	2.6	2.8	2.8	2.4	2.8	2.8	2.6	2.8	2.8

3 – Strong, 2- Medium, 1- Low

3rd YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAC63P	Project	CC-15	0	0	5	0	4	5	25	75	100

Learning Objectives	
LO1	Advance from an intellectually curious student to a creator/maker and an industry professional
LO2	Apply verbal and written communication skills to explain technical problem solving techniques and solutions to an increasingly diverse and global audience
LO3	Collaborate within and across disciplinary boundaries to solve problems
LO4	Apply mathematical and/or statistical methods to facilitate problem solving.
LO5	Exercise computational thinking over the entire software life cycle

	Content	Hours
	1. The Candidates have to undergo a Minimum of 150 Hours of Project Work during the Course of Study either in an IT Industry / Public or Private Sector Organization / Research Institutes / Institution itself. 2. The Candidates need to identify and analyze real world problems on the selected project domain. 3. During the course of study, the Candidates need to Develop, Design, Test, etc., the Applications as per the directions by the Guide. 4. Then the Candidates have to prepare and submit the manuscript of the Project Work as a Report as per the requirements of the Institution / Department for Evaluation. 5. The submission of the Project Report will be done at the end of the Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester. The Passing Minimum for Project Work is 50%. 7. If the Candidate fails to score 50% in the Project Work, the Candidate has to improve it during the next attempt. 8. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Project Work.	75

	9. The Faculty Member will act as the Internal Examiner during the course of Project Work as well as at the time of conducting the Viva-Voce Examination. 10. The Internal Marks for the Project Work will be awarded by the concerned Guide / Internal Examiner. 11. The Internal and External Examiners shall both evaluate the Project Report, Presentation and conduct the Viva-Voce Examination.	
	INTERNAL MARKS AWARDED FOR THE PROJECT WORK **25 Marks**	
	1. Plan of the Project – 3 Marks 2. Execution of the Plan – 5 Marks 3. Review 0 – 2 Marks 3. Review 1 – 4 Marks 4. Review 2 – 5 Marks 5. Review 3 – 6 Marks	
	EXTERNAL MARKS AWARDED FOR THE PROJECT WORK **75 Marks**	
	1. Evaluation of the Project Report – 25 Marks 2. Presentation – 25 Marks 3. Viva-Voce Examination – 25 Marks	

CO	Course Outcomes The Students will be able to
CO1	Demonstrate leadership abilities and develop effective time management skills.
CO2	Identify and apply appropriate tools to solve specific problems.
CO3	Analyze and evaluate reports critically.
CO4	Collaborate effectively within a team and lead it to achieve outstanding results.
CO5	Assess and enhance individual skills for presenting and organizing projects.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	15	15	15
Average	3	3	3	3	3	3	3	3	3	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE61	**IOT and its Applications**	**EC-10**	**4**	**1**	**0**	**0**	**4**	**5**	**25**	**75**	**100**

Learning Objectives

LO1	Understand IoT fundamentals, technologies, applications, and research directions
LO2	Understand M2M to IoT evolution, value chains, and architectural principles.
LO3	Explain IoT reference models, functional view and architectural perspectives for deployment and operations.
LO4	Apply IoT concepts to real-world applications such as smart industry, retail, oil & gas ehealth.
LO5	Evaluate IoT security, privacy, governance, and smart city applications.

Unit	Content	Hours
1	**IoT and its Technology :** The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization.	**15**
2	**M2M to IoT :** A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT- An Architectural Overview– Building an architecture, Main design principles and needed capabilities.	**15**
3	**IoT Architecture:** Introduction, State of the art, Architecture. Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	**15**
4	**IoT Applications for Value Creations:** Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth	**15**

5	**Internet of Things Privacy, Security and Governance:** Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	**15**

