DEPARTMENT OF COMPUTER APPLICATION

About the Department

        In order to impart knowledge of the students in the state-of-the-art Computer Application department was set up in the year 2003. Our department vision is achieved through imparting the quality education to students. Our faculty put the best possible efforts to ensure that the students gain the proper technical skills along with the life skills, which helps them to face the world confidently and with high self- esteem. As the Institute has been awarded the Autonomous status by UGC, necessary and required changes as per the requirement of industry, after due revisions and monitoring by experts have been made in OBE curriculum. The department has dedicated, motivated, devoted faculty with a passion for teaching. Faculty is committed to enrich their skills through continual higher education & research. The department conducts seminars, workshops, conferences and faculty development programs for faculty advancement. More innovative methods in teaching - learning have been developed and implemented. The overall strength of the department is 243 students in three year pattern with 8 faculties and well equipped 176systems.

PRINCIPAL

Dr. P. Balagurusamy,M.A., M.Phil., M.Ed., P.G.D.C.A., Ph.D.,

STAFF MEMBERS

1.	Mrs. M.Chanda Mona, M.Sc(CS)., M.Phil.,SET.,	- **Assistant Professor &Head**
2.	Mr. K.Muthu Bharathi, M.C.A., M.Phil.,	- **Assistant Professor**
3.	Mr. J.Shanmugakumar, M.C.A., M.Phil., DCT., M.Sc.	- **Assistant Professor**
4.	Mrs. P.Aarthy, M.Sc., M.Phil. PGDCA.,	- **Assistant Professor**
5.	Mrs. B.Renuka, M.Sc., M.Phil.,	- **Assistant Professor**
6.	Mrs. K.Priyadharsini, M.C.A., M.Phil., SET.,	- **Assistant Professor**
7.	Mrs. V.Lavanya, M.Sc (CT)., M.Phil.,	- **Assistant Professor**
8.	Mrs. S.Gowthami, M.C.A., M.Phil.,	- **Assistant Professor**

Bachelor of Computer Applications Under Choice Based Credit System (CBCS)

Course Pattern for BCA

The Undergraduate degree course consists of five vital components. They are as follows: Part I Language (Tamil / French)

Part II English

Part III Core Course (Theory, Practical, Electives, Allied, Project and Internship).

Part IV Skill Based, Non-Major Electives, Environmental Studies and Value Education and Self Study

Part V Physical Education(Non-Semester) and Extension Activities.

Objectives

The Syllabus for BCA Programme under semester system has been designed on the basis of Choice Based Credit System (CBCS), which would focus on job oriented programmes and value-added education. It will be in effect from June 2020 onwards.

Eligibility

Candidates should have passed the Higher Secondary Examination, Government of Tamil Nadu or any other examination accepted by the syndicate of Madurai Kamaraj University as equivalent there to.

Duration of the Course

The students who join the BCA Programme shall undergo a study period of three academic years

– Six semesters.

SUMMARY OF HOURS AND CREDITS UG COURSES

Part	Semester	Specification	No. of Course	Hrs	Credit	Total
I	I - II	**Languages (Tamil / French)**	2	12	6	6
II	I - II	**English**	2	12	6	6
III		**Core Courses**				
	I – VI	Theory	16	71	58	114
		Practical	12	45	32	
	V & VI	**Core Electives**	2	8	8	
	I - IV	**Allied Courses**	4	16	16	
IV	III – VI	**Skill Based Courses**	4	8	8	20
	III & IV	**Self-Study Courses (Soft Skill I & Soft Skill II)**	2		4	
	I & II	**Non-Major Electives**	2	4	4	
	I & II	**1. Value Education 2. Environment & Gender Studies**	2	4	4	
V		**Physical Education (Non-Semester Course) Extension Activities**	1 1		2 2	4
			TOTAL	**180**	**150**	**150**

Allied Courses

There will be FOUR Allied courses to fulfill the BCA programme during three years.

Subject	Maximum Marks	Year of Study
Mathematics	200	I
Commerce	200	II

The Syllabus for the Allied Courses can be obtained from the Allied Department of Mathematics.

Practicals

Record Note Book	: 10marks
Internal	: 30marks
External examination	: 60marks
Total	: 100 marks

Value Added Courses

The Department of BCA has offered the following Extra Credit Value Added Courses is for one hour for all UG students with no prejudice to the BCA programme results.

1. Tally
2. Computer Hardware and Troubleshooting
3. Ruby
4. Angular JS

Extra Credit Self- Paced Courses for Advanced Learners

The Department of BCA has offered the following Extra Credit Self-Paced Courses to enlighten the advanced learners. The department persuades the students to take virtual courses on MOOCS, SWAYAM and NPTEL.

1. Selenium Web Driver tool
2. Advance C
3. Quantitative Aptitude
4. Advanced JAV

Program Specific Outcomes (PSOs)

After completion of BCA programme, graduates will be able to

PSO1: Obtain fundamental knowledge of mathematics, commerce and computing techniques in Computer Science to solve the problems in computer application areas

PSO2: Identify, formulate, review and analyze complex problems using various techniques.

PSO3: Design and develop computer applications, evaluate and recognize potential risks and provide innovative solutions.

PSO4: Enhance comprehensive understanding of the theory in diverse fields like computer organization, software engineering, Data Structure, Web Designing, Big Data, IOT, Operating system, Artificial Intelligence and Cyber security

PSO5: Professionally excel in the areas of multimedia, animation, web designing, Networking, accounting and various domains-based electives.

PSO6: Apply modern application tool and technologies in the construction of software system

PSO7: Develop the capability to work with technical, management, leadership and entrepreneurial skills so as to deliver effective product within time constraints

PSO8: Implement various programming languages like C, C++, VB. Net, Java, Python and development of mobile applications in the right way

PSO9: Gaining knowledge of grammatical conventions, varieties, formulations, courses and culture. Becoming competent to face competitive examinations through development of language skills

PSO10: Understand roles and responsibilities in society and apply professional ethics, accountability and equity

PSO11: Design and use software systems within realistic social and environmental aspects with values, ethics and equity to transform the knowledge and skills to the community

PSO12: Show enthusiasm for self-improvement through continuous professional development and lifelong learning

Course Pattern – from 2020-2021 Batch

Sem.	Part	Study Component	Course Code	Course Title	Hrs	Credit
I	I	Tamil/Other	20UTAL11	Tamil I	6	3
	II	English	20UENL11	English I	6	3
	III	Core Course I	20UCAC11	Computer Fundamentals and Programming in C	4	3
	III	Core Practical I	20UCAC1P	Lab 1: Programming in C Lab	3	3
	III	Allied Course I	20UMAA21	Discrete Mathematics	4	4
	III	Core Practical II	20UCAC1Q	Lab 2: Python Programming Lab	3	3
	IV	Non-Major Elective Course I	20UCAN11	NME 1: Basics of Computer	2	2
	IV		20UVEV11	Value Education	2	2
				TOTAL	30	23
II	I	Tamil/Other	20UTAL21/	Tamil II	6	3
	II	English	20UENL21	English II	6	3
	III	Core Course II	20UCAC21	Data Structure using C	4	3
	III	Core Practical III	20UCAC2P	Lab 3:Data Structure using C Lab	3	3
	III	Allied Course II	20UMAA22	Operation Research	4	4
	III	Core Practical IV	20UCAC2Q	Lab 4: Advanced Excel Lab	3	3
	IV	Non-Major Elective Course II	20UCAN21	NME II: Basics of Internet	2	2
	IV		20UEGS21	Environment & Gender Studies	2	2
	V	Extension Activity	20UPEV2P	Physical Education		2
				TOTAL	30	25
III	III	Core Course III	20UCAC31	Computer Algorithm with C++	5	3
	III	Core Course IV	20UCAC32	Object Oriented Programming with JAVA	5	3
	III	Core Course V	20UCAC33	Computer Organization	5	3
	III	Allied Course III	20UCAA31	Computer Based Financial Accounting	4	4
	III	Core Practical V	20UCAC3P	Lab 5: Computer Algorithm with C++ lab	4	3
	III	Core Practical VI	20UCAC3Q	Lab 6: Object Oriented Programming with JAVA Lab	5	3
	IV	Soft Skill Course I				2
	IV	Skill Based Course I	20UCAS3P	Lab 7: Image Design (Adobe llustrator /In Design) Lab	2	2
				TOTAL	30	23
IV	III	Core Course VI	20UCAC41	Dot NET Programming	5	3
	III	Core Course VII	20UCAC42	Relational DBMS	5	3
	III	Core Course VIII	20UCAC43	Principles of Operating System	5	3

	III	Allied Course IV	20UCAA41	Cost and Management Accounting	4	4
	III	Core Practical VII	20UCAC4P	Lab 8: VB.NET Programming Lab	5	3
	III	Core Practical VIII	20UCAC4Q	Lab 9: RDBMS with ORACLE Lab	4	3
	IV	Soft Skill Course II			-	2
	IV	Skill Based Course II	20UCAS4P	Lab 10: Animation Technology Lab	2	2
	V	EA		NSS/NCC/CLUBS		2
				TOTAL	30	25
V	III	Core Course IX	20UCAC51	Web Technologies	4	4
	III	Core Course X	20UCAC52	Mobile Application Development	4	4
	III	Core Course XI	20UCAC53	Software Engineering	4	3
	III	Core Course XII	20UCAC54	Data Communication and Computer Networks	4	3
	III	Core Elective Course I	20UCAE51 20UCAE52 20UCAE53	1. Internet of things 2. E-Commerce Technologies 3. Data Ware housing and Data Mining	4	4
	III	Core Practical Course IX	20UCAC5P	Lab 11: Web Technology Lab	4	3
	III	Core Practical Course X	20UCAC5Q	Lab 12: Mobile Application Development Lab	4	3
	IV	Skill Based Course III	20UCAS5P	Lab 13: Audio/Video Editing (Adobe Premiere) Lab	2	2
				TOTAL	30	26
VI	III	Core Course XIII	20UCAC61	Big data Analytics using R	4	4
	III	Core Course XIV	20UCAC62	Soft Computing	4	4
	III	Core Course XV	20UCAC63	Digital Image Processing	4	3
	III	Core Course XVI	20UCAC64	Software Architecture and Design Patterns	3	3
	III	Core Elective Course II	20UCAE61 20UCAE62 20UCAE63	1. Cloud Computing 2. Security in Computing 3. Compiler Design	4	4
	III	Core Practical Course XI	20UCAC6Q	Lab 14: R programming Lab	3	3
	III	Core Practical Course XII	20UCAC6P	Lab 15: Project work and Viva voce	6	5
	IV	Skill Based Course IV	20UCAS6P	Lab 16: MATLAB	2	2
				TOTAL	30	28
TOTAL FOR ALL SEMESTERS					180	150

Programme	BCA	Programme Code	UCA
Course Code	20UCAC11	No. of Hrs per Cycle	4
Semester	I	Max. Marks	100
Part	III	Credit	4
Core Course I			
Course Title		Computer Fundamentals and Programing in C	
Cognitive Skills - Upto K3			

Preamble

This course provides an adequate knowledge in the Fundamentals of computer and basic concepts of C programming language and understand and develop structured programs using C Language

Unit I Introduction   **10 Hours**

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flowchart.

Unit II C Programming Basics   **12 Hours**

Problem formulation –Problem Solving – Introduction to„ C‟ programming–fundamentals–structure of a„C‟program–compilationandlinkingprocesses–Constants,Variables–DataTypes–

Expressions using operators in „C‟– Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

Unit III Arrays and Strings   **15 Hours**

Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. String-String operations – String Arrays. Simple programs - sorting- searching – matrix operations.

Functions

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion.

Unit IV Structures   **12 Hours**

Introduction – need for structure data type – structure definition – Structure declaration – Structure- within a structure.

Union

Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

Unit V Pointers   **11 Hours**

Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example-Problems.

Files

Defining, opening, closing a file - I/O operations on file - error handling during I/O operations - random access to file - command line argument.

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Books

1. Anita Goel and Ajay Mittal.,(2011), *Computer Fundamentals and Programming In C,* Dorling Kindersley(India) Pvt. Ltd., Pearson Education in SouthAsia
2. Balagurusamy.E., (2011), *Programming in ANSI C*, Tata McGraw Hill Publishing Company, New Delhi, 6thEdition

Reference Books

1. Gottfried,(2006).,*ProgrammingwithC*,Schaum„sOutlineseries,TataMcGrawHill,New Delhi
2. Ashok Kamthane. N.,(2006), *Programming with ANSI and Turbo C*, Pearson Education, New Delhi
3. Herbert Schildt, (2000), *C:The Complete Reference*, TMH Edition, New Delhi, 4thEdition.
4. Kanethkar Y, (1999), *Let us C*, BPB Publications, New Delhi, 4thEdition.
5. Paul Deitel, Harvey Deitel,(2010), *C How to Program*,Pearson India Education Services Pvt. Ltd,New Delhi, 6thEdition.

E-Resources

- .http://www.cprogramming.com/
- http://www.learn-c.org/
- http://www.javatpoint.com/
- http://www.guru99.com
- http://www.programiz.com

Course Outcomes

At the end of the course, students would be able to :

CO1	Define the basic organization of computer.
CO2	Demonstrate programs involving Decision structures and Control statements
CO3	Apply the concepts of Arrays and functions to write C programs
CO4	Construct Program using Structures and Unions
CO5	Experiment with dynamic memory allocation using Pointers.

Mapping Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PS012
CO1	2	1	1	3	0	0	1	1	0	0	0	3
CO2	2	3	3	1	1	2	2	3	0	0	0	3
CO3	2	3	3	1	1	2	2	3	0	0	0	3
CO4	2	3	3	1	1	2	2	3	0	0	0	3
CO5	2	3	3	1	1	2	2	3	0	0	0	3

1-Low, 2 – Medium, 3 – High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Questions	No. Of Questions
1	CO1	Upto K1	2	2(K1&K1)	2(K1&K1)	1(K1)
2	CO2	Upto K2	2	2(K1&K1)	2(K2&K2)	1(K2)
3	CO3	Upto K3	2	2(K1&K1)	2(K2&K2)	1(K3)
4	CO4	Upto K3	2	2(K1&K1)	2(K2&K2)	1(K3)
5	CO5	Upto K3	2	2(K1&K1)	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	10	8	10	28	28%	28
K2		32	10	42	42%	42
K3			30	30	30%	30
Total Marks	10	40	50	100	100%	100

LESSON PLAN

UNIT	DESCRIPTION	HOURS	MODE
I –Introduction	a) Generation and Classification of Computers	2	Descriptive method PPT Presentation
	b) Basic Organization of aComputer	2	
	c) Number System – Binary – Decimal– Conversion – Problems	3	
	d) Need for logical analysis and thinking – Algorithm – Pseudo code – Flowchart	3	
II-C Programming Basics	a) Problem formulation – ProblemSolving- Introduction to „C‟ programming–fundamentals	2	PPT Presentation
	b) structureofa„C‟program– compilation and linkingprocesses	2	
	c) Constants, Variables – Data Types – Expressions usingoperatorsin„C‟	4	
	d) Managing Input and Output operations– a. Decision Making and Branching	2	
	e) Looping statements – solving simple scientific and statisticalproblems	2	
III- Arrays and Strings , Functions	a) Initialization – Declaration	4	Descriptive method Assignments
	b) One dimensional and Two-dimensional arrays	2	
	c) String- String operations – StringArrays	2	
	d) Simple programs - sorting- searching – matrixoperations	3	
	e) Function – definition of function – Declaration of function – Pass by value – Pass by reference –Recursion.	4	
IV- Structures and Union	a) Introduction – need for structure datatype	2	Group Discussion, Seminar, Quiz
	b) structure definition – Structuredeclaration	3	
	c) Structure- within astructure	1	
	d) Union - Programs using structures and Unions	3	
	e) Storage classes, Pre-processordirectives	3	
V- Pointers and files	a) Pointers - Definition – Initialization – Pointers arithmetic	2	You Tube, Brain storming, Activity
	b) Pointers and arrays- Example-Problems.	2	
	c) Defining, opening, closing afile	2	
	d) O operations on file - error handling duringI/O operations	2	
	f) Random access to file – command line argument	3	

Course Designed By:Mrs.M.Chandamona,Head, Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAC1P	No. of Hrs per Cycle	4
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Course Practical I			
Course Title		Lab : Programming in C	
Cognitive Skills - Upto K3			

Preamble

This course provides the ability to write programs for solving computing problems using C Language as a tool.

LIST OF PRACTICALS

Write a C Program

1. To implement reading and writing characters andstrings
2. To use go tostatement
3. To implement various types of conditional branchingstatements
4. To create iteration without using loopstatement
5. To process two-dimensionalarray
6. To implement dynamicarray
7. To implement string handlingfunctions
8. To perform various arithmetic operations oncharacters
9. To create user – defined function
10. To serecursion
11. To pass various types of arguments tofunction
12. To usestructures
13. To implement union
14. To implement pointers
15. To process fileoperations
16. To implement command line argument

Course Designed By: Mrs.M.Chandamona, Head, Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAC1Q	No. of Hrs per Cycle	3
Semester	I	Max. Marks	100
Part	IV	Credit	3
Core Course Practical Ii			
Course Title		Lab : PYTHON PROGRAMMING	
Cognitive Skills - Upto K3			

Preamble

This course trains the students to develop applications in Python

LIST OF PRACTICALS

1. Write a script to display the various data timeformats.
2. Write a program to complete distance between two points taking input fromuser.
3. Write a program to print alphabet pattern.
4. Write a program to calculate multiplicationtable.
5. Write a program for checking whether given number is a even orodd.
6. Write a program to count the number of character in thestring.
7. Write a program combine _lists that combine these lists into adictionary.
8. Write a program to print each line of a file in reverseorder.
9. Write a program to complete the number of character, word and lines in a file.
10. Find mean, median, mode for the given set of numbers in a list.
11. Write a function unique to find all the unique elements in the list.
12. Write a simple script that serves a simple HTTP response and a simple HTML pages
13. Write a function dubs to find all duplicates in the list.
14. Write a function reverse to reverse a list without reverse function.
15. Write a program to perform addition of two matrixes.

Course Designed By: Mrs. P. Aarthy, Assistant Professor, Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAN11	No. of Hrs per Cycle	2
Semester	I	Max. Marks	100
Part	IV	Credit	2
Non-Major Elective Course I			
Course Title	Basics Of Computer		
Cognitive Skills - Upto K3			

Preamble

This course provides adequate knowledge on the computer fundamentals and basic organization of computer.

Unit I Introduction 5 Hours

Characteristics of computers - Evolution of computers- Computer generations.

Basic computer organization

The Five Basic Operations of a Computer System - Basic Organization

Unit II Processor andmemory 5 Hours

CPU - Main memory storage evaluation - Main memory organization and capacity - Types of memory chips - Cache memory.

Unit III Input –Outputdevices 8 Hours

Keyboard, point and draw, Data scanning, Digitizer, Card reader, Speech recognition and voice input devices - Output devices - Monitors, Printers, Plotters and projector.

UnitIVComputerSoftware 6 Hours

Relationship between software and hardware - Types of software – Logic system architecture - Acquiring software - SDLC - Software Engineering.

Unit VProgram planning 6 Hours

Purpose - Algorithm - Flow charts - Pseudo code – Basic Logic Structure.

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, Group Discussion,
Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Pradeep K.Sinha and Priti Sinha, (2011),*Computer Fundamentals*, BPBpublications.

Reference Books

1. Poonam Yadav and Praveen kumar, (2013), *Computer Fundamentals*, Vayu Education of India, FirstEdition.
2. Rozera.M.S and Deepak Rohilla,(2013), *Computer Fundamentals*, Vayu Education of India, First Edition.
3. Rajaraman.V and NeeharikaAdabala, (2011),*Fundamentalsof computers*, PHI publications, SixthEdition.

E-Resources

- www.tutorialspoint.com
- www.geeksforgeeks.com
- http://www.toppr,com
- http://edu.gcfglobal.org
- http://oer.nios.ac.in/wiki/index.php

Course Outcomes

At the end of the course, students would be able to :

CO1	Define the basic organization of computer.
CO2	Express the concepts of processor and memory.
CO3	Classify the input and output devices.
CO4	Outline the computer software and it types.
CO5	Make use of Algorithms and pseudo code to write a program.

On the Successful completion of course, student will be able to acquire knowledge about the basic organization, processor and about all input, output devices.

