PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

PREAMBLE

- UG : Programme Profile- List of Courses offered to other Departments and Syllabi of Courses in the III and IV Semesters along with Evaluation Components III and IV (With effect from 2021-2024 Batch Onwards) and
- **PG** : Programme Profile- List of Courses offered and Syllabi of Courses in the III and IV Semesters along with Evaluation Components III and IV (With effect from 2021-2023 Batch Onwards).

PROGRAMME PROFILE B.Sc. (COMPUTER SCIENCE)

(LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK)

- **PSO 1:** Understood the appropriate techniques to design, implement, and evaluate computer-based system process, & component to get results on desired needs.
- **PSO 2:** Learnt to engage in development of current technical concepts and Broadest context of technological change.
- **PSO 3:** Ability to have the required skills of IT industries as well as software developer, database administrator, programmer, system analyst, data scientist, web application developer, system programmer, software testing, expert system designer.
- **PSO 4:** Inculcate effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PSO 5:** Identified solutions for complex problems and design system components or processes that meet the specified needs for the societal and environmental Considerations.
- PSO 6: Gained the ethical principles of legal, security, social issues and responsibilities.
- **PSO 7:** Generate the impact of the professional techniques solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Semester	Part	Category	Course Code	Course Title	Previous Course Code	Contact Hour/ Week	Credit Min/Max
	Ι	Language	UTAL107/ UTAL108	Languages/ AECC-II Tamil-I/ Hindi-I/ French-I (2 Levels)	UTAL105/ UTAL106/ UHIL101/ UFRL101	5	3/4
	П	English	UENL109/ UENL110	English for Communication (Stream-I) / English for Communication (Stream-II)	UENL107/ UENL108	5	3/4
Ι	III	Major Core (DSC) - I	UCSM110/ UCAM110	Principles of Information Technology	UCSM108	5	4
	III	Major Core (DSC) - II	UCSM109/ UCAM111	Programming Methodology	-	4	4
	III	Major Core (DSC) - III	UCSR110/ UCAR106	Programming Methodology – Practical	-	3	2
	III	Allied (GE) - I	UMAA114	Mathematics for Computer Science	-	6	4
	III	Professional English	UPEM101	Professional English I	-	6	4
	IV	Value Education (SEC)				2	1
					Total	36	25/27
	Ι	Language	UTAL207/ UTAL208	Languages/ AECC-II Tamil-II/ Hindi-II/ French-II (2 Levels)	UTAL205/ UTAL206/ UHIL201/ UFRL201	5	3 /4
	II	English	UENL209/ UENL210	English for Communication (Stream-I)/ English for Communication (Stream-II)/	UENL207/ UENL208	5	3/4
	III	Major Core (DSC) - IV	UCSM207/ UCAM206	Data Structures	UCSM206	4	4
II	III	Major Core (DSC) - V	UCSM208/ UCAM207	Python Programming	-	4	4
	III	Major Core (DSC) - VI	UCSR207/ UCAR205	Data Structures using Python – Practical	UCSR206	3	2
	III	Allied (GE) - II	UMAA218	Mathematics for Computer Science	-	6	4
	III	Professional English	UPEM201	Professional English II	-	6	4
	IV	NME (Skill Enhancement Course)					
		Internship	UCSI201	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)