CO	**Course Outcomes** **The Students will be able to**
CO1	Explain IoT concepts, infrastructure, and challenges including security and energy issues.
CO2	Analyze IoT architectures and evaluate design principles and industrial structures.
CO3	Apply IoT reference architecture concepts for system design and deployment.
CO4	Evaluate IoT solutions for industrial applications and business value creation.
CO5	Analyze security, privacy, and governance challenges in IoT systems.
Textbooks:	
1	Vijay Madisetti and Arshdeep Bahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.
2	Ovidiu Vermesan and Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment"River Publishers,978-87-93102-94-1,2014
3	"From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
4	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
Reference Books:	
1	Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.
2	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,.
3	WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011
Web resources:	
1	https://www.simplilearn.com
2	https://www.javatpoint.com
3	https://www.w3schools.com

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3
CO3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	15	15	15	15	14	14	15	15
Average	3	2.8	2.8	3	3	3	3	2.8	2.8	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE62	Enterprise Resource Planning	EC-10	4	1	0	0	4	5	25	75	100

Learning Objectives	
LO1	To apply ERP fundamentals, evolution, structure, and benefits.
LO2	To analyse enterprise integration, system integration, and related technologies.
LO3	To understand ERP marketplace, modules, and emerging trends.
LO4	To Implement ERP strategies and lifecycle.
LO5	To build ERP integration with e-commerce and future trends.

Unit	Content	Hours
1	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages.	15
2	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.	15
3	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.	15
4	ERP Implementation Basics, ERP implementation Strategy, ERP Implementation Life Cycle, Pre-Implementation task, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	15

5	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.	**15**

CO	**Course Outcomes** **The Students will be able to**
CO1	Explain ERP concepts, components, vendors, and evaluate its benefits and limitations.
CO2	Analyze ERP's role in enterprise integration, BPR, data warehousing, OLAP, and SCM.
CO3	Evaluate ERP functional modules and their integration with business applications.
CO4	Apply ERP implementation methodologies and analyze roles of stakeholders.
CO5	Analyze ERP success factors and implement ERP tools like SAP/Oracle in case studies.
Textbooks:	
1	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.
2	Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
Reference Books:	
1	Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia
2	P.Rizwan Ahmed, Enterprise Resource Planning, Margham Publications, 2014
Web resources:	
1	https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm
2	https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/
3	https://www.guru99.com/erp-full-form.html
4	https://www.oracle.com/in/erp/what-is-erp/

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3
CO3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	15	15	15	15	14	14	15	15
Average	3	2.8	2.8	3	3	3	3	2.8	2.8	3	3

3 – Strong, 2- Medium, 1- Low

3rd YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE63	Cloud Computing	EC-11	4	1	0	0	4	5	25	75	100

Learning Objectives	
LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

Unit	Content	Hours
1	**Introduction to Cloud Computing:** Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. **Cloud Concepts and Technologies:** Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	15
2	**Cloud Services** Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines **Storage Services:** Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage - Microsoft Assesment - Microsoft Planning Toolkit- IBM: Cloud Models - IBM Smart Cloud **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service **Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network	15

3	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design **Methodologies:** Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non Relational Approach (NoSQL).	15
4	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.	15
5	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15

CO	**Course Outcomes**
CO1	Understand the fundamental concepts and Technologies in Cloud Computing.
CO2	Able to understand various cloud service types and their uses and pitfalls.
CO3	Able to understand Cloud Architecture and Application design.
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.
CO5	Understand various Case Studies in Cloud Computing.
Textbooks:	
1	Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018
Reference Books:	
1	Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical
2	Approach, Tata McGraw-Hill, 2013.
3	Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
4	David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
Web resources:	
1	**https://onlinecourses.nptel.ac.in/noc26_cs55/preview**
2	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7

Mapping with Programme Outcomes and Programme Specific Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	2	2	2	2	2	3
CO2	3	3	2	2	3	3	3	2	2	3	2
CO3	3	3	2	3	3	2	2	3	2	1	2
CO4	3	2	3	2	2	3	1	2	2	2	2
CO5	3	2	2	2	3	3	3	2	2	2	2
Total	15	12	10	11	12	13	11	11	10	10	11
Average	3.0	2.4	2.0	2.2	2.4	2.6	2.2	2.2	2.0	2.0	2.2

3 – Strong, 2- Medium, 1- Low

3rd YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAE64	**Natural Language Processing**	**EC – 11**	**4**	**1**	**0**	**0**	**4**	**5**	**25**	**75**	**100**

Learning Objectives	
LO1	To understand approaches to syntax and semantics in Natural Language Processing.
LO2	To learn Natural Language Processing and apply basic algorithms in this field.
LO3	To understand approaches to discourse, generation, dialogue, and summarization in NLP.
LO4	To understand algorithmic models of morphology, syntax, semantics, and pragmatics.
LO5	To understand current statistical methods used in machine translation.