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K – Level	Section A Either/or Choice No. Of Questions	Section B Open Choice No. Of Questions
1	CO1	Up to K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2(K2&K2)	1(K2)
3	CO3	Up to K3	2(K3&K3)	1(K3)
4	CO4	Up to K2	2(K2&K2)	1(K2)
5	CO5	Up to K3	2(K3&K3)	1(K3)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total Marks for each Section			15	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6		6	11	11%
K2	12	15	27	49	49%
K3	12	10	22	40	40%
Total Marks	30	25	55		100%

LESSON PLAN

UNIT	DESCRIPTION	HOURS	MODE
I –Introduction and Basic Computer Organization	a) Characteristics of computers - Evolution of computers- Computer generations. b) The Five Basic Operations of a Computer System - Basic Organization	2 3	Descriptive method PPT Presentation
II- Processor and memory	a) CPU - Main memory storage evaluation b) Main memory organization and capacity - Types of memory chips - Cache memory.	2 3	PPT Presentation
III-Input – Output devices	a) Keyboard, point and draw, Data scanning, Digitizer, Card reader, Speech recognition and voice input devices b) Output devices - Monitors, Printers, Plotters and projector	4 4	Descriptive method Assignments
IV- Computer Software	a) Relationship between software and hardware - Types of software b) Logic system architecture - Acquiring software - SDLC - Software Engineering	3 3	Group Discussion, Seminar, Quiz
V- Program Planning	a) Purpose - Algorithm - Flow charts b) Pseudo code – Basic Logic Structure	3 3	You Tube, Brain storming, Activity

Course Designed By: Mr.J.ShanmugaKumar,Assistant Professor,Department of BCA

Course Code	20UCAC21	No. of Hrs per Cycle	4
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course II			
Course Title	Data Structures Using C		
Cognitive Skills -Upto K3			

Preamble

This course provides an introduction to the basic concepts and techniques of linear and non-linear data structures and analyzes the various algorithms.

Unit I Introduction and Overview

15Hours

Introduction, Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithms complexity, time-space tradeoff. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. String Processing: Definition, Storing Stings, String as ADT, String operations, word/text processing, Pattern Matching algorithms.

Unit II Arrays **10Hours**

Introduction, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Sorting: Bubble sort, Insertion sort, Selection sort, Searching: Linear Search, Binary search, Multidimensional arrays, Matrices and Sparse matrices.

Unit III Linked list **15 Hours**

Introduction, Representation of Singly linked list in memory, traversing a singly linked list, Searching a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly liked list; doubly liked list, Header liked list, Circular linked list.

Stacks

Introduction, Array representation of stacks, linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack.

UnitIV Queues **8 Hours**

Introduction, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues, Applications of queues.

Unit V Tree **12 Hours**

Introduction, Binary trees, representing binary trees in memory, Traversing Binary Trees, Binary Search Trees, Searching, Inserting and Deleting in a Binary Search Tree.

Graphs

Graph theory terminology, Sequential representation of Graphs: Adjacency matrix, traversing a Graph.

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, YouTube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Seymour Lipschutz, (2005), *Data Structures with C*, McGraw Hill Education.

Reference Books

1. Chitra.A, Rajan.P.T , (2016*), Data Structures*, Vijay Nicol Imprints Pvt Ltd, McGraw-Hill Education of India Pvt Ltd, India, SecondEdition.
2. Reema Thareja, (2014), *Data Structures using C*,OxfordPublications.
3. Pai.G.A.V,(2009), *Data Structures andAlgorithms*,TMH.
4. Samanta.D , (2006), *Classic Data Structures*, Prentice Hall of India Pvt Ltd, NewDelhi.

E-Resources

- .http://www.tutorialspoint.com/data_structure_algorithms/index.htm
- .http://www.includehelp.com/data-structure-tutorial/
- http://www.geeksforgeeks.org/data-structures
- http://www.sitesbay.com/data-structure/
- http://www.studytonight.com/data-structures/

Course Outcomes

At the end of the course, students would be able to :

CO1	State need of Abstract Data Types and Manipulate various operations on strings .
CO2	Describe how arrays are represented in memory and used by algorithms.
CO3	Implement linked list in real time problem solving, Explain representation of stacks
CO4	Illustrate the common applications of Queues
CO5	Make use of graphs and trees to find shortest path.

Mapping CourseOutcomes with Program Outcomes

COs/Pos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10	PSO11	PS012
CO1	2	1	2	3	0	2	1	3	1	1	0	3
CO2	2	1	1	3	0	2	1	3	1	1	0	3
CO3	2	1	1	3	0	2	1	3	1	1	0	3
CO4	2	1	1	3	0	2	1	3	1	1	0	3
CO5	2	1	1	3	0	2	1	3	1	1	0	3

1-Low, 2 – Medium, 3 - High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K – Level	Section A MCQs No. Of Questions	Section A MCQs K-Level	Section B Either/or Choice No. Of Questions	Section C Open Choice No. Of Questions
1	CO1	Up to K2	2	2(K1&K1)	2(K2&K2)	1(K2)
2	CO2	Up to K2	2	2(K1&K1)	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	2(K1&K1)	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	2(K1&K1)	2(K3&K3)	1(K3)
5	CO5	Up to K3	2	2(K1&K1)	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10			10	10.00	10%
K2		32	20	52	52.00	52%
K3		8	30	38	38.00	38%
Total Marks	10	40	50	100		100%

LESSON PLAN

UNIT	DESCRIPTION	HOURS	MODE
I – Introduction and Overview	a) Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithmscomplexity, time-spacetradeoff	5	Descriptive method PPT Presentation
	b) Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity ofalgorithms	4	
	c) String Processing: Definition, StoringStings,String as ADT, String operations, word/text processing, Pattern Matching algorithms	6	
II- Arrays	a) Introduction, Linear arrays, arrays asADT, Representation of Linear Arrays in Memory	3	PPT Presentation
	b) Traversing Linear arrays, Inserting and deleting, Sorting: Bubble sort, Insertionsort,Selection sort	4	
	c) Searching: Linear Search, Binarysearch, Multidimensional arrays, Matrices and Sparse matrices	3	
III- Linked list and Stacks	a) Introduction, Representation of Singly linked list in memory, traversing a singly linkedlist	3	Descriptive method Assignments
	b) Searching a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linkedlist	3	
	c) Deletion from a singly liked list; doubly liked list, Header liked list, Circular linked list	3	
	d) Introduction, Array representation ofstacks, linked representation of stacks, Stack as ADT	3	
	e) Arithmetic Expressions: Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack	3	
IV- Queues	a) Introduction, Array representation ofqueue,Linked list representation of queues	4	Group Discussion, Seminar, Quiz
	b) Types of queue: Simple queue,Circular queue, Double ended queue, Priority queue, Operations on Queues, Applications of queues	4	
V- Tree and Graphs	a) Introduction, Binary trees, representing binary trees in memory, Traversing Binary Trees, Binary Search Trees, Searching, Inserting and Deleting in a Binary SearchTree.	6	You Tube, Brain storming, Activity
	b) Graph theory terminology,Sequential representation of Graphs: Adjacency matrix, traversing a Graph.	6	

Course Designed By: Mrs.B.Renuka,Assistant Professor,Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAC2P	No. of Hrs per Cycle	4
Semester	II	Max. Marks	100
Part	III	Credit	3
Core course Practical III			
Course Title	Lab: Data Structures Using C		
Cognitive Skills - Upto K3			

Preamble

This course provides an adequate knowledge to identify and apply the suitable data structure for given real world problems

LIST OF PRACTICALS

Write a Program

1. To insert an element in an array.
2. To delete an element from an array.
3. To add two matrixes A and B.
4. To implement Linked List.
5. To implement Stack using Linked List.
6. To implement Queue using Array.
7. To implement Circular Queue using Array.
8. To implement Binary Search Tree using Array.
9. To implement different Tree Traversals.
10. To implement Bubble Sort.
11. To implement Insertion Sort.
12. To implement Shell Sort.
13. To implement Selection Sort.
14. To implement Merge Sort.
15. To implement Quick Sort.
16. To implement Graph Traversal Algorithm.

Course Designed By: Mrs.B.Renuka, Assistant Professor,Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAC2Q	No. of Hrs per Cycle	3
Semester	II	Max. Marks	100
Part	IV	Credit	3
Core Course Practical IV			
Course Title	**Lab: Advanced Excel lab**		
Cognitive Skills -Upto K3			

Preamble

       This course provides the knowledge to design and create a spread sheet with its advanced options and functions.

LIST OF PRACTICALS

1. Introduction
2. VLOOKUP
3. Date to Period Conversion
4. Date Table
5. PivotTable1
6. PivotTable2
7. Filter1
8. Filter2
9. CF Row Banding
10. IF
11. IF-ISERROR
12. IF-NESTED
13. Database Functions
14. Macros

Course Designed By: Mrs.P.Aarthy, Assistant Professor, Department of BCA

Programme	BCA	Programme Code	UCA
Course Code	20UCAN21	No. of Hrs per Cycle	2
Semester	II	Max. Marks	100
Part	IV	Credit	2
Non-Major Elective course II			
Course Title	Basics Of Internet		
Cognitive Skills - Upto K3			

Preamble

This course provides adequate knowledge on the internet and basic needs of internet

Unit I Internet Basic concepts **6 Hours**

Communication on Internet- Internet Domains- Server Identities- Establishing connection- Client IP address- TCP.

Unit II Introduction to HTML **5 Hours**

Web server- Web Client- Html tags- Commonly used commands- Titles and Footers- Text formatting- Emphasizing text- Text styles.

UnitIII Lists and Graphics **8 Hours**

Types of List- Adding graphics to Html documents- Border, Width, Align and Alt attributes.

Unit IV Tables **5Hours**

Caption tag- width- cellpadding- cellspacing- bgcolor- colspan and rowspan- linking documents- image as hyperlinks.

Unit V Frames **6Hours**

Introduction - frameset tag- frame tag- attributes.

Text Book

1. Ivan Bayross, (2005),*Web enables commercial application using HTML, DHTML, JavaScript Perl, CGI*, BPB publications, Third RevisedEdition.

Reference Books

1. Xavier.C,(2013),*World Wide Web with HTML*, Mc GrawHill.
2. Thomas.A, (2016) ,Powell, *The complete reference HTML& CSS*, Indian Edition, Fifth Edition,.
3. Gopalan.N.P and Akilandeswari.J, (2014),*Web Technology,* PHI publications, SecondEdition.

E- Resources

- www.tutorialspoint.com
- www.w3schools.com
- http://way2tutorial.com/html
- http://html-css-js.com
- http://html.com/html

Course Outcomes

On completion of this course, the student will be able to

CO1	Define the basic concepts of Internet
CO2	Make use of basic tags of HTML.
CO3	Demonstrate graphics and lists.
CO4	Construct the tables and linking documents.
CO5	Apply the frame tags and its attributes.

On the e Successful completion of course, student will be able to acquire knowledge about the basic concepts of Internet and html lists, graphics, hyperlinks, tables, frames.

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K – Level	Section A Either/or Choice No. Of Questions	Section B Open Choice No. Of Questions
1	CO1	Up to K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2(K2&K2)	1(K2)
3	CO3	Up to K2	2(K2&K2)	1(K2)
4	CO4	Up to K2	2(K2&K2)	1(K2)
5	CO5	Up to K3	2(K3&K3)	1(K3)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total Marks for each Section			15	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	6	5	11	20.00	20%
K2	18	15	33	60.00	60%
K3	6	5	11	20.00	20%
Total Marks	30	25	55		100%

LESSON PLAN

UNIT	DESCRIPTION	HOURS	MODE
I – Internet Basic concepts	a) Communication on Internet- Internet Domains- Server Identities b) Establishing connection- Client IP address- TCP.	3 3	Descriptive method PPT Presentation
II- Introduction to HTML	a) Web server- Web Client- Html tags- Commonly used commands b) Titles and Footers- Text formatting- Emphasizing text- Text styles	2 3	PPT Presentation
III- Lists and Graphics	a) Types of List- Adding graphics to Html documents b) Border, Width, Align and Alt attributes	4 4	Descriptive method Assignments
IV- Tables	a) Caption tag- width- cellpadding- cellspacing- bgcolor- colspan and rowspan b) linking documents- image as hyperlinks	3 2	Group Discussion, Seminar, Quiz
V- Frames	a) Introduction - frameset tag b) frame tag- attributes	3 3	You Tube, Brain storming, Activity

Course Designed By: J.Shanmugakumar, Assistant Professor,Department of BCA

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC31	Number of Hours/Cycle		5	
Semester	III	Max. Marks		100	
Part	III	Credit		3	
Core Course III					
Course Title	Computer Algorithms With C++		L	T	P
Cognitive Level		Up to K4	73	2	-

L-Lecture Hours　　**T-Tutorial Hours**　　**P-Practical Hours**

Preamble

　　　This course discusses the usage of class and objects in C++ and identifies the role of inheritance, polymorphism, pointers and dynamic binding. It describes the basic algorithm design strategies and up-skill the students to write effective algorithms for solving a given problem using C++.

Unit I	Introduction to object oriented programming	13 Hours
	Basic Concepts of Object Oriented Programming –Functions in C++, Classes and Objects - Static Data Members and Member Functions – Array of Objects -Friendly functions – const Member Functions, Data Members and Objects, Constructors – Constructor Types, Destructors.	
Unit II	Operator Overloading and Inheritance	14 Hours
	Defining Operator Overloading – Overloading Unary Operators, Overloading Binary Operators – Manipulation of String using Operators, Inheritance – Defining Derived Class – Protected Derivation - Single Inheritance - Multilevel Inheritance – Multiple Inheritance, Hierarchal Inheritance – Hybrid Inheritance – Virtual Base Classes .	
Unit III	Pointers and Files	17 Hours
	Abstract Class -Pointers – new and delete operators, Pointers to Objects – this Pointer, Pointers to Derived Classes, Virtual Functions – Pure Virtual Functions-- Classes for File Stream Operations – Opening and Closing a File, File Pointers and their Manipulations, Sequential Input and Output Operations – Error Handling during File Operations, Command Line arguments.	
Unit IV	Introduction to Algorithm and Divide and conquer	14 Hours
	What is an Algorithm? Algorithm Specification, Performance Analysis: Space Complexity -Time Complexity-Asymptotic Notations- Divide and Conquer: General Method-Binary Search -Merge Sort, Quick Sort, Selection Sort.	
Unit V	The Greedy Method	15 Hours
	General Method -Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees: Prim's Algorithm - Kruskal's Algorithm - Optimal Merge Patterns -Single Source Shortest Paths.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. E. Balagurusamy.,(2020),*Object Oriented Programming with C++,*Tata McGraw Hill

publishing Company Limited, New Delhi, 8th Edition.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran .,(2018),*Fundamentals of Computer Algorithm* , Universities Press, 2nd Edition.

Reference Books
1. Bjarne Stroustrup.,(2013), *The C++ Programming Language*, Addision– Wesly Publishing Company, New York,4th Edition.
2. Yashavant P. Kanetkar.,(2017), *Let Us C++*, BPB Publications,16th Edition.
3. Alfred Aho, John E. Hopcroft, Jeffrey D. Ullman., (2004),*The Design and Analysis of Computer Algorithms*, Pearson Education,1st Edition.
4. Sara Base, Allen Van., (2002) , *Computer Algorithms: Introduction to Design and Analysis*, Pearson Education, 3rd Edition.

E-Resources
- https://www.tutorialspoint.com/cplusplus
- https://www.learncpp.com/
- https://www.cplusplus.com/doc/tutorial/
- https://www.programiz.com/cpp-programming
- https://www.javatpoint.com/cpp-tutorial

Course Outcomes
After completion of this course, the students will be able to:

CO1	Predict solutions for the problems using basic oops concepts
CO2	Interpret generic data type for independent programming which relates to reusability
CO3	Examine the difference between static and dynamic binding and apply both techniques to solve problems.
CO4	Infer the divide and conquer technique for solving typical sorting problems
CO5	Apply the procedure of Greedy method and its application in solving problems

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	1	1	3	1	3	1	1	1	3
CO2	2	3	2	1	1	3	1	3	1	1	1	3
CO3	2	3	2	1	1	3	1	3	1	1	1	3
CO4	3	2	3	2	1	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs		Section B Either/ or Choice	Section C Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K1	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consoli dated (Round ed off)
K1	10	8		18	18.00	18
K2		24	20	44	44.00	44
K3		8	20	28	28.00	28
K4			10	10	10.00	10
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit			Hours	Mode
Unit I	**Introduction to object oriented programming**		**13 Hours**	**Mode**
	a.	Basic Concepts of Object Oriented Programming	3	Descriptive method, PPT Presentation
	b.	Functions in C++, const Member Functions, Data Members and Objects,	2	
	c.	Classes and Objects, Static Data Members and Member Functions	3	
	d.	Array of Objects ,Friendly functions	2	
	e.	Constructors – Constructor Types, Destructors.	3	
Unit II	**Operator Overloading and Inheritance**		**14 Hours**	**Mode**
	a.	Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators	3	Descriptive method, PPT Presentation
	b.	Manipulation of String using Operators	2	
	c.	Inheritance -Defining Derived Class , Protected Derivation , Single Inheritance	3	
	d.	Multilevel Inheritance , Multiple Inheritance, Hierarchal Inheritance	3	
	e.	Hybrid Inheritance , Virtual Base Classes	3	
Unit III	**Pointers and Files**		**17 Hours**	**Mode**
	a.	Abstract Class,Pointers – new and delete operators, Pointers to Objects	3	Descriptive method,Assignments
	b.	this Pointer, Pointers to Derived Classes	2	
	c.	Virtual Functions ,Pure Virtual Functions	2	
	d.	Classes for File Stream Operations Opening and Closing a File	3	
	e.	File Pointers and their Manipulations, Sequential Input and Output Operations	3	
	f.	Error Handling during File Operations, Command Line arguments.	4	
Unit IV	**Introduction to Algorithm and Divide and conquer**		**14 Hours**	**Mode**
	a.	What is an Algorithm? Algorithm Specification,	2	Descriptive method PPT Presentation
	b.	Performance Analysis: Space Complexity ,Time Complexity	3	
	c.	Asymptotic Notations	2	
	d.	Divide and Conquer: General Method-Binary Search ,Merge Sort,	4	
	e.	Quick Sort, Selection Sort.	3	
Unit V	**The Greedy Method**		**15 Hours**	**Mode**
	a.	General Method -Knapsack Problem	3	Descriptive method,Assignment,PPT Presentation
	b.	Job Sequencing with Deadlines	2	
	c.	Minimum Cost Spanning Trees: Prim's Algorithm ,Kruskal's Algorithm	4	
	d.	Optimal Merge Patterns	3	
	e.	Single Source Shortest Paths	3	

Course designed by Mrs.S.Gowthami

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC32	Number of Hours/Cycle		5	
Semester	III	Max. Marks		100	
Part	III	Credit		3	
Core Course IV					
Course Title	Object Oriented Programming with Java	L	T		P
Cognitive Level		Up to K4	73	2	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours
Preamble

This course will help students to improve the analytical skills in object oriented programming, overall development of problem solving and critical analysis and formal introduction to Java programming language

Unit I	Introduction	12 Hours
	Object oriented programming -Two paradigms- Abstraction- OOP Principles - Writing a simple program - Data types - Variables – Single and multi dimensional Arrays – Operators – Control Statements – Class fundamentals - Declaring Objects.	
Unit II	Methods ,Packages and Interfaces	15 Hours
	Introducing methods –Constructors –this keyword Overloading methods – Argument passing – Returning objects –Recursion – Introducing access control **Packages:** Definition - Access Protection - Importing Packages. **Interfaces:** Definition – Implementation	
Unit III	Exception Handling and Multi threaded Programming	17 Hours
	…tion Handling: try – catch - throw - throws – finally …n Exception-User defined exception **Multithreaded Programming**: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication - Deadlock, Suspending, Resuming and Stopping threads.	
Unit IV	I/o Streams and String Handling	14 Hours
	I/O Streams: Byte Streams - Character Streams - Reading console input – Writing console output. **String Handling**: String Class - String Buffer Class.	
Unit V	Applets and AWT	15 Hours
	Applets: Applet Class – Applet architecture – Applet skeleton – Simple applet display methods. **Introducing AWT:** Window fundamentals - Working with Frame windows – Creating frame window in an applet	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Herbert Schildt.,(2017), ”*The Complete Reference, Java 2 “,* Tata McGraw Hill Publishing Company , New Delhi, 5th Edition.