	v	Extension Programme / Physical Education/ NCC				-	1/2
					Total	33	25/29
	I	Language	UTAL307/ UTAL308	Languages/ AECC-II Tamil-III/ Hindi-III/ French-III(2 Levels)	UTAL305/ UTAL306 UHIL301/ UFRL301	5	3 /4
	П	English	UENL309/ UENL310	English for Communication (Stream-I)/ English for Communication (Stream-II)	UENL307/ UENL308	5	3 /4
III	Ш	Major Core (DSC) - VII	UCSM305	Java Programming	UCSM304	5	5
	III	Major Core (DSC) - VIII	UCSM307	Software Engineering	UCSM511	4	4
	III	Major Core (DSC) - IX	UCSR308	Java Programming – Practical	UCSR305	3	2
	III	Allied (GE) – V	UPHA304	Electronics for Computer Science	-	3	3
	III	Allied (GE) –VI	UPHR304	Electronics for Computer Science– Practical	-	3	2
	IV	Value Education (SEC)				2	1
					Total	30	23/25
	Ι	Language	UTAL407/ UTAL408	Languages/ AECC-II Tamil-IV/ Hindi-IV/ French-IV(2 Levels)	UTAL405/ UTAL406/ UHIL401/ UFRL401	5	3 /4
	II	English	UENL409/ UENL410	English for Communication (Stream-I)/ English for Communication (Stream- II)	UENL407/ UENL408	5	3/4
IV	III	Major Core (DSC) - X	UCSM409	Operating Systems		5	5
	III	Major Core (DSC) - XI	UCSR412	Operating System Practical	UCSR411	4	3
	III	Allied (GE) – IX	UPHA403	Digital Electronics for Computer Science	UPHA303	3	3
	III	Allied (GE) - X	UPHR403	Digital Electronics for Computer Science – Practical	UPHR303	3	2

		NME (Skill					
	IV	Enhancement				3	2
		Course)				-	
		Online		NPTEL/SPOKEN			
	IV	Courses		TUTORIAL/SWAYAM		3	1/2
		Courses					
	IV	SOIL SKIII				2	1
		(SEC)					/1
		Internship	UCSI401	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)
		Extension					
	V	Programme /				_	0/2
	•	Physical					0/2
		Education					
				-	Total	33	23/28
	III	Major Core (DSC) - XII	UCSM506	Middleware Technologies	-	5	5
	III	Major Core (DSC) - XIII	UCSM510	Computer Networks		5	4
	III	Major Core (DSC) - XIV	UCSM512	Database Management System	UCSM509	4	4
V	III	Major Core (DSC) - XV	UCSR512	Middleware Technologies – Practical	UCSR509	4	3
	III	MAJOR ELECTIVE (Discipline Specific Elective)– XVI	UCSO501/ UCSO502/ UCSO503	Computer Ethics/ Computer Graphics/ Data Mining	-	5	4
	III	Major Core (DSC) - XVII	UCSP501	Project	UCSP601	5	5
	IV	Value Education				2	1
					Total	30	26
	III	Major Core (DSC) - Core XVIII	UCSM612	Cloud Computing	-	5	5
	III	Major Core (DSC) - XIX	UCSM614	Bigdata Tools	UCSM610	5	4
VI	III	Major Core (DSC) - XX	UCSM615	Internet of Things	UCSO608	5	4
	III	Major Core (DSC) - XXI	UCSR608	Bigdata Tools Practical	-	4	4
	III	Major Core (DSC) - XXII	UCSR609	Cloud Computing- Practical	UCSR508	4	3
	III	MAJOR ELECTIVE	UCSO609/ (UCSO610/	Artificial Intelligence/ Open Source Technology/	-	5	4

	(Discipline	UCSM613)/	Network Security			
	Specific	UCSO606				
	Elective)-					
	XXIII					
ш	Viva Voca	UCSM611	Comprehensive Viva			1
111	viva – voce	UCSIMOTT	Voce	-	-	1
ц.	Soft Skill				n	1
1 V	(SEC)				2	1
	Internship	UCSI601	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)
				Total	30	26/27
				Grand Total	192	148/162