Unit	Content	Hours
1	**Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.	15
2	**Word level and Syntactic Analysis:** Word Level Analysis: Regular Expressions-Finite-State Automata- Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.	15
3	**Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation Supervised – Dictionary based and Unsupervised Approaches. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	15
4	**Natural Language Generation:** Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.	15
5	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net Frame Net Stemmers- POS Tagger- Research Corpora SSAS.	15

CO	Course Outcomes The Student will be able to
CO1	Describe the fundamental concepts and applications of Natural Language Processing.
CO2	Apply NLP techniques for word level and syntactic analysis.
CO3	Analyze semantic and discourse processing in NLP.
CO4	Apply NLP methods for natural language generation and machine translation.
CO5	Use NLP techniques for information retrieval and lexical resource analysis.
Textbooks:	
1	Daniel Jurafsky & James H. Martin, Speech and Language Processing, **3rd Edition,2023,(Draft/Latest Online)**.
2	Jacob Eisenstein, Natural Language Processing, MIT Press, 2019.
Reference Books:	
1	Steven Bird et al., Natural Language Processing with Python, O'Reilly,2009, (Updated Edition).
Web resources:	
1	NPTEL: https://nptel.ac.in/courses/106106211
2	https://huggingface.co/learn
3	https://spacy.io/usage

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3
CO3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	14	14	15	15	15	15	14	14	15	15
Average	3	2.8	2.8	3	3	3	3	2.8	2.8	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAP61	**Power BI**	**PEC**	**1**	**1**	**0**	**0**	**2**	**2**	**25**	**75**	**100**

Learning Objectives	
LO1	To Learn a New too of Power Bi Basics Functions
LO2	To Learn about the power query and Data Modeling Techniques
LO3	To explore knowledge on DAX Operations
LO4	To know how to create a Dashboard
LO5	To explore knowledge on integrating PowerBi and Excel

Unit	Content	Hours
1	**Power BI Desktop Basics**: Understanding the Power BI interface - Connecting to different data sources: Excel / CSV, SQL Server / Database, Web / PDF / SharePoint - Understanding fields, tables, and data types - Renaming, duplicating, and formatting tables/columns	6
2	**Power Query (Data Transformation)** - Introduction - Removing rows/columns, filtering data - Changing data types - Replacing errors or null values - Splitting and merging columns - Grouping and summarizing data - Merging Queries (Joins) - Appending Queries (Union) - Creating custom columns with M language (basic) **Data Modeling:** Creating relationships between tables - One-to-many, many-to-one relationships - Star schema vs Snowflake schema - Managing relationships view	6
3	**DAX (Data Analysis Expressions):** Calculated columns vs. Measures - Basic and advanced DAX functions: Aggregation, logical, text, and date functions - Time intelligence and filter functions.**Data Visualization & Reporting:** Creating interactive reports - Visual formatting, interactions, bookmarks, and tooltips - Drill-down and drill - through functionality.	6
4	**Power BI Service (Cloud Operations):** Publishing reports from Desktop to Service - Creating Dashboards, Apps, and Workspaces - Setting up data refreshing (Data Gateways) - Sharing reports and collaborating - Row -Level Security (RLS).	6
5	**Integration & Automation:** Power BI + Excel integration - Power BI + Power Automate (basic workflows) - Using Python or R scripts (optional) - Embedding Power BI reports on websites Applications: Sales performance dashboard - HR analytics (employee attrition)	6