Reference Books

1   E Balagurusamy., (2019), *Programming with Java* , Mc-Graw Hill , 6th Edition
2   Daniel Liang .,(2009), *Introduction to Java Programming*, Pearson Education,New Delhi, 7th Edition,.
3   Sachin Malhotra &Saurabh Chaudhary .,(2013), *Programming in Java*, Oxford University Press,2nd Edition.
4   Doug Lowe, Joel Murach and Andrea Steelman ., (2005), *Murach's Beginning Java 2*, ,SPD,5th Edition.
5   Horstmann& Cornell .,(2012),*Core Java Volume-I Fundamentals*, Pearson Education, New Delhi, 9th Edition.

E-Resources

- https://www.javatpoint.com/
- https://www.tutorialspoint.com/
- https://beginnersbook.com/
- https://www3.ntu.edu.sg/
- https://www.w3schools.com/

Course Outcomes

After completion of this course, the students will be able to:

CO1	Discuss the basic concepts of Object oriented programming.
CO2	Demonstrate the use of methods in java program.
CO3	Apply the concept of exception handling.
CO4	Manipulate the strings using String Class and Stringbuffer Class
CO5	Connect Applets with AWT.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	3	2	2	1	1	3	1	3	1	1	1	3
CO2	2	3	3	1	1	3	1	3	1	1	1	3
CO3	3	2	3	1	1	3	1	3	1	1	1	3
CO4	3	3	3	1	1	3	1	3	1	1	1	3
CO4	3	3	3	1	1	3	1	3	1	1	1	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

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Units	Cos	K-Level	Section A MCQs		Section B Either/ or Choice	Section C Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
5	CO5	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	16		26	26.00	26
K2		16	20	36	36.00	36
K3		8	20	28	28.00	28
K4			10	10	10.00	10
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Object oriented programming	12 Hours	Mode

Unit								
	a. Object oriented programming -Two paradigms	3	Descriptive method, PPT Presentation					Course designed by Mrs.V. Lav anya
	b. Abstraction- OOP Principles	3						
	c. Single and multi dimensional Arrays – Operators – Control Statements	3						
	d. Class fundamentals - Declaring Objects	3						
Unit II	**Methods , Packages and Interfaces**	**15 Hours**	**Mode**					
	a. Introducing methods,Constructors,this Keyword	3	Descriptive method, PPT Presentation , Assignments					
	b. Overloading Methods,Argument passing, Returning Objects	3						

Programme	**BCA**	**Programme Code**		**UCA**
	c. Recursion, Introducing access control	3		
Course Code	**20UCCAC33**	**Number of Hours/Cycle**		**5**
Semester	**III**	d. Packages – Definitions, Access protection, Importing packages **Max. Marks**	3	**100**
Part	**III**	**Credit**		**3**
	e. Interfaces – Definition – Implementation **Core Course V**	3		
Course Title	**Computer System Architecture**		**L**	**T**	**P**	any a
Unit III	**Exception handling and Multithreaded Programming**	**17 Hours**	**Mode**			
Cognitive Level	Up to K4			73	2	-

L- Lecture Hours
T- Tutorial Hours
P- Practical Hours

	a. try,catch,throw, throws	4	Descriptive method PPT Presentation,	
	b. Finally, Built in exception, user defined exception.	2		
	c. Thread class, Runnable interface, Synchronization	4		
	d. Using synchronized methods, Using synchronization statement	3		
	e. Interthread Communication - Deadlock, Suspending, Resuming and Stopping threads.	4		
Unit IV	**I/O Streams and String Handling**	**14 Hours**	**Mode**	
	a. Byte streams, Character streams	4	Descriptive method, PPT Presentation	
	b. Reading Console input, Writing Console output	5		
	c. Stringclass, String buffer class	5		
Unit V	**Applets and AWT**	**15 Hours**	**Mode**	
	a. Applet class, Applet architecture, Applet skeleton, Simple applet display methods	5	Descriptive method , Assignment, PPT Presentation.	
	b. Introducing AWT – Window fundamentals, Working with frame windows	5		
	c. Creating frame window with an applet	5		

Preamble

This course enables the students to understand concept of Logic gates, digital components , CPU , Input Output devices and various types of memory

Unit I	Digital Logic Circuits and Digital Components	15 Hours

	Digital Logic Circuits: Digital Computers – Logic Gates - Boolean Algebra – Map simplification – Combinational circuits – Flip flops – Sequential circuits. **Digital Components**: Integrated Circuits – Decoders – Multiplexers	
Unit II	**Digital Components and Data Representation**	**13 Hours**
	Digital Components::Registers –Shift registers – Binary counters – Memory unit **Data Representation** :Data types – Complements – Fixed point representation – Floating point representation – Other Binary codes – Error detection codes	
Unit III	**Register Transfer and Micro operations and Basic Computer Organization**	**17 Hours**
	Register Transfer and Micro operations : Register Transfer Language – Register Transfer – Bus and memory transfers – Arithmetic Micro operations –Logic Micro operations – Shift Micro operations – Arithmetic Logic Shift Unit **Basic Computer Organization** :Instruction codes – Computer Registers – Computer Instructions – Timing and Control – Instruction cycle	
Unit IV	**Programming the Basic Computer and Central Processing Unit**	**14 Hours**
	Programming the Basic Computer: Introduction – Machine Language – Assembly Language – The Assembler – Program Loops – Programming Arithmetic and Logic Operations – Subroutines **Central Processing Unit:** Introduction – General Register Organization – Stack Organization – Instruction Formats – Addressing modes – Data Transfer and Manipulation	
Unit V	**Input – Output Organization and Memory Organization**	**14 Hours**
	Input – Output Organization: Peripheral devices – Input-Output Interface – Asynchronous Data Transfer – Modes of Interrupt –Priority Interrupt – Direct Memory Access **Memory Organization:** Memory hierarchy – Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. M. Morris Mano,,(2017),"*Computer System Architecture*, Pearson Education", 3rd edition

Reference Books

1. William Stallings,(2015),"*Computer Organization & Architecture*", Pearson India Education Services Pvt Ltd, 9th Edition
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, (2002),"*Computer Organization*, Tata McGraw Hill ", 5th Edition
3. Tanenbaum,(2016).,"*Structured Computer Organization*", Pearson India Education Services Pvt Ltd, 6th edition

4. John P Hayes,(2017) ,"*Computer Architecture and Organization*" , McGraw Hill,3rd edition

E-Resources
- https://www.w3schools.com/computer-organization/
- http://www.a-zshiksha.com/forum/viewtopic.php?f=133&t=61511/notes-co
- https://www.smartzworld.com/notes/computer-organization-pdf
- https://gurukpo.com/Content/BCA/computerorganization.pdf
- https://www.geektonight.com/computer-organization-and-architecture

Course Outcomes
After completion of this course, the students will be able to:

CO1	Explain simplification of Map ,Circuits and flip-flops
CO2	Assess data types and produce complements
CO3	Explain types of transfers, micro operations and organization of Computer
CO4	Determine the steps to program basic computer and working of CPU
CO5	Differentiate between different types of memory

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	3	1	1	3	1	2	1	1	1	1	1	3
CO2	2	1	2	3	1	3	1	1	1	1	1	3
CO3	3	1	2	3	1	3	1	1	1	1	1	3
CO4	3	3	3	3	2	3	1	1	1	1	1	3
CO5	3	2	2	3	1	2	1	1	1	1	1	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3

Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8		18	18.00	18
K2		16	10	26	26.00	26
K3		16	20	36	36.00	36
K4			20	20	20.00	20
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Digital Logic Circuits and Digital Components**	**15 Hours**	**Mode**
	Digital Computers – Logic Gates - Boolean Algebra – Map simplification –	5	Descriptive method, PPT Presentation
	Combinational circuits – Flip flops – Sequential circuits.	5	
	Integrated Circuits – Decoders – Multiplexers	5	
Unit II	**Digital Components and Data Representation**	**13 Hours**	**Mode**
	Registers –Shift registers – Binary counters – Memory unit	5	Descriptive method, PPT Presentation , Assignments
	Data types – Complements – Fixed point representation	4	
	Floating point representation – Other	4	

Unit III	**Register Transfer and Micro-opeartions**	**17 Hours**	**Mode**
	Binary codes – Error detection codes		
	Register Transfer Language – Register Transfer – Bus and memory transfers – Arithmetic Micro operations	5	Descriptive method,PPT Presentation
	Logic Micro operations – Shift Micro operations – Arithmetic Logic Shift Unit - Instruction codes – Computer Registers	6	
	Computer Instructions – Timing and Control – Instruction cycle	6	
Unit IV	**Programming the Basic Computer and Central Processing unit**	**14 Hours**	**Mode**
	Introduction – Machine Language – Assembly Language – The Assembler	4	Descriptive method, PPT Presentation
	Program Loops – Programming Arithmetic and Logic Operations – Subroutines Introduction – General Register Organization	5	
	Stack Organization – Instruction Formats – Addressing modes – Data Transfer and Manipulation	5	
Unit V	**Input – Output Organization and Memory Organization**	**14 Hours**	**Mode**
	Peripheral devices – Input-Output Interface – Asynchronous Data Transfer	4	Descriptive method, Assignment, PPT Presentation.
	Modes of Interrupt –Priority Interrupt – Direct Memory Access Memory hierarchy – Main memory – Auxiliary memory	5	
	Associative memory – Cache memory – Virtual memory Hard-wired Control, Micro programmed Control	5	

Course designed by Mrs.P.Aarthy

Programme	BCA	Programme Code	UCA		
Course Code	20UCAC3P	No. of Hrs per Cycle	4		
Semester	III	Max. Marks	100		
Part	III	Credit	3		
Core Course Practical V					
Course Title	Computer Algorithm with C++ Lab		L	T	P
Cognitive Levels	Upto K4		-	-	60

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble
     This paper will train the students to develop smart computational algorithmic solutions through C++ programming**.**

List of Practicals

Write A Program In C++
    1. To create classes and objects
    2. To add two numbers using the concept of operator Overloading

3. To implement the concept of function overloading.
4. To manipulate String operations.
5. To implement all types of inheritance
6. To demonstrate Pointers
7. To implement Virtual Functions.
8. To process Files and Streams.
9. To implement Knapsack problem using greedy method.
10. To demonstrate minimum spanning tree using Prim's algorithm.
11. To show the working of Bubble sort.
12. To find a book in library using Binary search.
13. To implement Quick sort algorithm.
14. To show the working of Merge sort algorithm.

Course Designed By: Mrs.S.Gowthami

Programme	BCA	Programme Code			UCA
Course Code	20UCAC3Q	No. of Hrs per Cycle			5
Semester	III	Max. Marks			100
Part	III	Credit			3
Core Course Practical VI					
Course Title	Object Oriented Programming with Java Lab	L	T		P
Cognitive Levels	Upto K4	-	-		75

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

To develop programs using fundamental concepts of java and demonstrate advanced programming using threads and applets.

List of Practicals

Write a program in JAVA

       1. To define control structures

       2. To create arrays.

       3. To define class, methods and objects.

       4. To demonstrate constructors.

       5. To demonstrate method overloading.

       5. To define inheritance

       6. To implement method overriding.

       7. To demonstrate Packages.

       8. To demonstrate Exception Handling.

       9. To create Multithreading.

       10. To demonstrate I/O operations.

       11. To process file operations

       12. To implement Applet

       13. To implement event handling

Course Designed By: Mrs.V.Lavanya

Programme	BCA	Programme Code	UCA			
Course Code	20UCAS3P	No. of Hrs per Cycle	2			
Semester	III	Max. Marks	100			
Part	IV	Credit	2			
Skill Based Course I						
Course Title	Business Accounting TALLY Lab			L	T	P
Cognitive Level	Upto K4			-	-	30

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

To expose the students about the basics of business organizations and accounting in Tally

List of Practicals

    I.   Company Creation
    II.   Ledger Creation
    III.   Voucher Creation
        a) Contra voucher
        b) Payment voucher
        c) Receipt voucher
        d) Journal voucher
        e) Purchase voucher
        f) Sales counter
    IV. Reports
        a) Day book
        b) Trail balance
        c) Final Accounts
        d)   Purchase Register
        e) Sales Register
        f) Outstanding Receivable
        g) Outstanding Payable
        h) Cheque Printing
        i) Bank Reconciliation Statement

Course Designed By: Mrs.P.Aarthy

Programme	BCA	Programme Code			UCA
Course Code	20UCAC41	Number of Hours/Cycle			5
Semester	IV	Max. Marks			100
Part	III	Credit			3
Core Course VI					
Course Title	C#.Net Programming		L	T	P
Cognitive Level		Up to K4	73	2	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course enables the students to understand the basics of C#..NET, Controls, Classes, objects, strings, Concept of menus, built-in dialog boxes, toolbars and status bars. This makes them to create real time windows form applications.

Unit I	**Getting Started With C#**	**13 Hours**
	A Simple C# Console Application-Windows First Form :Adding Controls To A Blank Form -Properties Of A Control -Adding Code To A Button -A Other Things To Do With The Message Box- Other Button Options -Adding Icons To A Message Box-Variables: Strings , Numbers.	
Unit II	**Basic Windows Control**	**12 Hours**
	List Controls, Ore Controls. Adding Menus To Windows Form, Events -The Click Event For Buttons -The Mouse down Event -The Key down Event -The Leave Event –List box And Combo box Events	
Unit III	**Classes And Objects In C# .Net**	**17 Hours**
	What Is A Class? What Is An Object? Creating Objects From Your Classes -Passing Values To Your Classes - Adding Properties To Your Class -Using Your Properties - Class Constructors -Inheritance -Method Overloading - Static Methods. Collections- Lists-Hash tables- Understanding Arrays.	
Unit IV	**String Manipulation In C#**	**15 Hours**
	String Variables- Methods-Manipulating Files With C# .Net :Open A File, Read, Write, Append And Closing A File. Creating Multiple Forms: Modal Forms -Getting At The Values On Other Forms-Graphics: The Rectangle Class. - Brushes - Drawing Polygons -Drawing Text.	
Unit V	**Sql Server Express And Visual C# .Net**	**16 Hours**
	What Is Sql Server Express? Create Tables -Adding Data - Create A Database Project -Connecting To A Sql Server Express Database - Datasets And Data Adapters - Accessing Data From The Dataset - Database Navigation Buttons - Add A New ,Update And Delete A Record -Finding Records- How To Create A Class Library File.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book
1. Ken Carney. (2020) ,"*C# .NET: for complete beginners*" , Home and Learn Publishers.
2. Erik Brown. (2002) ,"*Window forms with C#*" , Manning Publications.

Reference Books
1. Jon skeet.(2019) ,"*C# In depth*" , Manning Publications, 4th Edition.
2. John sharp.(2018) ,"*Microsoft visual C# step by step*" , Microsoft Press , 9th Edition.
3. Joseph Albahari & Ben Albahari .(2019) ,"*C# 8.0 Pocket Reference*" , O'Reilly Publications.

E-Resources
- https://www.c-sharpcorner.com
- https://www.w3schools.com
- https://www.tutorialsteacher.com
- https://www.javatpoint.com
- https://www.guru99.com

Course Outcomes
After completion of this course, the students will be able to:

CO1	Discuss the fundamentals of C#.Net framework
CO2	Describe various controls and events in C#.Net
CO3	Manipulate properties of Class in C#.Net
CO4	Infer Manipulation of Strings and Files in C#
CO5	Use and connect to Sql Server Express Database

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	3	3	2	1	1	3	1	3	1	1	1	3
CO2	2	2	3	2	2	3	1	3	1	1	1	3
CO3	2	2	3	2	2	3	1	3	1	1	1	3
CO4	2	3	3	2	2	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A	Section B	Section C

			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	16		26	26.00	26
K2		16	20	36	36.00	36
K3		8	20	28	28.00	28
K4			10	10	10.00	10
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Getting Started with C#	13 Hours	Mode

I	A Simple C# Console Application-Windows First Form :Adding Controls To A Blank Form	4	Descriptive method, PPT Presentation	
	Properties Of A Control -Adding Code To A Button -A Other Things To Do With The Message Box	3		
	Other Button Options -Adding Icons To A Message Box	3		
	Variables: Strings , Numbers.	3		
Unit II	**Basic Windows Control**	**12 Hours**	**Mode**	
	List Controls, Ore Controls. Adding Menus To Windows Form, Events	4	Descriptive method,,PPT Presentation, Assignments	
	The Click Event For Buttons -The Mousedown Event -The Keydown Event – x	4		
	The Leave Event -Listbox And Combobox Events extboxes, Rich Textbo	4		
Unit III	**Classes and objects**	**17 Hours**	**Mode**	
	What Is A Class? What Is An Object? Creating Objects From Your Classes - Passing Values To Your Classes -	5	Descriptive method, PPT Presentation,	
	Adding Properties To Your Class -Using Your Properties -Class Constructors	4		
	Inheritance -Method Overloading -.	4		
	Static Methods. Collections- Lists-Hash tables-Understanding Arrays	4		
Unit IV	**String Manipulation and Files in C#**	**15 Hours**	**Mode**	
	String Variables- Methods	3	Descriptive method, PPT Presentation	
	Manipulating Files With C# .Net :Open A File, Read, Write, Append And Closing A File Creating Multiple Pickers, Notify Icons, Tool tips	5		
	Forms: Modal Forms -Getting At The Values On Other Forms-	3		
	Graphics: The Rectangle Class. - Brushes - Drawing Polygons -Drawing Text.	4		
Unit V	**Sql Server and Visual C#**	**16 Hours**	**Mode**	
	What Is Sql Server Express? Create Tables -Adding Data -Create A Database Project	5	Descriptive method, Assignment,PPT Presentation, Group discussions.	
	Connecting To A Sql Server Express Database - Datasets And Data Adapters - Accessing Data From The Dataset -	6		
	Database Navigation Buttons - Add A New ,Update And Delete A Record -Finding Records- How To Create A Class Library File.	5		

Course designed by Mrs.K.Priyadharsini

Programme	BCA	Programme Code		UCA
Course Code	**20UCAC42**	**Number of Hours/Cycle**		**5**

Semester	IV	Max. Marks		100
Part	III	Credit		3
Core Course VII				
Course Title	Relational DBMS	L	T	P
Cognitive Level	Up to K4	73	2	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

       This course is dedicated to make students understand the database concept and design, Run data manipulation statements (DML) , Describe the features and syntax of PL/SQL, stored procedures and functions, and Use PL/SQL programming constructs

Unit I	**Database concept and Design**	13 Hours
	Database Concepts: A Relational approach: Database – Relationships – DBMS – Relational Data Model – Integrity Rules – Theoretical Relational Languages. **Database Design**: Data Modeling and Normalization: Data Modeling – Dependency – Database Design – Normal forms – Dependency Diagrams – De -normalization – Another Example of Normalization. .	
Unit II	**Oracle9i: Overview and Oracle Tables**	15 Hours
	Overview :Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus - SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - iSQL *Plus. **Oracle Tables**: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.	
Unit III	**Working with Table**	16 Hours
	Data Management and Retrieval: DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – Revisiting Substitution Variables – DEFINE command – CASE structure. Functions and Grouping: Built-in functions –Grouping Data. Multiple Tables: Joins and Set operations: Join – Set operations.	
Unit IV	PL/SQL	15 Hours
	PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L in PL/SQL – Data Manipulation – Transaction Control	

	statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	
Unit V	**PL/SQL Composite Data Types**	**14 Hours**
	PL/SQL Composite Data Types: Records – Tables – arrays. Named Blocks: Procedures – Functions – Packages –Triggers –Data Dictionary Views	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Nilesh Shah (2015),,"*Database Systems Using ORACLE,*", , 2nd edition, Pearson Education, India

Reference Books

1. Arun Majumdar & Pritimoy Bhattacharya(2017) ,"*DATABASE MANAGEMNET SYSTEMS* ", TMH.
2. Raguramakrishnan, Johaanes Gehrke,(2014) ,"*DATABASE MANAGEMETN SYSTEMS"*,3rd edition, TMH.
3. Steven Feuerstein (2014) ,"*Oracle PL/SQL Programming: Covers Versions Through Oracle Database*", 6th Edition.
4. Kevin Loney, George Koch ,(2002),"*Oracle9i: The Complete Reference*", McGraw Hill
5. Scott Urman.(2002),"*Oracle 9i PL/SQL Programming*" , 1St Edition, TMH

E-Resources

- https://www.javatpoint.com/dbms-tutorial
- https://beginnersbook.com/2015/04/dbms-tutorial/
- https://www.studytonight.com/dbms/
- https://www.guru99.com/pl-sql-tutorials.html
- https://www.w3schools.com/

Course Outcomes

After completion of this course, the students will be able to:

CO1	Tell about database concepts
CO2	Discuss about oracle 9i and oracle SQL *plus
CO3	Determine the concept of Data Manipulation language, Arithmetic operations and Functions, Grouping
CO4	Summarize PL/SQL data types, operators and control statements
CO5	Illustrate various PL/SQL Composite data types

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO	PS	PS	PSO	PS	PS	PSO	PSO	PSO	PSO	PS	PSO

	1	O2	O3	4	O5	O6	7	8	9	10	O 11	12
CO 1	3	2	2	1	1	3	1	3	1	1	1	3
CO 2	3	3	3	1	1	3	1	3	1	1	1	3
CO 3	2	3	3	1	1	3	1	3	1	1	1	3
CO 4	2	3	1	1	1	3	1	3	1	1	1	3
CO 5	2	2	2	1	1	3	1	3	1	2	1	2

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K1	2(K2&K2)	1(K2)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8		18	18.00	18
K2		16	20	36	36.00	36
K3		16	20	36	36.00	36
K4			10	10	10.00	10
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	Database concept and Design	13 Hours	Mode
	A Relational approach: Database – Relationships	3	

			Descriptive method, PPT Presentation
	– DBMS – Relational Data Model		
	Integrity Rules – Theoretical Relational Languages	3	
	Data Modeling and Normalization: Data Modeling – Dependency – Database Design	3	
	Normal forms – Dependency Diagrams – De - normalization – Another Example of Normalization.	4	
Unit II	**Oracle9i: Overview and Oracle Tables**	**15 Hours**	**Mode**
	Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus	4	Descriptive method, PPT Presentation,Assignment
	SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - iSQL *Plus.	4	
	DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information	4	
	Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.	3	
Unit III	**Working with Table**	**16 Hours**	**Mode**
	Data Management and Retrieval: DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table	4	Descriptive method
	Arithmetic Operations – restricting Data with WHERE clause – Sorting – Revisiting Substitution Variables	4	
	DEFINE command – CASE structure. Functions and Grouping: Built-in functions	4	
	Grouping Data. Multiple Tables: Joins and Set operations: Join – Set operations.	4	
Unit IV	**PL/SQL**	**15 Hours**	**Mode**
	A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators	5	Descriptive method, PPT Presentation
	Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L in PL/SQL – Data Manipulation – Transaction Control statements	5	
	PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	5	
Unit	**PL/SQL Composite Data Types**	**14 Hours**	**Mode**

V	Records – Tables – arrays.	4	Descriptive method, PPT Presentation, Assignment
	Named Blocks: Procedures – Functions – Packages	5	
	Named Bolocks:Triggers –Data Dictionary Views	5	

Course designed by Mr.K.Muthubarathi

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC43	Number of Hours/Cycle		5	
Semester	IV	Max. Marks		100	
Part	III	Credit		3	
Core Course VIII					
Course Title	Principles of Operating System		L	T	P
Cognitive Level		Up to K4	73	2	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

      This course will enable the student to have an overview on the components and functions of Operating systems. It will also provide knowledge on the synchronization, principles of deadlock, processor scheduling, process management, memory management and disk management.

Unit I	**Introduction to OS and Operating System Architecture**	**15 Hours**
	Introduction to OS: Introduction – Need of OS – Evolution of OS – Types of OS – Goals of an OS – Functions of OS – OS's Generic Components **Operating System Architectures:** Introduction – General working of OS – System calls – System programs – System Generation programs – General Structure of OS – Monolithic – Layered – Virtual machine – Microkernel – Exo kernel-Hybrid Kernel based OS	
Unit II	**Fundamentals of Process management**	**13 Hours**
	Introduction – Terminology – Implicit and Non-implicit processes –Relationship between processes – Life Cycle of a Process – Process Control Block – Implementation of Processes – Context Switching – Process switching – Schedulers – Process Operations	
Unit III	**Process Scheduling , Process Communication and Synchronization**	**17 Hours**
	Process Scheduling :Introduction – Process Behavior for Scheduling – Scheduling Decision - Scheduling Levels – Scheduling types – Process-scheduling goals – Scheduling Algorithms **Process Communication and Synchronization**: Introduction – Concurrent Processes – Critical Section – Algorithmic approach to CS – Semaphores – Solution of Classic Synchronization Problems using Semaphores – Critical Regions – Monitors	
Unit IV	**Deadlocks and Basic Memory Management**	**15 Hours**
	Deadlock: Introduction – Defining Deadlocks – Modeling of Deadlocks –Conditions for Deadlock – Dealing with Deadlock - Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock – Practical Approach for Deadlock handling – Two-phase Locking – Starvation **Basic Memory Management:** Introduction – Basic Concepts – Contiguous memory Allocation – Buddy system	

	– Non-Contiguous Memory Allocation – Paging Concept – Page table structures – Segmentation	
Unit V	**Disk Management**	**13 Hours**
	Introduction – Disk Scheduling – Disk-scheduling Criteria – Disk Scheduling algorithms – Rotational Optimization – Disk formatting – Bad sectors – Swap space Management – RAID Structure	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Naresh Chauhan, (2014), "Principles of Operating Systems", First Edition, Oxford University Press, NewDelhi.

Reference Books

1. Silberschatz Abraham, Galvin Baer Peter and Gagne Greg, (2012),"*Operating System Concepts*", Ninth Edition, , John Wiley & Sons Pvt. Ltd,USA
2. Deitel & Deitel Chofines, (2008), "*Operating systems*", Third Edition, Pearson education., Mumbai.
3. Tanenbaum S. Andrew, (2011),"*Modern Operating Systems*", Third Edition, Prentice-Hall, Inc
4. Stallings William, (2011),"*Operating Systems*", Seventh Edition,, Pearson Education.
5. nanjay Dhamdhere, M., (2012), "*Operating Systems, A concept based approach*", Third Edition,TMH, New Delhi.

E-Resources

- https://www.tutorialspoint.com/operating_system/index.htm
- https://www.oreilly.com/library/view/
- https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/
- https://en.wikipedia.org/wiki/Transaction_processing_system
- https://www.tutorialspoint.com/operating_system/os_memory_management.html

Course Outcomes

After completion of this course, the students will be able to:

CO1	Classify the functions ,components and architecture of operating system
CO2	Predict the process management concept for the given situation
CO3	Solve Classic Synchronization problems using semaphores
CO4	Categorize conditions of Deadlock and deal with Deadlock
CO5	Discover bad sectors and manage disks

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	3	2	2	3	1	2	1	1	1	1	1	3
CO2	2	3	2	3	1	2	1	1	1	1	1	3
CO3	3	2	2	3	1	2	1	1	1	1	1	3
CO4	2	3	2	3	1	2	1	1	1	1	1	3
CO5	3	3	2	3	1	2	1	1	1	1	1	3

3. High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs — No. Of Questions	Section A MCQs — K-Level	Section B Either/ or Choice — No. Of Question	Section C Open Choice — No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
2	CO2	Up to K2	2	K1&K1	2(K1&K1)	1(K2)
3	CO3	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
4	CO4	Up to K4	2	K1&K1	2(K3&K3)	1(K4)
5	CO5	Up to K3	2	K1&K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	16		26	26.00	26
K2		16	20	36	36.00	36
K3		8	20	28	28.00	28
K4			10	10	10.00	10
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	Introduction to OS and Operating System Architecture	15 Hours	Mode
	Introduction – Need of OS – Evolution of OS – Types of OS –	4	Descriptive method, PPT Presentation
	Goals of an OS – Functions of OS – OS's Generic Components	3	
	Introduction – General working of OS – System calls – System programs – System Generation programs	3	
	General Structure of OS –Monolithic – Layered – Virtual machine – Microkernel – Exokernel-Hybrid Kernel based OS	5	
Unit II	Fundamentals of Process management	13 Hours	Mode
	Introduction – Terminology – Implicit and Non-implicit processes	4	Descriptive method, PPT Presentation, Assignments
	Relationship between processes – Life Cycle of a Process – Process Control Block	4	
	Implementation of Processes – Context Switching – Process switching – Schedulers – Process Operations	5	
Unit III	Process Scheduling , Process Communication and Synchronization	17 Hours	Mode
	Introduction – Process Behavior for Scheduling – Scheduling Decision - Scheduling Levels	4	Descriptive method, PPT Presentation
	Scheduling types – Process-scheduling goals – Scheduling Algorithms	4	
	Introduction – Concurrent Processes – Critical Section – Algorithmic approach to CS	4	
	Semaphores – Solution of Classic Synchronization Problems using Semaphores – Critical Regions – Monitors	5	
Unit IV	Deadlock and MultiThreading	15 Hours	Mode
	Introduction – Defining Deadlocks – Modeling of Deadlocks –Conditions for Deadlock – Dealing with Deadlock – Deadlock Prevention	4	Descriptive method, PPT Presentation
	Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock – Practical Approach for Deadlock handling – Two-phase Locking – Starvation	5	
	Introduction – Basic Concepts – Contiguous memory Allocation – Buddy system	3	

	usage of Multi-Threading –Types of threads – Hybrid threads –Thread operations and other issues in Thread Implementation	3	
Unit V	**Disk Management**	**13 Hours**	**Mode**
	Introduction – Disk Scheduling – Disk-scheduling Criteria	4	Descriptive method,Assign ment,PPT Presentation, Group discussions.
	Disk Scheduling algorithms – Rotational Optimization	3	
	Disk formatting – Bad sectors	3	
	Swap space Management – RAID Structure	3	

Course designed by Mrs.M.Chandamona

Programme	BCA	Programme Code		UCA
Course Code	20UCAC4P	Number of Hours/Cycle		5
Semester	IV	Max. Marks		100
Part	III	Credit		3
Core Practical VII				
Course Title	C#.Net Programming Lab	L	T	P
Cognitive Level	Up to K4	-	-	75

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

To develop applications on Controls, Classes , objects, strings, Concept of menus, built-in dialog boxes, toolbars and database connectivity.

List of Practicals

C# Console application:

1. **To get a number and display the number in reverse order**
2. To swap the contents of two numbers using Bitwise XOR operation.
3. To check whether the given integer has an alternate pattern.
4. To perform unboxing operation.
5. To implement for-each interface.
6. To find rank of a given matrix.

C# Windows application:

1. Design a login form using basic controls.
2. Create a menu driven application.
3. Design calculator application.
4. Design traffic signal application.
5. Implement any four event handlers.
6. Draw geometric shapes using graphics.
7. To implement string manipulation.
8. To design a database using ADO.net.
9. Create a student database and implement database navigation buttons.
10. Create an employee database and display data in DataGridView.

Course designed by Mrs.K.Priyadharsini

Programme	BCA	Programme Code			UCA
Course Code	20UCAC4P	Number of Hours/Cycle			4
Semester	IV	Max. Marks			100
Part	III	Credit			3
Core Practical VII					
Course Title	RDBMS with Oracle Lab		L	T	P
Cognitive Level	Up to K4		-	-	60

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble:

To design databases using SQL and create appropriate queries to extract information from databases and write PL/SQL programs using triggers, Cursors and Exception.

List of Practicals

1. Creating, modifying and dropping Tables.
2. Creating tables with referential and check constraints.
3. Inserting, modifying, deleting rows.
4. Dropping, disabling /enabling constraints.
5. Retrieving rows with operators in where Clause.
6. Retrieving rows with Character functions.
7. Retrieving rows with Number and Date functions.
8. Retrieving rows with Group functions and HAVING.
9. Joining Tables. (Inner and Outer).
10. Retrieving rows with Sub Queries.
11. Simple PL/SQL Programs.
12. PL/SQL programs with control structures.
13. PL/SQL programs with Cursors.
14. PL/SQL programs with Exception Handling.
15. Creating and Calling Procedures.
16. Creating and Calling Functions.
17. Creating and Calling Packages.
18. Overloading Packages.
19. Working with Triggers.

Course designed by Mr.K.Muthubarathi

Programme	BCA	Programme Code		UCA	
Course Code	20UCAS4P	Number of Hours/Cycle		2	
Semester	IV	Max. Marks		100	
Part	IV	Credit		2	
Skill Based Course II					
Course Title	Image Design Lab		L	T	P
Cognitive Level	Up to K4		-	-	30

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble:

   To use basic tools and techniques in Indesign and Illustrator to design magazines,logo,E-book , wrappers etc..

List of Practicals
Adobe Illustrator

1. Design an Artwork for a Postcard using shapes.
2. Create a Digital Tattoo art.
3. Apply dynamic gradient to an image.
4. Design a logo for an organization.
5. Create a T-shirt design using vector art.
6. Create an infographics for an Hotel.

Adobe Indesign

1. Create a logo for a company
2. Create and publish the cover and index pages of the book.
3. Create and publish the Digital magazines using Indesign Tools.
4. Create and publish the eBooks model page.
5. Create and publish posters for your institution.
6. Create and publish the online application

Course designed by Mrs.M.Chandamona

Extra Credit Value Added Courses

Programme	BCA	Programme Code	UCA
Course Code	20CBCA41	Number of Hours/Cycle	2
Semester	III	Max. Marks	100
Part	III	Credit	2
Value Added Course I			
Course Title	Introduction to E-Commerce		

Preamble

To make students understand about basics, process models and impact of E-Commerce. Students can analyze the concept of electronic payment

Unit I	Basics and definitions	6 Hours
	The term E-Commerce – Business models related to E-Commerce-Technical and Economic challenges	
Unit II	Frameworks and architectures	6 Hours
	Actors and stakeholders – Fundamentals sales process – Technological elements	
Unit III	B2C and B2B Business	6 Hours
	The Process model and its variants – The Pricing Challenge –The fulfillment challenge – The payment challenge – B2C business and CRM – B2C software systems The process model and its variants – B2B software systems	
Unit IV	Impact of E-Commerce	6 Hours
	Ethics , morale and technology –Ethical aspects of ICT – Overall impacts of E-Commerce –Specific Impacts of E-Commerce	
Unit V	Electronic payment	6 Hours
	Business and money - The payment challenge – Payment procedures – Receivable management – Cyber money	

Text Book
1.Martin kutz,(2016),"*Introduction to E-Commerce*", First edition,bookboon.com

Reference Books
1. Ravi Kalakota, Andrew B. Whinston(2002), "*Frontiers of E-Commerce*", Pearson Education
2. Janice Reynolds(2017), "*The Complete E-Commerce book*", Second edition, CRC Press
3. Ian Daniel(2011), "*E-Commerce : Get it Right*" ,NeuroDigital
Course designed by Mrs.M.Chandamona

Programme	BCA	Programme Code	UCA
Course Code	20CBCA42	Number of Hours/Cycle	2
Semester	IV	Max. Marks	100
Part	III	Credit	2
	Value Added Course II		
Course Title	PC Hardware and Troubleshooting		

Preamble

This course helps students to gain the knowledge on hardware components of the computer. And also learn about Trouble Shooting, Servicing and Computer maintenance.

Unit I	**Introduction to Computer**	**5 Hours**
	Introduction to Computer - Components of Computer - Booting Process -Assemble the PC - Concept of BIOS – Review	
Unit II	**Basic Computer Technical Knowledge**	**4 Hours**
	Basic Computer Technical Knowledge - How a Computer Works – Hardware – Software – Review	
Unit III	**Computer Maintenance**	**6 Hours**
	Computer Maintenance - Why Maintain? - Updating Software - Virus and Malware -Prevention and Removal - Computer Hardware Maintenance - Peripheral Hardware Use and Maintenance – Review	
Unit IV	**Setting Up or Customizing a Computer**	**6 Hours**
	Setting Up or Customizing a Computer - When a Computer Arrives - Partitioning a Hard Drive - Installing Operating Systems - Installing and Uninstalling Other Software - Setting Up User Accounts – Review	
Unit V	**Computer Troubleshooting and Repair Basics**	**9 Hours**
	Computer Troubleshooting and Repair Basics - Improving Slow Performance - Stepwise guides for Common Problems - Understanding Error Messages - How to Search for Information - How to Distinguish a Software Issue from a Hardware Issue - Fixing Software Problems - Fixing Hardware Problems - Troubleshooting and Repairing Printers - Managing E-Waste - Review	

Text Book

1. Craig Zacker, John Rourke ,(2017),"*PC HARDWARE – The Complete Reference*",Mc Graw Hill Education,India

Reference Books

1. Nega Tarekegn Adane , Kumilachew Tegegne Alemu ,(2015)"A Simple Guide to Computer Maintenance and Troubleshooting"
2. D. Balasubramanian, (2010),*"Computer Installation and Servicing"*, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2010.
3. Peter Abel, Niyaz Nizamuddin,(2007), "*IMB PC Assembly Language and Programming*", Pearson Education
4. Scott Mueller,(1992), "*Repairing PC's*", PHI
5. Brain Austin, (2006),"*Upgrading your PC in Easy steps*", Dream tech publications

Course designed by Mrs.M.Chandamona

Programme	BCA	Programme Code			UCA
Course Code	20UCAC51	Number of Hours/Cycle			4
Semester	V	Max. Marks			100
Part	III	Credit			4
Core Course IX					
Course Title	Big data Analytics using R	L	T	P	
Cognitive Level	Up to K3	60		-	

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course helps to learn basic terminologies of R Programming, data warehouse environment, challenges in big data, terminologies used in Hadoop environment and HDFS Concepts. It describes Hadoop Eco System such as Pig for data analytics on Structured and Unstructured Data.

Unit I	**Introduction to R**	**11 Hours**
	Introduction to R: Introduction- R Nuts and Bolts- Getting Data In and Out of R - Vectorized Operations - Dates and Times- Control Structures – Functions - Loop Functions.	
Unit II	**Types of Digital Data and Introduction to Big Data:**	**11 Hours**
	Types of Digital Data: Classification of Digital Data, **Introduction to Big Data:** Characteristics of data-Evolution of Big data- Need for Big Data – A Typical Data Warehouse Environment – A Typical Hadoop Environment – New Technologies – changes in the Realms of Big Data	
Unit III	**Big data analytics:**	**12 Hours**
	Beginning of big data – Big Data Analytics – Classification of Analytics — Top Challenges Facing Big Data – Need for Data Analytics –Data Science – Data Scientist.	
Unit IV	**Introduction to Hadoop:**	**14 Hours**
	Introducing Hadoop – Distributed Computing Challenges – History of Hadoop – Hadoop Overview – Use Case of Hadoop – Hadoop Distributors – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Interacting with Hadoop Ecosystem.	
Unit V	**Introduction to Pig**	**12 Hours**
	Pig: Introduction -Anatomy – Pig Latin Overview - Pig Primitive Data Types -Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function	

Pedagogy
Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1.SeemeAcharya, Subhashini Chellappan, (2015), 1st Edition," *Big Data and Analytics"*, Wiley India Pvt.Ltd, Kolkatta.

2.Roger D.peng, (2012), **"*R Programming for Data Science"*, Lean Publications, Canada.

Reference Books

1. Nathan Marz, James Warren, (2015), "*Big Data – Principles and best practices of scalable real-time data systems"*, Manning Publication, USA.