CO	Course Outcomes The Students will be able to
CO1	Understand and explain the components, architecture, and functionalities of Power BI for business intelligence applications.
CO2	Connect, transform, and clean data from multiple sources using Power Query Editor.
CO3	Apply DAX functions to create calculated columns, measures, and perform advanced data analysis.
CO4	Create a Effective Dashboard and publish and share the reports
CO5	Develop interactive dashboards and reports, and publish, share, and manage them using Power BI Service.
Text books:	
1	Microsoft Power BI Complete Reference – Devin Knight, Brian Knight, Mitchell Pearson
Reference Books:	
1	Learn Power BI – Greg Deckler
2	Microsoft Power BI Cookbook – Brett Powell
Web resources:	
1	https://learn.microsoft.com/en-us/power-bi
2	https://www.geeksforgeeks.org/power-bi/power-bi-tutorial/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	2	2	3	3	3	3	3
CO4	3	3	3	3	2	3	3	2	3	3	3
CO5	3	2	3	3	3	3	3	2	3	3	3
Total	15	14	15	15	12	14	15	13	15	15	15
Average	3	2.8	3	3	2.4	2.8	**3**	2.6	3	3	3

3 – Strong, 2- Medium, 1- Low

3RD YEAR: SIXTH SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UCAL61	**MongoDB**	**SLC**	**0**	**0**	**0**	**3**	**2**	**3**	**25**	**75**	**100**

Learning Objectives	
LO1	Introduce NoSQL databases and MongoDB fundamentals
LO2	Develop skills to manage and manipulate data using MongoDB
LO3	Enable querying, indexing, and performance optimization
LO4	Apply aggregation for data analysis
LO5	Integrate MongoDB with Python and data science tools

Unit	Content	Hours
1	Introduction to MongoDB - What is NoSQL- Difference between SQL and NoSQL- Features of MongoDB - Use cases in Data Science - Installation and setup	9
2	MongoDB Basics - Database, Collection, Documents - BSON format- CRUD Operations (Insert, Read, Update, Delete)- Data types in MongoDB	9
3	Querying Data- Query operators ($eq, $gt, $lt, $and, $or)- Projection-Sorting and limiting- Querying nested documents Indexing and Performance -Indexing concepts= Types of indexes -Performance optimization	9
4	Aggregation Framework - Aggregation pipeline - Stages: $match, $group, $sort, $project - Data analysis using aggregation Data Modeling- Schema design- Embedding vs Referencing- Efficient document structures - MongoDB with Python-PyMongo usage- CRUD operations using Python- JSON handling	9
5	MongoDB with Pandas-Loading data into Data Frames-Data preprocessing Exporting data MongoDB Atlas- Cloud database setup- Security basics- Remote connections- Visualization and Analytics-• Integration with Matplotlib, Seaborn-Tableau / Power BI usage -Replication and Sharding- Transactions- Change Streams	9

CO	Course Outcomes The Students will be able to
CO1	Understand NoSQL concepts and MongoDB architecture
CO2	Perform CRUD operations and manage MongoDB data structures
CO3	Apply querying techniques and optimize performance using indexing
CO4	Use aggregation framework and design efficient data models
CO5	Integrate MongoDB with Python, Pandas, and visualization tools
Textbooks:	
1	Kristina Chodorow – *MongoDB: The Definitive Guide*, O'Reilly
2	Shannon Bradshaw, Eoin Brazil – *MongoDB: The Complete Developer's Guide*, Packt
Reference Books:	
1	Dan Sullivan – NoSQL for Mere Mortals, Addison-Wesley
2	Kyle Banker – MongoDB in Action, Manning Publications
Web resources:	
1	MongoDB Official Documentation – https://www.mongodb.com/docs
2	MongoDB University (Free Courses) – https://university.mongodb.com
3	PyMongo Documentation – https://pymongo.readthedocs.io

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	2	2	3	3	3	3	3
CO4	3	3	3	3	2	3	3	2	3	3	3
CO5	3	2	3	3	3	3	3	2	3	3	3
Total	15	14	15	15	12	14	15	13	15	15	15
Average	3	2.8	3	3	2.4	2.8	**3**	2.6	3	3	3

3 – Strong, 2- Medium, 1- Low