2. Tom White, (2015), "*Hadoop The Definitive Guide"*, O'Reilly Publications, Fourth Edition.

3. Paul Zikopoulos, (2012), "*Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data"*, McGraw Hill, Chuck Lam.

4. Jared P. Lander, "*R for Everyone: Advanced Analytics and Graphics"*, 2nd Edition, Pearson Education, 2018.

5. S. R. Mani Sekhar and T. V. Suresh Kumar, "*Programming with R"*, 1st Edition, CENGAGE, 2017.

E-Resources

- https://www.tutorialspoint.com/big_data_analytics/
- https://www.simplilearn.com/what-is-big-data-analytics
- https://www.analyticssteps.com/
- http://leanpub.com/rprogramming
- https://www.r-project.org/

Course Outcomes
After completion of this course, the students will be able to:

CO1	Enumerate to learn the basic terminology of R
CO2	Discover solutions for the problems using basic big data analytics
CO3	Discuss great challenges and terminology used for big data analytics
CO4	Express the Hadoop for distributed computing challenges
CO5	Interpret the pig technique for solving typical distributed problems

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6	PSO 7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	1	3	1	3	1	1	1	3
CO2	2	3	2	1	1	3	1	3	1	1	1	3
CO3	2	3	2	1	1	3	1	3	1	1	1	3
CO4	3	2	3	2	1	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A	Section B	Section C
			MCQs	Either/ or Choice	Open Choice

			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1	2(K3)	1(K3)
5	CO5	Up to K3	2	K1	2(K3)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		16	20	36	36.00	36
K3		16	20	36	36.00	36
Total Marks	10	40	50	100	100.00	100

Lesson Plan

Unit I	Introduction to R	11 Hours	Mode
	a. Introduction - R Nuts and Bolts	2	Descriptive method, Assignment, PPT Presentation
	b. Getting Data In and Out of R-Vectorized Operations - Dates and Times	4	
	c. Control Structures - Functions - Loop Functions.	5	
Unit II	Types of Digital Data and Introduction to Big Data:	11 Hours	Mode
	a. Types of Digital Data: Classification of Digital Data	2	Descriptive method, PPT Presentation
	b. **Introduction to Big Data:** Characteristics of data	2	
	c. Evolution of Big data - A Typical Data Warehouse Environment	2	
	d. A Typical Hadoop Environment -New Technologies	2	
	e. changes in the Realms of Big Data	3	

Unit III	Big data analytics:	12 Hours	Mode
	a. Beginning of big data – Big Data Analytics – Classification of Analytics	5	Descriptive method, PPT Presentation
	b. Top Challenges Facing Big Data – Need for Data Analytics	5	
	c. Data Science – Data Scientist	2	
Unit IV	Introduction to Hadoop	14 Hours	Mode
	a. Introducing Hadoop – Distributed Computing Challenges	4	Descriptive method, Assignments
	b. History of Hadoop – Hadoop Overview	3	
	c. Use Case of Hadoop – Hadoop Distributors – HDFS(Hadoop Distributed File System)	4	
	d. Processing Data with Hadoop – Interacting with Hadoop Ecosystem.	3	
Unit V	Introduction to Pig	12 Hours	Mode
	a. **Pig:** Introduction -Anatomy – Pig Latin Overview	3	Descriptive method, Assignment, PPT Presentation
	b. Pig Primitive Data Types -Running Pig - Execution Modes of Pig- HDFS Commands	4	
	c. Relational Operators - Eval Function - Complex Data Types - Pig Versus Hive	5	

Course designed by Dr.T.Priya

Programme	BCA	Programme Code			UCA
Course Code	20UCAC52	Number of Hours/Cycle			4
Semester	V	Max. Marks			100
Part	III	Credit			4
Core Course X					
Course Title	Mobile Application Development	L	T		P
Cognitive Level	Up to K3	60	-		-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course helps to learn about different types of mobile devices, modern mobile operating systems and able to design the various kinds of mobile applications.

Unit I	Introduction	12 Hours
	Getting Started - Overview of Android and Android SDK - Getting to know your Android development environment - Writing your first Android application - Running and debugging your application - Test your application on device	
Unit II	Android Applications - The Big Picture	13 Hours
	Android Applications - The Big Picture: Android architecture - Android application model - Overview of Android application building blocks - Application design guidelines - Application lifecycle	
Unit III	Building User Interface	13 Hours
	Building User Interface: Overview of Android's view structure - Android built-in layouts - Defining a layout in XML - Android built-in Views - Event handling - Building custom views and layouts	
Unit IV	Building Android Applications	11 Hours
	Building Android Applications: AndroidManifest.xml file - the control file - Building activities - Building intents - Building and using services – Notifications - Building and using content providers	
Unit V	Location and mapping , Drawing 2D and 3D Graphics	11 Hours
	Location and mapping:Location based services-Mapping-working with Map views-Location without maps. **Drawing 2D and 3D Graphics:**Rolling your own widgets-Blings.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. John Lombardo, Blake Meike, Rick Rogers, Zigurd Mednieks.,(2010), "*Android Application Development*" , O'Reilly Media, Inc.

Reference Books

1. Barry Burd.,(2015), "*All-in-one for Dummies* ",Wiley publications, 2nd Edition.
2.John Horton.,(2015), "*Android Programming for beginners*", Packt Publishing Limited,3rd edition..
3. David Griffith.,(2017),"*Headfirst Android Development: A Brain-Friendly Guide*", O'Reilly ,1st Edition.

E-Resources

- https://www.tutorialspoint.com/mobile_development_tutorials.htm
- https://developer.android.com/training/basics/firstapp
- https://www.ibm.com/cloud/learn/mobile-application-development-explained
- https://www.theserverside.com/tutorial/Mobile-application-development-tutorial
- https://www.toptal.com/android/developing-mobile-web-apps-when-why-and-how

Course Outcomes
After completion of this course, the students will be able to:

CO1	Describe the types of mobile devices and mobile platforms
CO2	Summarize the basic structure of mobile operating systems and their architecture
CO3	Classify programming tools for a mobile application developer
CO4	Use various mobile application tools.
CO5	Discover the runtime environment for mobile application

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO 3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO10	PSO 11	PSO 12
CO1	2	2	1	1	3	2	2	3	1	1	1	3
CO2	2	2	1	3	2	3	2	3	1	1	2	3
CO3	3	3	3	2	2	3	1	3	1	1	1	3
CO4	2	2	2	3	1	3	1	3	2	1	1	3
CO5	1	2	3	2	2	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit	Introduction	12 Hours	Mode
I	a. Getting Started - Overview of Android and Android SDK	2	Descriptive method, PPT Presentation
	b. Getting to know your Android development environment	2	
	c. Writing your first Android application	3	
	d. Running and e. debugging your application	2	

	f. Test your application on device	3	
Unit II	**Android Applications - The Big Picture**	**13 Hours**	**Mode**
	a. Android architecture - Android application model	4	Descriptive method, PPT Presentation
	b. Overview of Android application building blocks	3	
	c. Application design guidelines	3	
	d. Application lifecycle	3	
Unit III	**Building User Interface:**	**13 Hours**	**Mode**
	a. Overview of Android's view structure	3	Descriptive method,Assignments
	b. Android built-in layouts	2	
	c. Defining a layout in XML	2	
	d. Android built-in Views	3	
	e. Event handling, Building custom views and layouts	3	
Unit IV	**Building Android Applications**:	**11 Hours**	**Mode**
	a. AndroidManifest.xml file	2	Descriptive method PPT Presentation
	b. The control file - Building activities	3	
	c. Building intents - Building and using services	2	
	d. Notifications - Building and using content providers	4	
Unit V	**Location and mapping**:	**11 Hours**	**Mode**
	a. Location based services-Mapping	3	Descriptive method,Assignment,PPT Presentation
	b. working with Map views	2	
	c. Location without maps.	3	
	d. Drawing 2D and 3D Graphics: Rolling your own widgets-Blings.	3	

Course designed by Mrs.K.Priyadharsini

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC53	Number of Hours/Cycle		4	
Semester	V	Max. Marks		100	
Part	III	Credit		3	
		Core Course XI			
Course Title	Software Engineering		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

The course also enables the students to acquire analytical, critical, technical writing, team building and managerial skills through team project activities by using agile practices.

Unit I	**Introduction to Software Engineering**	12 Hours
	Some definition – Some size factors – Quality and productivity factors – Managerial issue. **Planning a Software Project:** Defining the problem – Developing a solution strategy – planning the development process – planning an organization structure – other planning activities	
Unit II	**Software Cost Estimation**	12 Hours
	Software Cost factors – Software cost estimation techniques– Staffing level estimation – estimating software maintenance costs. **Software Requirements Definition:** The software requirements specification – Relational notations – State oriented notations - formal languages and processors for requirements specification – PSL/PSA – RSL/REVS.	
Unit III	**Software Design:**	12 Hours
	Fundamental Design concepts – Modules and modularizing Criteria – Design Notations – Design Techniques – Detailed Design Consideration – Real time and distributed system design	
Unit IV	**Verification and validation techniques:**	13 Hours

	Quality assurance – Walkthroughs and inspections - Unit testing and Debugging – System testing. **Software Maintenance:** Enhancing maintainability during development – Managerial aspects of Software Maintenance – Configuration Management.	
Unit V	**Implementation issues:**	**11 Hours**
	Structured coding techniques – Coding style – Standards and guidelines- Documentation guidelines. **Modern Programming Language Features:** Type checking – User defined data types – Data abstraction – Scoping rules.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Richard Fairly. E., (2017), "*Software Engineering Concepts*", Tata McGraw Hill book Company, New Delhi.

Reference Books

1. Ian Sommerville., (2017), "*Software Engineering*", Pearson Education, 10th edition.

2. Rajib mall., (2018)," *Fundamentals of Software Engineering*", Prentice Hall of India Pvt. Ltd, New Delhi,5th edition.

3. Roger Pressman.S.,(2009), "*Software Engineering*", Tata Mc Graw Hill Pvt. Ltd., New Delhi

E-Resources

- https://www.tutorialspoint.com/software_engineering/index.htm
- https://www.javatpoint.com/software-engineering-tutorial
- https://www.geeksforgeeks.org/software-engineering/
- https://www.educba.com/software-development/software-development-tutorials/software-engineering-tutorial/
- https://www.guru99.com/software-engineering-tutorial.html

Course Outcomes
After completion of this course, the students will be able to:

CO1	Identify the size factors to plan an organizational structure
CO2	Understand the metrics and estimates of software and Quality
CO3	Interpret the requirement and design engineering
CO4	Discover the various testing techniques and maintenance strategies
CO5	Apply the coding standards and guidelines

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	1	3	2	1	1	1	2	3
CO2	3	3	2	3	1	3	1	1	1	1	2	3
CO3	2	2	3	3	1	3	3	2	1	1	2	3
CO4	3	3	3	3	1	3	2	2	1	1	2	3
CO5	1	3	3	3	1	3	1	1	1	1	2	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs No. Of Questions	Section A K-Level	Section B Either/ or Choice No. Of Question	Section C Open Choice No. Of Question
1	CO1	Up to K1	2	K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Introduction to Software Engineering	12 Hours	Mode
I	a. Some definition – Some size factors	2	Descriptive method, PPT Presentatio n
	b. Quality and productivity factors	2	
	c. Managerial issue.	2	
	d. Defining the problem – Developing a solution strategy	2	
	e. planning the development process	2	
	f. planning an organization structure – other planning activities	2	
Unit II	**Software Cost Estimation**	**12 Hours**	**Mode**
	a. Software Cost factors-- Software cost estimation techniques	1	Descriptive method, PPT Presentation
	b. Staffing level estimation	2	
	c. Estimating software maintenance costs.	2	
	d. The software requirements specification	1	
	e. Relational notations and State oriented notations	2	
	f. formal languages and processors for requirements specification	2	
	g. PSL/PSA – RSL/REVS	2	
Unit III	**Software Design**	**12 Hours**	**Mode**
	a. Fundamental Design concepts	2	Descriptive method,Assignments
	b. Modules and modularizing Criteria	2	
	c. Design Notations – Design Techniques	3	
	d. Detailed Design Consideration	2	
	e. Real time and distributed system design	3	
Unit IV	**Verification and validation techniques:**	**13 Hours**	**Mode**
	a. Quality assurance	1	Descriptive method PPT Presentation
	b. Walkthroughs and inspections	2	
	c. Unit testing and Debugging	2	
	d. System testing.	2	
	e. Enhancing maintainability during development	2	
	f. Managerial aspects of Software Maintenance	2	
	g. Configuration Management	2	
Unit V	**Implementation issues**	**11 Hours**	**Mode**
	a. Structured coding techniques	3	Descriptive method,Assignment,
	b. Coding style	2	

	c. Standards and guidelines- Documentation guidelines.	2	PPT Presentation
	d. Type checking – User defined data types	2	
	e. Data abstraction – Scoping rules	2	

Course designed by Mrs.V.Lavanya

Programme	BCA	Programme Code			UCA
Course Code	20UCAC54	Number of Hours/Cycle			4
Semester	V	Max. Marks			100
Part	III	Credit			3
Core Course XII					
Course Title	Computer Networks		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

The course aims to know the functions of Data link layer, understand network layer functions and protocols used in it. It is also used to learn about transport layer, session, presentation and application layers.

Unit I	Introduction	12 Hours
	Uses of Computer Networks – Network Hardware – Network Software – Reference Models.	
Unit II	Physical Layer	12 Hours
	PHYSICAL LAYER - Wireless Transmission: Electromagnetic Spectrum – Radio Transmission – Microwave Transmission – Infrared and Millimeter Waves – Light Waves. Communication Satellites: Geostationary, Medium-Earth Orbit, Low Earth-orbit Satellites – Satellites versus Fiber.	
Unit III	Data-Link Layer	12 Hours
	DATA-LINK LAYER: Error Detection and correction – Elementary Data-link Protocols – Sliding Window Protocols. MEDIUM-ACCESS CONTROL SUB LAYER: Multiple Access Protocols – Ethernet – Wireless LANs - Broadband Wireless – Bluetooth.	
Unit IV	Network Layer	13 Hours

	NETWORK LAYER: Routing algorithms – Congestion Control Algorithms. TRANSPORT LAYER: Elements of Transport Protocols – Internet Transport Protocols: TCP.	
Unit V	**Application Layer**	**11 Hours**
	APPLICATION LAYER: DNS – E-mail. NETWORK SECURITY: Cryptography – Symmetric Key Algorithms – Public Key Algorithms – Digital Signatures.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming Activity

Text Book

1. Andrew S. Tanenbaum ., (2013), "*COMPUTER NETWORKS"* , Pearson Education India, 5th edition.

Reference Books

1. Achyut Godbole and Atul Kahate.,(2017)," *Data Communications and Networks"* , Tata McGraw Hill Education.

2. Larry L. Peterson, Bruce S. Davie.,(2011), "*Computer Networks: A Systems Approach*", Fifth Edition, Morgan Kaufmann Publishers.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker., (2011), "*Computer Networks: An Open Source Approach"*, McGraw Hill Publisher.

E-Resources

- https://www.geeksforgeeks.org/computer-network-tutorials/
- https://dcandcn.blogspot.com/p/dcn-tutorial.html
- https://ecomputernotes.com/computernetworkingnotes/communication-networks/what-is-data-communication
- https://www.javatpoint.com/computer-network-tutorial
- https://www.guru99.com/data-communication-computer-network-tutorial.html

Course Outcomes
After completion of this course, the students will be able to:

CO1	Identify the uses of Computer Networks and Models.
CO2	Understand the various protocols in physical layer.
CO3	Interpret the working of Data Link layer.
CO4	Illustrate the role of Network layer.
CO5	Relate the services of Transport layer

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	1	2	1	2	2	1	1	1	1	1	3
CO2	2	2	3	1	2	2	1	1	1	1	1	3
CO3	2	1	2	1	2	2	1	1	1	1	1	3
CO4	2	1	2	1	2	2	1	1	1	1	1	3
CO5	2	1	2	1	2	2	1	1	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs		Section B Either/ or Choice	Section C Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit I	**Introduction**		**12 Hours**	**Mode**
	a. Uses of Computer Networks	3		Descriptive method, PPT Presentation
	b. Network Hardware	3		
	c. Network Software	3		
	d. Reference Models.	3		
Unit II	**Physical Layer**		**12 Hours**	**Mode**
	a. Wireless Transmission: Electromagnetic Spectrum	3		Descriptive method, PPT Presentation
	b. Radio Transmission – Microwave Transmission	3		
	c. Infrared and Millimeter Waves – Light Waves	3		
	d. Communication Satellites : Geostationary, Medium-Earth Orbit, Low Earth-orbit Satellites – Satellites versus Fiber.	3		
Unit III	**Data-Link Layer**		**12 Hours**	**Mode**
	a. Error Detection and correction	3		Descriptive method, Assignments
	b. Elementary Data-link Protocols – Sliding Window Protocols	3		
	c. Medium-Access Control Sub Layer: Multiple Access Protocols	3		
	d. Ethernet – Wireless LANs - Broadband Wireless – Bluetooth.	3		
Unit IV	**Network Layer**		**13 Hours**	**Mode**
	a. Routing algorithms – Congestion Control Algorithms. –	5		Descriptive method PPT Presentation
	b. Transport Layer: Elements of Transport Protocols	4		
	c. Internet Transport Protocols: TCP.	4		
Unit V	**Application Layer**		**11 Hours**	**Mode**
	a. DNS – E-mail.	4		Descriptive method, Assignment, PPT Presentation
	b. Network Security: Cryptography	3		
	c. Symmetric Key Algorithms	2		
	d. Public Key Algorithms – Digital Signatures.	2		

Course designed by Mrs.V.Lavanya

Programme	BCA	Programme Code	UCA

Course Code	20UCAE51	Number of Hours/Cycle			4
Semester	V	Max. Marks			100
Part	III	Credit			4
Core Elective Course I					
Course Title	Internet of Things		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course helps students to understand the basics of IoT, develop knowledge about difference between IoT and M2M , IoT devices and data analytics for IoT.

Unit I	**Introduction to IoT**	**12 Hours**
	Introduction – Physical design of IoT – Logical design of IoT – IoT enabling Technologies – IoT and deployment Templates	
Unit II	**Domain specific IoTs**	**10 Hours**
	Introduction – Home automation – Cities – Environment – Energy – Retail – Logistics- Agriculture – Industry – Health and Life style	
Unit III	**IoT and M2M, IoT System Management with NETCONFIG-YANG**	**13 Hours**
	Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT. Need for IoT system management – Simple Network Management Protocol – Network operator requirements-YANG - IoT system management with NETCONFIG-YANG	
Unit IV	**IoT physical devices and Endpoint**	**13 Hours**
	What is an IoT device-Basic Building blocks of an IoT device-Raspberry Pi-About the board –Linux on Raspberry Pi-Interfaces-Programming Raspberry Pi with Python – Other IoT devices	
Unit V	**Data Analytics for IoT**	**12 Hours**
	Overview of MapReduce parallel programming model – Overview of Hadoop – Case study on Batch data analysis using Hadoop – Case study on real-time data analysis using Hadoop – Overview of Apache Oozie– Overview of Apache Spark – Overview of Apache Storm –Case study on using Apache Storm for real-time data analysis	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. .Arshdeep Bahga , Vijay Medisetti, (2015), "*Internet of Things Hands on Approach*"

    ,Universities Press(INDIA) Pvt Ltd., Mumbai.

Reference Books

1. Daniel Minoli,(2014), "*Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications*", Willy Publications

2. CunoPfister, ,(2011), "*Getting started with Internet of Things*", O'Relly

3. Adrian McEven, Hakim Cassimally,(2014),"*Designing the Internet of Things*",Wiley Publications

4. Marco Schwartz,(2014),"*Internet of Things with Arduino Yun*",Packt Publishing,Mumbai

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- http://alvarestech.com/temp/smar/Smar/Book2021/Industry4.0/2019
- https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf
- https://www.leverege.com/iot-ebook/how-iot-systems-work
- https://freecomputerbooks.com/Internet-of-Things-in-5-days.html
- https://en.wikipedia.org/wiki/Internet_of_things

Course Outcomes
After completion of this course, the students will be able to:

CO1	Infer the fundamentals of Internet of Things
CO2	Develop domain specific IoT devices.
CO3	Classify differences between IoT and Machine to Machine
CO4	Build an IoT device using Raspberry Pi
CO5	Make use of Data analytics for IoT applications

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	2	2	1	1	3	1	2	1	1	1	3
CO2	2	3	3	1	1	3	1	2	1	1	1	3
CO3	2	2	2	1	1	3	1	2	1	1	1	3
CO4	2	3	3	1	1	3	1	3	1	1	1	3
CO5	2	3	3	1	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K2	2	K1&K1	2(K1)	1(K2)
2	CO2	Up to K3	2	K1&K1	2(K2)	1(K3)

3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8		18	18.00	18
K2		32	20	52	52.00	52
K3			30	30	30.00	30
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Introduction to IoT**	**12 Hours**	**Mode**
	a. Introduction – Physical design of IoT	4	Descriptive method, PPT Presentation
	b. Logical design of IoT – IoT enabling Technologies,	4	
	c. IoT and deployment Templates	4	
Unit II	**Domain specific IoTs**	**10 Hours**	**Mode**
	e. Introduction – Home automation	2	Descriptive method, PPT Presentation
	f. Cities – Environment – Energy	3	
	g. Retail – Logistics – Agriculture –	3	
	h. Industry – Health and Life style	2	
Unit III	**IoT and M2M, IoT System Management with NETCONFIG-YANG**	**13 Hours**	**Mode**
	a. Introduction – M2M- Difference between IoT and M2M	4	Descriptive method, PPT Presentation
	b. SDN and NFV for IoT	2	
	c. Need for IoT system management – Simple Network Management Protocol	3	
	d. Network operator requirements- YANG - IoT system management with NETCONFIG-YANG	4	
Unit	**IoT physical devices and Endpoint**	**13 Hours**	**Mode**

IV	a. What is an IoT device-Basic Building blocks of an IoT device	4	Descriptive method, PPT Presentation
	b. Raspberry Pi-About the board –Linux on Raspberry Pi	4	
	c. Interfaces-Programming Raspberry Pi with Python – Other IoT devices	5	
Unit V	**Iot with Arduino Yun**	**12 Hours**	**Mode**
	a. Overview of MapReduce parallel programming model – Overview of Hadoop – Case study on Batch data analysis using Hadoop – Case study on real-time data analysis using Hadoop	5	Descriptive method, PPT Presentation
	b. Overview of Apache Oozie– Overview of Apache Spark	4	
	c. Overview of Apache Storm –Case study on using Apache Storm for real-time data analysis	3	

Course designed by Mrs.M.Chandamona

Programme	BCA	Programme Code		UCA
Course Code	**20UCAE52**	Number of Hours/Cycle		**4**
Semester	**V**	Max. Marks		**100**
Part	**III**	Credit		**4**
Core Elective Course I				
Course Title	**Cyber Security**		L	T	P
Cognitive Level	Up to K3		60	-	-

L-Lecture, T-Tutorial, P-Practical

Preamble

This course enables the students to understand the broad set of technical aspects of cyber security and able to understand the purpose of intrusion detection problem and understand the threat from cyber crime

Unit I	**Introduction Cyber Crime**	11 Hours
	Introduction-Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime - Types of Cybercrime-Cybercrime against Individuals and property-Classification of Cybercriminals - Execution of Cybercrime -Tools used in Cybercrime - Factors Influencing Cybercrime -Challenges to Cybercrime-Strategies to Prevent Cybercrimes-Extent of Cybercrime.	

Unit II	**Cybercrime—The Present and the Future**	**12 Hours**
	Introduction to Cyber War—The Present and the Future of Cybercrime –Cryptocurrency: Characteristics ,Types - Bitcoin : Bitcoin Cash - Ethereum - Comparison between Bitcoin and Ethereum - Blockchain :Association between bitcoin and blockchains-Ransomware: Evolution, types, entities affected by ransomware and steps-Deep web and Dark Web-Deep Web and its Challenges.	
Unit III	**Introduction to Cyber Forensics**	**13 Hours**
	Interrelation among Cybercrime, Cyber Forensics, and Cyber Security-Cyber Forensics-Disk Forensics-Network Forensics - Wireless Forensics-Database Forensics-Malware Forensics-Mobile Forensics-GPS Forensics-Email Forensics-Memory Forensics.	
Unit IV	**Digital Evidence**	**12 Hours**
	Introduction to Digital Evidence and Evidence Collection Procedure-Sources of Evidence -Digital Evidence from Standalone Computers/Electronic Communication Devices - Operating Systems and their Boot Processes- Storage Medium- File System-Windows Registry-Windows Artifacts-Browser Artifacts-Digital Evidence on the Internet.	
Unit V	**Cyber Forensics—The Present and the Future**	**12 Hours**
	Forensic Tools-Cyber Forensic Suite-Drive Imaging and Validation Tools- Forensic Tool for Integrity Verification and Hashing, Data Recovery, RAM analysis, Analysis of Registry, Encryption/Decryption, Password recovery, Analysing network and Mobile devices-Need for Computer Forensic Investigators	

Pedagogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments.

Text Book

1. Dejey, S.Murugan (2018)*"Computer Forensics "*, Oxford University press , Chennai

Reference Book

1. W.A. Conklin , G. White,(2016),"*Principles of Computer Security"*, Mc Graw Hill, fourth edition
2. William stalling, (2013), "*Cryptography and Network Security Principles and Practices"*, Tata McGraw-Hill , 7th edition
3. Bernadette H Schell, Clemens Martin,(2004),"*Cybercrime",* ABC-CLIO Inc., California.

E-Resources

- https://www.newhorizons.com/promotions/cybersecurity-ebooks/
- http://books.google.co.in/books/about/cybercrime_and_Digital_Forensics/
- https://www.javapoint.com/cyber security tutorial/
- https://www.simplilearn.com/cyber security tutorial/
- https://www.w3schools.com/cyber security tutorial/

Course Outcomes

After completion of this course, the students will be able to:

CO1	Infer the concept of Cyber crime and its types
CO2	Express the concepts of Cryptocurrency
CO3	Distinguish between Cyber Forensics , cyber crime and cyber security
CO4	Classify various Digital Evidence collection methods
CO5	Examine the Cyber Forensics tools

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO 11	PSO12
CO1	2	2	2	1	1	3	1	2	1	1	1	3
CO2	2	3	3	1	1	3	1	2	1	1	1	3
CO3	2	2	2	1	1	3	1	2	1	1	1	3
CO4	2	3	3	1	1	3	1	3	1	1	1	3
CO5	2	3	3	1	1	3	1	3	1	1	1	3

3-High: 2- Moderate: 1-low

Articulation Mapping - K Levels with Course Outcomes

Units	Cos	K-Level	Section A MCQs No. Of Questions	K-Level	Section B Either/ or Choice No. Of Question	Section C Open Choice No.Of Question
1	CO1	Up to K2	2	K1&K1	2(K1)	K2
2	CO2	Up to K2	2	K1&K1	2(K1)	K2
3	CO3	Up to K2	2	K1&K1	2(K2)	K2
4	CO4	Up to K3	2	K1&K1	2(K2)	K3
5	CO5	Up to K3	2	K1&K1	2(K2)	K3
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Either/or)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	16		26	26	26%
K2		24	30	54	54	54%
K3			20	20	20	20%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Introduction Cyber Crime	11 Hours	Mode
I	**a.** Introduction-Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime -Types of Cybercrime	3	Lectures Notes Seminars
	b.Cybercrime against Individuals and property-Classification of Cybercriminals	3	
	c.Execution of Cybercrime -Tools used in Cybercrime- Factors Influencing Cybercrime	3	
	d.Challenges to Cybercrime-Strategies to Prevent Cybercrimes-Extent of Cybercrime.	2	
Unit	**Cybercrime—The Present and the Future**	12 Hours	Mode
II	**a.**Introduction to Cyber War—The Present and the Future of Cybercrime –Cryptocurrency: Characteristics ,Types.	4	Lectures YouTube video
	b.Bitcoin :Bitcoin Cash - Ethereum - Comparison between Bitcoin and Ethereum	3	
	c.Blockchain :Association between bitcoin and blockchains-Ransomware: Evolution, types, entities affected by ransomware and steps	3	
	d. Deep web and Dark Web-Deep Web and its Challenges.	2	
Unit	**Introduction to Cyber Forensics**	13 Hours	Mode
III	**a**. Interrelation among Cybercrime, Cyber Forensics, and Cyber Security-Cyber Forensics	3	Lectures Notes Seminars
	b. Disk Forensics-Network Forensics -Wireless Forensics-Database Forensics	4	
	c. Malware Forensics-Mobile Forensics-	3	
	d. GPS Forensics-Email Forensics-Memory Forensics	3	
Unit	**Digital Evidence**	12 Hours	Mode
IV	**a.**Introduction to Digital Evidence and Evidence Collection Procedure-Sources of Evidence	3	Notes Assignments Learn through Website
	b.Digital Evidence from Standalone Computers/Electronic Communication Devices - Operating Systems and their Boot Processes	3	
	c. Storage Medium- File System- Windows Registry	3	
	d. Windows Artifacts-Browser Artifacts-Digital Evidence on the Internet.	3	
Unit	**Cyber Forensics—The Present and the Future**	12 Hours	Mode
V	**a.** Forensic Tools-Cyber Forensic Suite-Drive Imaging and Validation Tools- Forensic Tool for Integrity	3	Lectures Notes Seminars

	b.	c. Verification and Hashing, Data Recovery, RAM analysis, Analysis of Registry,	4	
	c.	Encyption/Decryption, Password recovery, Analysing network and Mobile devices-Need for Computer Forensic Investigators.	5	

Course designed by B. Sasi Revathi.

Programme	BCA	Programme Code		UCA	
Course Code	20UCAE53	Number of Hours/Cycle		4	
Semester	V	Max. Marks		100	
Part	III	Credit		4	
Core Elective Course I					
Course Title	Data Warehousing and Data Mining		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course helps to learn the concept of database technology for data mining and data warehousing .This enables the students to work with the various classification and Cluster analysis methods and apply the basic algorithms in data mining.

Unit I	Introduction to Data Mining	10 Hours
	Introduction: What is Data Mining-On What Kind of Data-Data Mining functionalities-Classification of Data Mining Systems Integration of a Data Mining System with a Database or Data Warehouse system-Major issues in data mining.	
Unit II	Data Warehouse and OLAP Technology for Data Mining	12 Hours

	Data Warehouse and OLAP Technology for Data Mining: What is a Data Warehouse? -Multidimensional data model - Data Warehouse Architecture. Association Rule Mining: The Apriori Algorithm Generating association Rules from Frequent Itemsets - Improving the efficiency of Apriori-Mining Frequent Itemsets without Candidate Generation.	
Unit III	**Classification and Prediction**	**13 Hours**
	Classification and Prediction: What is Classification? - What is Prediction?-Comparing Classification and Prediction Methods Classification: Decision Tree Induction-Attribute Selection Measures Prediction: Linear regression -Non–Linear Regression.	
Unit IV	**Cluster Analysis**	**13 Hours**
	Cluster Analysis: What is Cluster Analysis? -Types of Data in Cluster Analysis A Categorization of Major Clustering Methods: Partitioning Methods: K-means, CLARA, K-Medoids,Hierarchical Methods: BIRCH, ROCK Density based Methods: DBSCAN Grid based Method: STING.	
Unit V	**Mining Multimedia Databases**	**12 Hours**
	Mining Multimedia Databases: Similarity Search in Multimedia Data, Sequential Pattern Mining Text mining: Keyword-Based Association and Document Classification Mining the Worldwide Web: Mining the Web's Link Structures to Identify Authoritative Web Pages -Web Usage Mining.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Jiawei Han, MichelineKamber., (2012),"*Data Mining Concepts and Techniques"*, Morgan Kaufman Publisher(Elsevier),3rd Edition.

Reference Books

1. Hongbo DLL., (2010), "*Data Mining Techniques and Applications: An Introduction"*, Cengage Lmg Business Press.
 2. Jiawei Han, MichelineKamber., (2011), "*Data Mining: Concepts and Techniques"*, 3rd Edition Morgan Kauffmann Publishers, 3rd Edition.
 3. Udit Agarwal.,(2016)," *Data Mining & Data Warehousing"* , S.K.Kataria& sons Publication, 1st Edition.

E-Resources

- https://www.javatpoint.com/data-mining
- https://www.tutorialspoint.com/data_mining/dm_classification_methods.htm
- https://www.guru99.com/data-mining-tutorial.html

- https://www.tutorialride.com/data-mining/data-mining-tutorial.htm
- https://www.tutorialandexample.com/data-mining-tutorial/

Course Outcomes
After completion of this course, the students will be able to:

CO1	Compare and contrast Data Mining and Traditional DBMS and major issues in Data mining.
CO2	Discuss the Data Warehouse architecture and apply On-line Analytical Processing (OLAP) operations for manipulations.
CO3	Illustrate the use of decision tree induction algorithm for mining classification rules and methods used for Prediction.
CO4	Explain the various clustering methods used in Cluster Analysis.
CO5	Describe the various applications and web usage in data mining.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO 5	PSO6	PSO7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	1	1	2	3	1	3	3	2	2	3
CO2	3	3	2	2	1	1	1	1	1	1	1	3
CO3	2	3	3	3	1	2	2	1	1	1	2	3
CO4	3	3	3	3	1	3	2	1	1	1	1	3
CO5	1	3	3	3	3	2	2	1	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. Of Question**	**No. Of Question**
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3

Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consoli dated (Round ed off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit				Mode
Unit I	**Introduction to Data Mining**		**10 Hours**	**Mode**
	a) Introduction: What is Data Mining	1		Descriptive method, PPT Presentation
	b) On What Kind of Data-Data Mining functionalities	3		
	c) Classification of Data Mining Systems	2		
	d) Integration of a Data Mining System with a Database or Data Warehouse system	3		
	e) Major issues in data mining.	1		
Unit II	**Data Warehouse and OLAP Technology for Data Mining**		**12 Hours**	**Mode**
	a) What is a Data Warehouse? - Multidimensional data model	2		Descriptive method, PPT Presentation
	b) Data Warehouse Architecture.	2		
	c) Association Rule Mining: The Apriori Algorithm	3		
	d) Generating association Rules from Frequent Itemsets	2		
	e) Improving the efficiency of Apriori- Mining Frequent Itemsets without Candidate Generation.	3		
Unit III	**Classification and Prediction**		**13 Hours**	**Mode**
	a) Classification and Prediction: What is Classification? What is Prediction?	2		Descriptive method,As signments
	b) Comparing Classification and Prediction Methods	2		
	c) Classification: Decision Tree Induction	3		
	d) Attribute Selection Measures Prediction: Linear regression	3		
	e) Non–Linear Regression	3		

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Unit IV	Cluster Analysis	13 Hours	Mode
	a) What is Cluster Analysis? -Types of Data in Cluster,	2	Descriptive method PPT Presentation
	b) Categorization of Major Clustering Methods: Partitioning Methods: K-means	3	
	c) CLARA, K-Medoids	2	
	d) Hierarchical Methods: BIRCH, ROCK	2	
	e) Density based Methods: DBSCAN	2	
	f) Grid based Method: STING.	2	
Unit V	Mining Multimedia Databases	12 Hours	Mode
	a) Mining Multimedia Databases: Similarity Search in Multimedia Data	3	Descriptive method,Assignment,PPT Presentation
	b) Sequential Pattern Mining Text mining: Keyword-Based Association and Document	3	
	c) Classification Mining the Worldwide Web: Mining the Web's Link Structures to Identify Authoritative Web Pages	3	
	d) Web Usage Mining.	3	

Course designed by Mrs.S.Gowthami

Programme	BCA	Programme Code	UCA
Course Code	20UCAC5P	No. of Hrs per Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
Core Practical Course IX			

Course Title	R programming Lab	L	T	P
Cognitive Levels	Upto K4	-	-	60

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This paper will train the students programming logic and thereby developing skills in clear understanding on how to organize data and analyze data using real time examples.

List of Practicals

Write A Program In R

1. To count the number of even numbers in the given vector.
2. To merge given two list into one.
3. To convert given data frame to a list of rows.
4. To create a list containing String, numbers, vectors and logical values.
5. To extract the five of the levels of factor created from a random sample from the LETTERS.
6. To multiply the 3x3 matrix.
7. To convert the given matrix to a list.
8. To add ten to each element of the first vector in a given list.
9. To get the details of the objects in memory.
10. To implement data read and write in memory.
11. To change given string in to date format.
12. To check whether the given year is a leap year or not.
13. To check student grade based on the marks using control structure.
14. To Check the given integer number is a Palindrome number or not.
15. To find the greatest number among the three given integer number.
16. To prepare bill for stationary Store.
17. To find the sum of series using recursive function.
18. To split the data using looping function.

Course Designed By: Dr.T.Priya

Programme	BCA	Programme Code	UCA
Course Code	20UCAC5Q	No. of Hrs per Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
Core Practical Course X			

Course Title	Mobile Application Development Lab	L	T	P
Cognitive Levels	Upto K4	-	-	60

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This paper will train the students to develop mobile application through android.

List of Practicals

Develop an application using android

1. To develop an application using GUI components, Font and Colours
2. To develop an application using Layout Managers.
3. To develop an application for implementing event listeners.
4. To develop an application for drawing basic graphical primitives on the screen.
5. To develop an application using databases.
6. To develop an application using Notification Manager
7. To develop an application using Multi-threading
8. To develop an application using GPS location information
9. To develop an application for writing data to the SD card.
10. To develop an application for creating an alert upon receiving a message.
11. To develop an application using RSS feed.
12. To develop an application for sending an email.
13. To develop an application for creating a game application.
14. To develop an application for creating alarm clock.

Course Designed By: Mrs.K.Priyadharsini

Programme	BCA	Programme Code	UCA
Course Code	20UCAS5P	No. of Hrs per Cycle	2
Semester	V	Max. Marks	50
Part	IV	Credit	2
Skill Based Course III			
Course Title	Animation Technology Lab(Flash)	L	T	P
Cognitive Levels	Upto K3	-	-	30

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This paper will train the students to develop smart animation graphics through Adobe Flash.

List of Practicals

Design a Program in Flash

1. Draw an animation to show a moving stick man.

2. Draw an animation to show sunrise and sunset.

3. Draw an animation to show a disappearing house.

4. Draw an animation to show two boats sailing in river.

5. Draw an animation to show a scene of cricket match.

6. Draw an animation to show cartoon with a message.

7. Draw an animation to help to teach a poem or a song.

8. Create a shining store with the help of Movie Clip.

9. Create an Album with the help of Buttons.

10. Create a 3D Rotation of a Box with the help of Shape Animation.

11. Create an application using Flash tools.

12. Make a movie showing Shape tweening and Motion Tweening.

Course Designed By: Mrs.S.Gowthami

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC61	Number of Hours/Cycle		4	
Semester	VI	Max. Marks		100	
Part	III	Credit		4	
Core Course XIII					
Course Title	Web Technologies		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

 This course introduces World Wide Web as a fundamental information and application platform for today's information systems. Students will examine core aspects of web technologies and web applications, and will develop usable websites.

Unit I	Web Essentials and Markup Languages	12 hours

	Web Essentials: Clients, Servers, and Communication-The Internet-Basic Internet Protocols The World Wide Web-HTTP request message-response message-Web Clients Web Servers. **Markup Languages:** An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics Some Fundamental HTML Elements-Lists-tables-Frames-Forms-XML .	
Unit II	**Style Sheets and Client- Side Programming**	**14 Hours**
	Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets. **Client- Side Programming:** The JavaScript Language-History and Versions- Introduction JavaScript in Perspective-Syntax Variables and Data Types-Statements Operators- Literals-Functions-Objects-Arrays-Built-in Objects.	
Unit III	**Host Objects and Server side Programming**	**13 Hours**
	Host Objects : Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window. **Server-Side Programming:** Java Servlets- Architecture - Overview-A Servelet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies- URL Rewriting-Other Capabilities.	
Unit IV	**Representing Web Data**	**11 Hours**
	Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration –Namespaces. **JavaScript and XML**: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data-XPATH.	
Unit V	**Related Technologies.**	**10 Hours**
	Related Technologies-Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSPJava Beans Classes and JSP-Tag Libraries and Files-Support for the Model-View.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book
1. Jeffrey C.Jackson., (2006), "*Web Technologies--A Computer Science Perspective*", Pearson Education.

Reference Books
1. Robert. W. Sebesta.,(2007), "*Programming the World Wide Web*", Pearson Education, 4th Edition.

2. Deitel, Deitel, Goldberg.,(2006), "*Internet & World Wide Web How To Program*," Pearson Education, 3rd Edition.

3. Marty Hall and Larry Brown.,(2001),"*Core Web Programming"*, Volume I and II, Pearson Education, 2nd Edition.

E-Resources
- https://www.w3schools.com
- https://developer.mozilla.org
- http://html.netR
- https://www.w3schools.in/javascript-tutorial/overview/
- http://www.javascriptkit.com/dhtmltutors/domevent1.shtml

Course Outcomes
After completion of this course, the students will be able to:

CO1	Explain different components and technologies of World Wide Web as a platform
CO2	Construct and visually format tables and forms using HTML and CSS
CO3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using Java servlets to generate and display the contents dynamically
CO4	Describe various web application development technologies like ajax DOM, Java script, SAX and Xpath.
CO5	Inspect JavaScript frameworks like JSP and Backbone which facilitates developer to focus on core features.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	1	1	3	1	3	1	1	1	3
CO2	2	3	2	1	1	3	1	3	1	1	1	3
CO3	2	3	2	1	1	3	1	3	1	1	1	3
CO4	3	2	3	2	1	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)

No of Questions to be asked	10		10	5
No of Questions to be answered	10		5	3
Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit				
Unit I	**Web Essentials and Markup Languages**	**12 Hours**	**Mode**	
	a) Clients, Servers, and Communication	2	Descriptive method, PPT Presentation	
	b) The Internet-Basic Internet Protocols The World Wide Web	2		
	c) HTTP request message-response message-Web Clients Web Servers	3		
	d) An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics	2		
	e) Fundamental HTML Elements-Lists-tables-Frames-Forms-XML .	3		
Unit II	**Style Sheets and Client- Side Programming**	**14 Hours**	**Mode**	
	a) Introduction to Cascading Style Sheets-Feature	3	Descriptive method, PPT Presentation	
	b) Core Syntax-Style Sheets.	2		
	c) The JavaScript Language-History and Versions-	2		
	d) Introduction JavaScript in Perspective-Syntax Variables	3		
	e) Data Types-Statements Operators- Literals-Functions	3		
	f) Arrays-Built-in Object	1		
Unit III	**Host Objects and Server side Programming**	**13 Hours**	**Mode**	
	a) Introduction to the Document Object Model DOM History and Levels	2		

	b)	Intrinsic Event Handling-Modifying Element Style	2	Descriptive method,Assignments
	c)	The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window.	2	
	d)	Java Servlets- Architecture -Overview-A Servelet	3	
	e)	Generating Dynamic Content-Life Cycle-Parameter Data-Sessions	2	
	f)	Cookies- URL Rewriting-Other Capabilities.	2	
Unit IV	**Representing Web Data**		**11 Hours**	**Mode**
	a)	XML-Documents and Vocabularies-Versions and Declaration –Namespaces.	2	Descriptive method PPT Presentation
	b)	Versions and Declaration –Namespaces	3	
	c)	Ajax-DOM based XML processing Events	2	
	d)	oriented Parsing: SAX-Transforming XML Documents	2	
	e)	Selecting XML Data-XPATH.	2	
Unit V	**Related Technologies.**		**10 Hours**	**Mode**
	a)	JSP Technology Introduction-JSP and Servlets	3	Descriptive method,Assignment,PPT Presentation
	b)	Running JSP Applications Basic JSPJava Beans Classes	2	
	c)	JSP-Tag Libraries and Files	3	
	d)	Support for the Model-View	2	

Course designed by Mrs.P. Aarthy

Programme	BCA	Programme Code	UCA
Course Code	20UCAC62	Number of Hours/Cycle	4

Semester	VI	Max. Marks		100	
Part	III	Credit		4	
		Core Course XIV			
Course Title	Digital Image Processing		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

       To impart knowledge on various Digital Image Processing Techniques and their Applications, know about various image sensing methods, gain knowledge about Image enhancement, know the processes involved in image restoration, and to get knowledge about primary and secondary colors

Unit I	**Digital Image Processing**	12 hours
	Digital Image Processing – origins – Example of fields that use Digital Image Processing – Fundamental steps in digital image processing – Components of an Image processing.	
Unit II	**Digital Image Fundamentals**	14 Hours
	Elements of Visual Perception – Light and Electromagnetic spectrum – Image Sensing and acquisition – Image sampling and Quantization.	
Unit III	**Image Enhancement in spatial domain**	13 Hours
	The Basics of Intensity Transformations and Spatial filtering – basic intensity Transformation function – Histogram processing – Fundamentals of spatial filtering	
Unit IV	**Image Restoration and Color image processing**	11 Hours
	A model of the image degradation/restoration process – Noise models- Color fundamentals – Color models – The RGB color model – The CMY and CMYK color models – The HSI Color Model – Converting colors from HIS to RGB - pseudo color image processing.	
Unit V	**Image Compression**	10 Hours
	Introduction – Mathematical analysis – Types of Data Redundancies – Image compression model – Compression strategies – Loseless(Error free compression)- lossy compression – Image compression standards .	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1.Rafel C. Gonzalez and Richard E. Woods.,(2002), Second Edition, "*Digital Image Processing*", Pearson education, Chennai.

Reference Books

1.Robert J. Sehalkoff, "*Digital image Processing and Computer Vision*". John Wiley and Sons lnc. New Delhi.

2.A.K. Jain., (1994), "*Digital image Processing*", PHI, New Delhi.

3.Abhishak Yadav,Poonam Yadav.,(2009), *"Digital image processing"*, University Science Press, NewDelhi, 1st Edition.

E-Resources

- https://www.mygreatlearning.com
- https://www.sciencediret.com
- http://www.javapoint.com
- https://www.geeksforgeeks.org/digital-image-processing-basics/
- https://www.mygreatlearning.com/blog/digital-image-processing-explained/

Course Outcomes

After completion of this course, the students will be able to:

CO1	Recall the example fields of digital image processing.
CO2	Explain the fundamentals of digital image and its processing
CO3	Perform image enhancement techniques in spatial domain.
CO4	Elucidate the mathematical modeling of Image restoration and color image processing
CO5	Apply the concept of Image compression using various algorithms

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	2	1	1	3	1	3	1	1	1	3
CO2	2	3	2	1	1	3	1	3	1	1	1	3
CO3	2	3	2	1	1	3	1	3	1	1	1	3
CO4	3	2	3	2	1	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question

1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit I	**Digital Image Processing**	**12 hours**	**Mode**
	a. Digital Image Processing	3	Descriptive method, PPT Presentation
	b. Origins	2	
	c. Example of fields that use Digital Image Processing	3	
	d. Fundamental steps in digital image processing	2	
	e. Components of an Image processing.	2	
Unit II	**Digital Image Fundamentals**	**14 Hours**	**Mode**
	a. Elements of Visual Perception	3	Descriptive method, PPT Presentation
	b. Light and Electromagnetic spectrum	4	
	c. Image Sensing and acquisition	4	
	d. Image sampling and Quantization.	3	
Unit III	**Image Enhancement in spatial domain**	**13 Hours**	**Mode**
	a. The Basics of Intensity Transformations and Spatial filtering	3	Descriptive method,Assignments
	b. basic intensity Transformation function	3	
	c. Histogram processing	3	
	d. Fundamentals of spatial filtering	4	
Unit IV	**Image Restoration and Color image processing**	**11 Hours**	**Mode**
	a. A model of the image degradation/restoration process	2	Descriptive

	b.	Noise models	2	method PPT Presentation
	c.	Color fundamentals – Color models	2	
	d.	The RGB color model – The CMY and CMYK color models – The HSI Color Model	3	
	e.	Converting colors from HIS to RGB - pseudo color image processing.	2	
Unit V	**Image Compression**		**10 Hours**	**Mode**
	a.	Introduction – Mathematical analysis	2	Descriptive method,Assign ment,PPT Presentation
	b.	Types of Data Redundancies	2	
	c.	Image compression model – Compression strategies	2	
	d.	Loseless(Error free compression)	2	
	e.	lossy compression – Image compression standards	2	

Course designed by Mrs.P. Aarthy

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC63	Number of Hours/Cycle		4	
Semester	VI	Max. Marks		100	
Part	III	Credit		3	
Core Course XV					
Course Title	Introduction to Artificial Intelligence		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble
This course helps to learn a foundation of information system by imparting e-business systems which helps to provide enterprise business support systems.

Unit I	**Introduction to AI**	14 Hours
	The AI Problems – The Underlying Assumption AI Technique-The level of the Model – Criteria for Success Problems, Problem Spaces and Search: Defining the Problem as a State Space Search – Production Systems Problem Characteristics – Production System Characteristics Issues in the Design of Search Programs	
Unit II	**Heuristic Search Techniques**	10 Hours
	Generate-and-Test – Hill Climbing Best-First Search – Problem Reduction Constraint Satisfaction – Means-Ends Analysis.	
Unit III	**Knowledge Representation**	12 Hours
	Representing Knowledge using Rules: Procedural versus Declarative knowledge – Logic Programming Forward versus Backward Reasoning – Matching – Control Knowledge-Expert Systems: Representing and Using Domain Knowledge	

Unit IV	**Predicate Logic**	**12 Hours**
	Using Predicate Logic: Representing Simple Facts in Logic Representing instance and Relationships Computable Functions and Predicates – Resolution – Natural Deduction.	
Unit V	**Introduction To NLP, Neural Nets, Game Playing, Expert Systems**	**12 Hours**
	Game Playing: Overview – The Minimax Search Procedure Natural Language Processing: Introduction. Connectionist Models: Introduction Hopfield Networks Learning in Neural Networks: Perceptron	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Elaine Rich ,Kevin Knight and Shivashankar B Nair.,(2014), "*Artificial Intelligence"*, Tata Mc-Graw, Hill publications,3rd Edition.

Reference Books

1. Nils J Nilson.,(1993), "*Principles of Artificial Intelligence"*, Narosa Publishing House.
2. Elaine Rich.,(2008), "*Artificial Intelligence"*, Tata McGraw-Hill publications.
 3. V.S.Janakiraman, K. Sarukesi, P.Gopalakrishnan.,(2016), "*Foundations of Artificial Intelligence and Expert System:*, Infinity Press, 1st Edition.

E-Resources

- https://www.javatpoint.com/artificial-intelligence-tutorial
- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- https://www.w3schools.com/ai/
- https://builtin.com/artificial-intelligence
- https://www.nist.gov/artificial-intelligence

Course Outcomes
After completion of this course, the students will be able to:

CO1	Identify AI method of problem solving from normal method
CO2	Infer heuristics for a given problem
CO3	Classify the various search techniques and Expert system
CO4	Relate predicate logic
CO5	Describe the fundamentals of Game Playing, NLP and NN

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO9	PSO 10	PSO 11	PSO 12
CO1	3	3	2	3	1	3	2	2	2	1	3	3
CO2	3	3	3	3	2	3	1	1	2	1	3	3

CO3	3	3	3	3	2	3	1	1	2	1	3	3
CO4	3	3	3	3	2	3	2	1	2	1	3	3
CO5	3	3	3	3	2	3	2	1	2	1	3	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs		Section B Either/ or Choice	Section C Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1	2(K2&K2)	1(K2)
3	CO3	Up to K2	2	K1	2(K2&K2)	1(K2)
4	CO4	Up to K3	2	K1	2(K2&K2)	1(K3)
5	CO5	Up to K3	2	K1	2(K2&K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit			Hours	Mode
Unit I		**Introduction to AI**	**14 Hours**	**Mode**
	a.	The AI Problems – The Underlying Assumption AI Technique	3	Descriptive method, PPT Presentation
	b.	The level of the Model– Criteria for Success Problems	3	
	c.	Problem Spaces and Search: Defining the Problem as a State Space Search	2	
	d.	Production Systems Problem Characteristics	3	
	e.	Production System Characteristics Issues in the Design of Search Programs	3	
Unit II		**Heuristic Search Techniques**	**10 Hours**	**Mode**
	a.	Generate-and-Test	2	Descriptive method, PPT Presentation
	b.	Hill Climbing Best-First Search	3	
	c.	Problem Reduction Constraint Satisfaction	3	
	d.	Means-Ends Analysis	2	
Unit III		**Knowledge Representation**	**12 Hours**	**Mode**
	a.	Representing Knowledge using Rules: Procedural versus Declarative knowledge	3	Descriptive method,Assignments
	b.	Logic Programming Forward versus Backward Reasoning	3	
	c.	Matching – Control Knowledge	3	
	d.	Knowledge Representation issues: Representations and Mappings	3	
Unit IV		**Predicate Logic**	**12 Hours**	**Mode**
	a.	Using Predicate Logic: Representing Simple Facts in Logic	3	Descriptive method PPT Presentation
	b.	Representing instance and Relationships	3	
	c.	Computable Functions and Predicates	3	
	d.	Resolution – Natural Deduction.	3	
Unit V		**Introduction To NLP, Neural Nets, Game Playing, Expert Systems**	**12 Hours**	**Mode**
	a.	Game Playing: Overview – The Minimax Search Procedure	3	Descriptive method,Assignment,PPT Presentation
	b.	Natural Language Processing: Introduction	3	
	c.	Connectionist Models: Introduction Hopfield Networks	3	
	d.	Learning in Neural Networks: Perceptron Expert Systems: Representing and Using Domain Knowledge	3	

Course designed by Mrs.K.Priyadharsini

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC64	Number of Hours/Cycle		3	
Semester	VI	Max. Marks		100	
Part	III	Credit		3	
		Core Course XVI			
Course Title	Software Architecture and Design Patterns		L	T	P
Cognitive Level		Up to K3	45	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course will enable students to learn how to add functionality to designs while minimizing complexity and to explore the appropriate patterns for design problems.

Unit I	Introduction:	9 Hours
	What is object-oriented development? -key concepts of object oriented design -benefits and drawbacks of the paradigm. Basics of Object oriented programming: The Basics- Implementing classes - Interfaces –Abstract classes- A Notation for describing object oriented system.	
Unit II	Analyzing a System:	9 Hours
	Overview of the analysis phase : gathering the requirements-functional requirements specification-defining conceptual classes and relationships	
Unit III	Interactive systems and the MVC architecture:	9 Hours
	Introduction -The MVC architectural pattern-analyzing a simple drawing program -designing the system-designing of the subsystems.	
Unit IV	Introduction to Design Patterns :	8 Hours
	What is a design pattern? Describing design patterns-how design patterns solve design problems - Finding Appropriate Objects- Determining Object Granularity- Specifying Object Interfaces - Specifying Object Implementations - Class versus Interface Inheritance - Inheritance versus Composition - Designing for Change.	
Unit V	Structural patterns:	10 Hours
	Structural patterns- Adapter – bridge – composite – decorator - proxy.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Brahma Dathan, Sarnath Rammath.,(2013), "*Object-oriented analysis, design and implementation*", Universities press.
2. Erich Gamma, Richard Helan, Ralph Johman , John Vlissides.,(2013), "*Design patterns*", PEARSON Publication.

Reference Books

1. Frank Bachmann, RegineMeunier., (1996), Hans Rohnert "*Patter n Oriented Software Architecture*" –Volume 1.

2. William J Brown et al.,(1998), "*Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis*", John Wiley.

E-Resources
- https://en.wikipedia.org/wiki/Software_design_pattern
- https://www.geeksforgeeks.org/software-design-patterns/
- https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm
- https://www.javatpoint.com/design-patterns-in-java
- https://www.journaldev.com/1827/java-design-patterns-example-tutorial

Course Outcomes
After completion of this course, the students will be able to:

CO1	Identify the concept of object oriented design.
CO2	Understand the functional requirement specification.
CO3	Interpret the MVC architecture and software design.
CO4	Discover various design patterns.
CO5	Explain the design pattern catalog.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	3	3	2	2	3	1	1	1	1	2	3
CO2	2	2	2	2	2	3	2	1	1	1	2	3
CO3	2	3	3	2	1	3	1	1	1	1	2	3
CO4	2	3	3	2	1	3	1	2	1	1	2	3
CO5	2	2	3	3	2	3	1	1	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A MCQs		Section B Either/ or Choice	Section C Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit I	Introduction:	9 Hours	Mode
	a. What is object-oriented development?	1	Descriptive method, PPT Presentation
	b. key concepts of object oriented design	1	
	c. benefits and drawbacks of the paradigm	2	
	d. Basics of Object oriented programming: The Basics- Implementing classes	2	
	e. Interfaces –Abstract classes	2	
	f. A Notation for describing object oriented system.	1	
Unit	Analyzing a System:	9 Hours	Mode

II	a. Overview of the analysis phase : gathering the requirements	3	Descriptive method, PPT Presentation
	b. functional requirements specification	3	
	c. defining conceptual classes and relationships	3	
Unit III	**Interactive systems and the MVC architecture**:	**9 Hours**	**Mode**
	a. Introduction -The MVC architectural pattern	2	Descriptive method,Assignments
	b. analyzing a simple drawing program	2	
	c. designing the system	3	
	d. Designing of the subsystems.	2	
Unit IV	**Introduction to Design Patterns :**	**8 Hours**	**Mode**
	a. What is a design pattern?	3	Descriptive method PPT Presentation
	b. Describing design patterns	3	
	c. How design patterns solve design problems?	2	
Unit V	**Design Pattern Catalog**:	**10 Hours**	**Mode**
	a. Structural patterns	3	Descriptive method,Assignment,PPT Presentation
	b. Adapter-bridge	3	
	c. composite decorator- proxy	4	

Course designed by Mrs.V.Lavanya

Programme	BCA	Programme Code		UCA	
Course Code	20UCAE61	Number of Hours/Cycle		4	
Semester	VI	Max. Marks		100	
Part	III	Credit		4	
Core Elective Course I					
Course Title	Cloud Computing		L	T	P
Cognitive Level		Up to K3	58	2	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This course will help students to improve the knowledge about cloud concepts, cloud architecture, IT infrastructure cost cutting techniques, various cloud applications (Google) and Maximize knowledge about cloud storage (Amazon)

Unit I	UNDERSTANDING CLOUD COMPUTING	14 Hours
	Cloud computing – cloud types – the cloud cube model – deployment models – service models – characteristics of cloud computing – benefits of cloud computing – disadvantages of cloud computing.	
Unit II	CLOUD ARCHITECTURE AND VIRTUALIZATION	10 Hours
	The cloud computing stack – virtual appliances – communication protocols – Google Chromium OS – load balancing and virtualization	
Unit III	DEVELOPING CLOUD SERVICES	11 Hours
	Infrastructure as a Service (IaaS) – IaaS workloads – Platform as a Service (PaaS) – Software as a Service (SaaS) – Identity as a Service (IDaaS) – Compliance as a Service (CaaS).	
Unit IV	CLOUD APPLICATIONS	12 Hours
	The cloud providers – Cloud Analytics. Healthcare: ECG analysis in the cloud - Geoscience: satellite image processing.	
Unit V	CLOUD STORAGE	13 Hours
	Cloud storage – unmanaged cloud storage – managed cloud storage – creating cloud storage systems. Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of Cloud computing.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Barrie Sosinsky., (2012), "*Cloud Computing Bible",* Wiley India Pvt. Ltd. Print, New Delhi.

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Reference Books

1. Kaittwang Geoffrey C.Fox and Jack J Dongrra., (2012), *"Distributed and Cloud Computing",* Elsevier India.

2. Michael Miller., (2008), *"Cloud Computing",* Pearson Education Inc., New Delhi, [1st] Edition.

3. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter ., (2011), *"Cloud Computing : A Practical Approach",* Tata McGraw Hill.

Course Outcomes
After completion of this course, the students will be able to:

CO1	State the basics of Cloud Computing.
CO2	Discuss Architecture of Cloud.
CO3	Infer Knowledge about Cloud Platforms.
CO4	Classify various Cloud applications.
CO5	Interpolate about cloud storage.

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	3	2	1	3	2	2	3	1	1	1	1	1
CO2	2	2	2	2	1	2	2	2	2	2	1	1
CO3	1	3	2	3	3	3	1	2	3	3	1	1
CO4	3	3	3	3	1	3	3	2	3	1	1	1
CO5	3	2	2	2	3	3	2	2	3	2	1	1

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit	UNDERSTANDING CLOUD COMPUTING	14 Hours	Mode
I	a. Cloud computing – cloud types	3	Descriptive method, PPT Presentation
	b. The cloud cube model – deployment models	3	
	c. Service models – characteristics of cloud computing	4	
	d. Benefits of cloud computing – disadvantages of cloud computing.	4	
Unit II	CLOUD ARCHITECTURE AND VIRTUALIZATION	10 Hours	Mode
	a. The cloud computing stack	3	Descriptive method, PPT Presentation
	b. Virtual appliances	1	
	c. Communication protocols	3	
	d. Google Chromium OS– load balancing and virtualization	3	
Unit III	DEVELOPING CLOUD SERVICES	11 Hours	Mode
	a. Infrastructure as a Service (IaaS) – IaaS workloads	3	Descriptive method, Assignments
	b. Platform as a Service (PaaS) – Software as a Service (SaaS)	3	
	c. Identity as a Service (IDaaS)	2	
	d. Compliance as a Service (CaaS).	3	
Unit IV	CLOUD APPLICATIONS	12 Hours	Mode
	a. The cloud providers	3	Descriptive method PPT Presentation
	b. Cloud Analytics	3	
	c. Healthcare: ECG analysis in the cloud	3	
	d. Geoscience: satellite image processing.	3	
Unit V	CLOUD STORAGE	13 Hours	Mode
	a. Cloud storage – unmanaged cloud storage	3	Descriptive method, Assignment,PPT
	b. Managed cloud storage – creating cloud storage systems	4	
	c. Public clouds - Private clouds - Community clouds	3	

	d.	Hybrid cloud s - Advantages of Cloud computing.	3	Presentation

Course designed by Mr. A. IGNATIOUS AROCKIAM

Programme	BCA	Programme Code		UCA	
Course Code	20UCAE62	Number of Hours/Cycle		4	
Semester	VI	Max. Marks		100	
Part	III	Credit		4	
Core Elective Course II					
Course Title	Biometrics		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

      To impart knowledge on various concepts of Biometrics, to enable design of biometric system and to Learn the computational methods involved in the biometric systems.

Unit I	Biometric Fundamentals	12 hours

	Benefits of biometrics versus Traditional: Authentication Methods – Benefits of biometrics in Identification system – Conclusion. Key Biometric Terms and Processes – Definitions – Verification and Identification – Logical versus Physical Access – How biometric matching works conclusion. Accuracy in Biometrics system: False match Rate – False Nonmatch Rate – Failure to – Enroll(FTE) Rate – Derived metrics – conclusion.	
Unit II	**Leading Biometric Technologies:**	14 Hours
	Finger Scan: Components – How Finger Scan Technology Works – Competing Finger scan Technologies –Finger scan deployments- Finger scan strengths – finger scan weaknesses – Conclusion. Facial Scan: How Facial scan Technology works – Competing Facial Scan Technologies – Facial scan Deployments- Facial Scan Strengths – Facial Scan weaknesses – Conclusion.	
Unit III	**Iris Scan and Voice Scan**	12 Hours
	Iris Scan: Components – How it works – Deployments – Iris Scan Strengths – Iris Scan Weaknesses –Conclusion. Voice Scan: Components - – How it works – Deployments – Voice Scan Strengths – Iris Scan Weaknesses –Conclusion.	
Unit IV	**Other Physiological Biometrics**	10 Hours
	Other Physiological Biometrics: Hand Scan – Retina Scan – Automated Fingerprint Identification Systems(AFS). Other Leading Behavioural Biometrics: Signature Scan – Keystroke Scan.	
Unit V	**Biometric Applications and Markets**	12 Hours
	Citizen – Facing Applications: Criminal Identification – Citizen Identification – Surveillance. Employee-Facing Applications: PC/Network Access – Physical Access/Time and Attendance. Customer-Facing Applications: E-commerce / Telephony – Retail /ATM/Point of sale. Biometric Vertical Markets: Five Primary Biometric Vertical Markets – Law Enforcement – Government sector – Financial Sector – Healthcare – Travel and Immigration – Additional Biometric Verticals.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1.Samir Nanavati, Michael Thieme, Raj Nananvati., (2002), "*Biometrics*", Wiley Publication, India,2nd Edition.

Reference Books

1.Anil K Jain, Arun A. Ross, Karthik Nandakumar., (2011),"*Introduction to Biometrics.*" Springer – Verlag New York Inc.

2.Maria Birmingham., (1994), "*Biometrics: Your Body and the Science of Security*", PHI, New Delhi.

3.John Chirillo, Scott Blaul., (2003),"*Implementing Biometric Security*", John Wiley & Sons, US, 1st Edition

E-Resources

- https://www.biometricsinstitute.org
- https://www.tutorialspoint.com/biometrics
- http://nptel.ac.in

Course Outcomes

After completion of this course, the students will be able to:

CO1	Recall the functions of biometric fundamentals
CO2	Apply biometric matching for identification
CO3	Identify algorithms for iris and voice biometric technology
CO4	Apply other technologies like iris, hand and behavioral biometrics for identification
CO5	Infer the usage of Biometric Applications and Markets

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	2	1	1	3	1	3	1	1	1	3
CO2	2	3	2	1	1	3	1	3	1	1	1	3
CO3	2	3	2	1	1	3	1	3	1	1	1	3
CO4	3	2	3	2	1	3	1	3	1	1	1	3
CO5	3	2	3	2	1	3	1	3	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1&K1	2(K1)	1(K1)

2	CO2	Up to K2	2	K1&K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1&K1	2(K2)	1(K2)
4	CO4	Up to K3	2	K1&K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1&K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consoli dated (Round ed off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit I	Biometric Fundamentals	12 hours	Mode
	d. Benefits of biometrics versus Traditional: Authentication Methods – Benefits of biometrics in Identification system – Conclusion	3	Descriptive method, PPT Presentation
	e. Key Biometric Terms and Processes – Definitions – Verification and Identification	2	
	f. Logical versus Physical Access – How biometric matching works conclusion.	3	
	g. Accuracy in Biometrics system: False match Rate – False Nonmatch Rate	2	
	h. Failure to – Enroll(FTE) Rate – Derived metrics – conclusion	2	
Unit II	**Leading Biometric Technologies:**	**14 Hours**	**Mode**
	i. Finger Scan: Components – How Finger Scan Technology Works – Competing Finger scan Technologies	4	Descriptive method, PPT Presentation
	j. Finger scan deployments- Finger scan strengths – finger scan weaknesses – Conclusion	3	
	k. Facial Scan: How Facial scan Technology works – Competing Facial Scan Technologies	4	

Unit		Hours	Mode
	l. Facial scan Deployments- Facial Scan Strengths – Facial Scan weaknesses – Conclusion.	3	
Unit III	**Iris Scan and Voice Scan**	**12 Hours**	**Mode**
	f. Iris Scan: Components – How it works – Deployments	3	Descriptive method,Assignments
	g. Iris Scan Strengths – Iris Scan Weaknesses –Conclusion	3	
	h. Voice Scan: Components - – How it works	3	
	i. Deployments – Voice Scan Strengths – Iris Scan Weaknesses –Conclusion	3	
Unit IV	**Other Physiological Biometrics**	**10 Hours**	**Mode**
	e. Other Physiological Biometrics: Hand Scan	3	Descriptive method PPT Presentation
	f. Retina Scan – Automated Fingerprint Identification Systems(AFS)	4	
	g. Other Leading Behavioural Biometrics: Signature Scan – Keystroke Scan	3	
Unit V	**Biometric Applications and Markets**	**12 Hours**	**Mode**
	d. Citizen – Facing Applications: Criminal Identification – Citizen Identification – Surveillance	2	Descriptive method,Assignment,PPT Presentation
	e. Employee-Facing Applications: PC/Network Access – Physical Access/Time and Attendance	3	
	f. Customer-Facing Applications: E-commerce / Telephony – Retail /ATM/Point of sale	2	
	g. Biometric Vertical Markets: Five Primary Biometric Vertical Markets – Law Enforcement – Government sector	2	
	h. Financial Sector – Healthcare – Travel and Immigration – Additional Biometric Verticals.	3	

Course designed by Mrs.P. Aarthy

Programme	BCA	Programme Code	UCA
Course Code	20UCAE63	Number of Hours/Cycle	4
Semester	VI	Max. Marks	100
Part	III	Credit	4
Core Elective Course III			

Course Title	Cryptography		L	T	P
Cognitive Level		Up to K3	60	-	-

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

      This course helps students to understand about Cryptography, develop knowledge about Symmetric, Asymmetric key Ciphers, Digital Signatures and password generation.

Unit I	**Introduction**	12 Hours
	Security goals – Attacks– Services and mechanism – Techniques enabling Technologies **Traditional Symmetric-key Ciphers** : Introduction – Substitution ciphers –transposition ciphers – Stream and block ciphers	
Unit II	**Introduction to Modern Symmetric-key Ciphers**	12 Hours
	Modern block ciphers – Modern stream ciphers **Data Encryption Standard:** Introduction-Data Encryption Standard Structure– DES Analysis – Multiple DES – Security of DES	
Unit III	**Advanced Encryption Standard**	13 Hours
	Introduction – Transformation – Key expansion– Ciphers – Examples- Analysis of AES **Encipherment using modern symmetric-key ciphers**: Use of modern block ciphers – use of stream ciphers – Other issues.	
Unit IV	**Asymmetric key Cryptography**	10 Hours
	Introduction-RSA Cryptosystem – RABIN Cryptosystem – ELGAMAL Cryptosystem – Elliptic curve Cryptosystem	
Unit V	**Digital Signature**	13 Hours
	Comparison – Process – Services – Attacks on Digital Signatures – Digital Signature schemes – Variations and Applications **Entity Authentication**: Introduction – Passwords – Challenge Response – Zero knowledge – Biometrics	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Behrouz A Forouzan , (2007), Special Edition, "*Cryptography and Network Security*" ,Tata McGraw Hill(INDIA) Pvt Ltd., NewDelhi.

Reference Books

1. William Stallings.,(2017).,"*Cryptography And network Security principles And Practice",*Pearson Education Limited,7th Edition

2. Bruce Schneier.,(2007), "*Applied Cryptograhy Protocols,Algorithms and Source code in C"*, Wiley Publishing Company, 2nd Edition.
3. Christof Paar and Jan Pelzi.,(2010), "*Understanding Crptography"*, Springer,1st Edition.
4. D.R Stinson and Maura B.Paterson., "*Cryptography : Theory and Practice"*, Chapman and Hall/CRC,4th Edition.

E-Resources
- https://en.wikipedia.org/wiki/Cryptography
- https://www.geeksforgeeks.org/cryptography-and-its-types/
- https://www.techtarget.com/searchsecurity/definition/cryptography
- https://www.encryptionconsulting.com/education-center/what-is-cryptography/
- https://www.sciencedirect.com/topics/earth-and-planetary-sciences/cryptography

Course Outcomes
After completion of this course, the students will be able to:

CO1	Describe various security concepts and traditional symmetric key ciphers
CO2	Interpret the modern symmetric key ciphers
CO3	Cite the advanced encryption standards.
CO4	Apply the various operations in Asymmetric key ciphers.
CO5	Use the concept of Digital Signature and password generation

Mapping of Course Outcomes (COs) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	3	2	2	2	1	1	1	1	1	3
CO2	2	3	2	3	2	1	2	1	1	1	1	3
CO3	2	3	2	3	2	1	2	1	1	1	1	3
CO4	2	3	2	3	1	1	2	1	1	1	1	3
CO5	2	3	2	3	1	1	2	1	1	1	1	3

3.High; 2. Moderate ; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. Of Question	No. Of Question
1	CO1	Up to K1	2	K1	2(K1)	1(K1)
2	CO2	Up to K2	2	K1	2(K2)	1(K2)
3	CO3	Up to K2	2	K1	2(K2)	1(K2)

4	CO4	Up to K3	2	K1	2(K2)	1(K3)
5	CO5	Up to K3	2	K1	2(K2)	1(K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section - wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	10	8	10	28	28.00	28
K2		32	20	52	52.00	52
K3			20	20	20.00	20
Total Marks	10	40	50	100	100.00	100%

Lesson Plan

Unit	Introduction	12 Hours	Mode
I	a. Security goals – Attacks– Services and mechanism – Techniques enabling Technologies	4	Descriptive method, PPT Presentation
	b. **Traditional Symmetric-key Ciphers** : Introduction – Substitution ciphers – transposition ciphers	4	
	c. Stream and block ciphers IoT and deployment Templates	4	
Unit II	**Introduction to Modern Symmetric-key Ciphers**	**12 Hours**	**Mode**
	a. Modern block ciphers – Modern stream ciphers	4	Descriptive method, PPT Presentation
	b. **Data Encryption Standard:** Introduction-Data Encryption Standard Structure– DES Analysis	4	
	c. Multiple DES – Security of DES	4	
Unit III	**Advanced Encryption Standard**	**13 Hours**	**Mode**
	a. Introduction – Transformation – Key expansion	3	Descriptive method, PPT Presentatio
	b. Ciphers –Examples- Analysis of AES	4	
	c. **Encipherment using modern symmetric-key ciphers**: Use of modern block ciphers	3	

Unit				
	d. use of stream ciphers – Other issues.	3	n	
Unit IV	**Asymmetric key Cryptography**	**10 Hours**	**Mode**	
	a. Introduction-RSA Cryptosystem	3	Descriptive method, PPT Presentation	
	b. RABIN Cryptosystem – ELGAMAL Cryptosystem	4		
	c. Elliptic curve Cryptosystem	3		
Unit V	**Digital Signature**	**13 Hours**	**Mode**	
	a. Comparison – Process – Services – Attacks on Digital Signatures	4	Descriptive method, PPT Presentation	
	b. Digital Signature schemes – Variations and Applications	3		
	c. **Entity Authentication**: Introduction – Passwords – Challenge Response – Zero knowledge – Biometrics	6		

Course designed by Mrs.M.Chandamona

Programme	BCA	Programme Code		UCA	
Course Code	20UCAC6Q	Number of Hours/Cycle		3	
Semester	VI	Max. Marks		100	
Part	III	Credit		3	
Core Practical Course					
Course Title	LAB: Web Technologies Lab		L	T	P
Cognitive Level		Up to K3	-	-	60

Preamble

    This paper will train the students to develop smart computational algorithmic solutions through Client and server side programming languages**.**

    1. Design the following static web pages required for an online book store web site.

1) HOME PAGE: The static home page must contain three frames.
2) LOGIN PAGE
3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
4) REGISTRATION PAGE

2. Write JavaScript to validate the following fields of the Registration page.
   1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
   2. Password (Password should not be less than 6 characters length).
   3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty)..

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.

4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function
   b) Output: Display date in the textbox
   a) Input: A number n obtained using prompt
   b) Output: Factorial of n number using alert
   a) Input: A number n obtained using prompt
   b) Output: A multiplication table of numbers from 1 to 10 of n using alert
   a) Input: A number n obtained using prompt and add another number using confirm
   b) Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color,bold and font size). To create HTML page that contain textbox, submit / reset button.

6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not.

8. Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) Servlet and (d) JSP.

Course designed by Mrs.P. Aarthy

Programme	BCA	Programme Code	UCA		
Course Code	**20UCAC6P**	Number of Hours/Cycle	6		
Semester	VI	Max. Marks	100		
Part	III	Credit	5		
Project					
Course Title	**Project work and Viva voce**	L	T		P
Cognitive Level	**Up to K4**	-	-		90

L-Lecture Hours, T-Tutorial Hours, P-Practical Hours

Course Outcomes
Upon successful completion of this project work the student:

CO1	Will get a little exposure to the field of Computer Application.
CO2	Able to convert a real life problem into a Computer Application projects and solve it by using domains.
CO3	Will gain through practical experience, a sound appreciation and understanding of the theoretical principles learnt in previous semesters
CO4	Will Develop the skills, knowledge and attitude needed to make an effective start as a member of Computer professional

Project work:

- Each faculty will be alloted a group of (**2**) students for their project in any one of the areas of Computer Science in consultation with their guide and the Head of the Department.

- The topic/area of work will be finalized at the Starting of VI semester, allowing scope for the students to gather relevant coding during the Semester.

- The project report should be submitted to the Head of the Department of Computer Application through the Guide one week prior to the commencement of the summative examination.

- They shall submit **three** copies of their project report for valuation.

- The choice of the topic for the project can be from a wide range of subjects, but a text or topic prescribed in the syllabi should be strictly avoided.

Area of work:
C#.Net, ASP.Net, PHP, Java, Java Script, VB, VB.Net, XML, HTML and CSS, Android
Each project should contain the following details:
 Brief introduction on the topic
System Analysis

Feasibility Studies
System design
System Requirements
System Implementation
Software Description
Software Testing
Source Code
Screen Shots
Conclusion
Bibliography

● The project should be at least 40 pages excluding bibliography and appendices.

● There shall be **internal and external valuation**.

● The maximum marks for the project work shall be 100.

InternalAssessment:100 Marks

Mode of Evaluation	Marks
Project Report	**40**
Viva Voce	**60**

● Further for a pass in this course as a whole, an individual can secure at least 40 marks in

project report and viva-voce put together.

Programme	BCA	Programme Code	UCA		
Course Code	20UCAS6P	No. of Hrs per Cycle	2		
Semester	VI	Max. Marks	50		
Part	IV	Credit	2		
Skill Based Course IV					
Course Title	MATLAB		L	T	P
Cognitive Levels	Upto K3		-	-	30

L-Lecture Hours   T-Tutorial Hours   P-Practical Hours

Preamble

This lab will equip the students to apply a variety of digital image processing techniques and algorithms for real-world applications.

List of Practicals

1. Implement the spatial image enhancement functions on a bitmap image – Mirroring (Inversion)

2. Implement the spatial image enhancement functions on a bitmap image – Rotation (Clockwise)

3. Implement the spatial image enhancement functions on a bitmap image – Enlargement (Double Size)

4. Implement (a) LowPassFilter(b) HighPass Filter

5. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter

6. Implement Smoothing and Sharpening of an eight bit color image

7. Write a Program to perform shrinking, zooming and cropping of an image

8. Write a Program to perform blurring and de-blurring on an image.

9. Write a Program to Remove salt and pepper noise in an image.

10. Write a Program to Perform Edge detection using Operators.

Course Designed By: Mrs P.Aarthy

Extra Credit Value Added Courses

Programme	BCA	Programme Code	UCA
Course Code	20CBCA51	Number of Hours/Cycle	2
Semester	V	Max. Marks	50
Part	III	Credit	2
Value Added Course I			
Course Title	Business Process Outsourcing		

Preamble

This course will enable the students to understand about BPO industry and the trends in healthcare and human resource outsourcing.

Unit I	**Business Process Outsourcing**	**6 Hours**
	Basics – Benefits of BPO – Growth Drivers – BPO Models and Types of Vendors – Offshore BPO: Evolution Destinations – Challenges of Off shoring – BPO Companies in India.	
Unit II	**BPO Industry**	**6 Hours**
	Employment Opportunities – Employee Structure – Skill Set Required – Compensation Levels – Contact Centre BPO: Types of Call Centers – Technology – Components and working of a Call center – Issues and Problems – Case Study – Internet Global.	
Unit III	**Healthcare BPO**	**6 Hours**
	Structure of the American Healthcare Sector – Activity Profile – Future Trends and Threats – Case Study – C bay Systems.	
Unit IV	**Transaction Processing BPO**	**6 Hours**
	Elements of Back – Office Services – Financial Services – Insurance – Case Studies – Data Matics – Hinjuja TMT.	
Unit V	**Human Resource BPO**	**6 Hours**
	Reasons for Outsourcing HR – Activities Involved in HR BPO – HR Outsourcing Trends – Career in HR BPO – Emerging BPO Domains – Media and Entertainment BPO – Publishing BPO.	

Text Book
1.Sarika Kulkarni, 2005, Business Process Outsourcing, Jaico Publishing House, Delhi.

Reference Books

1. Deepak Shikapur, 2004, BPO DIGEST, Ameya(Inspiring Books)
2. John K.Halvey, Barbara M. Melby, Business Process Outsourcing, John Wiley & Sons, Inc.
3. Gupta, 1st Edition, Comdex BPO training course kit, International Edition, New Delhi.

Course designed by Miss. S. Monisha

Extra Credit Value Added Courses

Programme	BCA	Programme Code	UCA
Course Code	20CBCA61	Number of Hours/Cycle	2
Semester	VI	Max. Marks	50
Part	III	Credit	2
Value Added Course II			
Course Title	**Mobile Commerce**		

Preamble

   This course will enable the students to learn about Mobile commerce applications and digital cellular technology.

Unit I	**MOBILE COMMERCE**	**4 Hours**
	Introduction to Mobile Commerce - Scope of Mobile Commerce - Mobile Commerce Framework - Mobile Commerce Business Models - Mobile Commerce Applications - Mobile Commerce Services.	
Unit II	**APPLICATIONS**	**8 Hours**
	Mobile Commerce Applications - Mobile Application Development – Software Platforms – Software Tools - Mobile Commerce Technology – Wireless and Mobile Communication – Communication Systems – Wireless Communication – Satellite Communication – Mobile Communication Systems.	
Unit III	**DIGITAL CELLULAR TECHNOLOGY, 2G AND 3G**	**7 Hours**

	Digital Cellular Technology – Cellular Communication – Cellular Networks – Mobile Phone Cellular Network – Mobile Access Technology – Evolution of Mobile Communication Systems – 2 G Systems – 3G Systems.	
Unit IV	**4G AND 5G**	**6 Hours**
	4G Systems – 4G Features - 4G Technologies – 4G Objectives and Goals – 4G Deployment Plans – 5 Systems – Mobile Devices – Mobile Service Providers – Mobile Network Operators.	
Unit V	**MOBILE BANKING**	**5 Hours**
	Mobile Products - Mobile Banking – Tickets On Mobile – Mobile Payment – Security and Legal Aspects – Future of Mobile Commerce.	

Pedagogy

Class Room Lectures, chalkboards, Power point presentation, You Tube, Group Discussion, Seminar, Quiz, Assignments, Brain storming, Activity

Text Book

1. Karabi BandyoPadhyay., (2013), "*Mobile – Commerce",* PHI Learning Private Limited

.
Reference Books

1. Jeanne Hopkins, Jamie Turner., (2012), "*Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business",* John Wiley&Sons Inc

2. Paul Skeldon., (2012), "*M- Commerce",* Crimson Publishing

3. E.Brian Mennecke, J.Troy Strader., (2003), "*Mobile Commerce: Technology, Theory and Applications",* Idea Group Inc., IRM press

Course designed by Mr. A. IGNATIOUS AROCKIAM