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

Class & Major	Semester	Category	Course Code	New Course Title	Previous Course Code	Contact Hour/ Week	Credit Min/Max
	Ι	Allied	UCSA105	Multimedia	UCSA303	3	3
	Ι	Allied Practical	UCSR111	Multimedia Lab	UCSR306	3	2
	II	Allied	UCSA205	C Programming	UCSA104	3	3
	II	Allied Practical	UCSR208	C Programming Lab	UCSR110	3	2
	III	Allied	UCSA307	Object Oriented Programming	UCSA204	3	3
B.Com with Computer Applications	III	Allied Practical	UCSR311	Object Oriented Programming – Lab	UCSR207	3	2
Applications	IV	Allied	UCSA408	Fundamentals of Blockchain Technology	UCSA305	3	3
	IV	Allied Practical	UCSR414	Blockchain Technology Using Solidity – Lab	UCSR309	3	2
	V	Allied	UCSA510	Digital Marketing Analytics	UCSA406	3	3
	V	Allied Practical	UCSR513	Web Design using Microsoft Expression Web4 – Lab	UCSR412	3	2
BBA, B.Com	IV	Allied	UCSA409	Business Analytics and Intelligence.	UCSA509	3	3
and B.COM (IAT)	IV	Allied Practical	UCSR415	Business Analytics and Intelligence - Lab	UCSR512	3	2
Tamil	V	Allied	UCSA505	Tamil Kanini	-	3T + 2P	5
	III	Allied	UCSA304	Mathematical Programming using C	-	3	3
Maths	III	Allied Practical	UCSR307	Mathematical Programming using C – Lab	-	3	2

	V	Allied	UCSA507	Object Oriented Programming using Java	-	3	3
	V	Allied Practical	UCSR508	Object Oriented Programming using Java - Lab	-	3	2
	III	Allied	UCSA306	Computational Physics with Python	-	3	3
Physics	III	Allied Practical	UCSR310	Computational Physics with Python – Lab	-	3	3

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Previous Course Code	Contact Hour/we ek	Credit Min/Max				
			UCSE206	Tableau Programming	UCSE202	2T+2P	2				
			UCSE207	Python Programming	UCSE203	4P	2				
II IV	IV I	Non Major Elective	UCSE208	R Programming	UCSE204	4P	2				
			UCSE209	Arduino Programming	UCSE205	4P	2				
			UCSE210	Go Programming	-	4P	2				
IV IV					Non Major	Non Major	UCSE406	DIGITAL DESIGN	-	4P	2
	IV	Elective	UCSE407	DATA VISUALIZATION	-	4P	2				

EXTRA CREDIT EARNING PROVISION

Someston Bart C		Catagory	Category Course Code	Course Title	Contact	Cr	edit
Semester	1 alt	Category	Course Coue	Course The	Hour/week	Min	Max
v	III	Self Study Paper	UCSS501	Python Programming	2	1	1
V	III	Self Study Paper	UCSS502/ UCAS502	Android Applications	2	1	1
VI	III	Self Study Paper	UCSS601/ UCAS601	Angular JS	2	1	1
VI	III	Self Study Paper	UCSS602/ UCAS602	Green Computing	2	1	1

JAVA PROGRAMMING UCSM305/ UCAM310

Semester: IIICategory: Core VIIClass & Major: II B.Sc. CS

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire the knowledge of OOPs.
CO-2	Understand the concepts of class and methods.
CO-3	Learn java's exception handling mechanism, multithreading, packages and interfaces.
CO-4	Analyze different string function
CO-5	Develop Graphical User Interface (GUI) or windows-based applications in java.

UNIT -I INTRODUCTION

Fundamentals of Object Oriented Programming: Java Evolution – Overview of Java Language – Data Types, variables, arrays – Operators – Control statements.

UNIT –II CLASSES AND METHODS

Introduction to classes – class fundamentals – Declaring objects – Constructors – Methods and Classes – Overloading methods – static - final - Nested and Inner classes – Inheritance – Method Overriding – Abstract Classes – Packages – Interfaces.

UNIT – III EXCEPTION HANDLING AND FILES

Exception handling – Types of Exception – try and catch – nested try – throw and throws – Multithreading Programming –I/O Streams – Reading and Writing files – Reading and writing Console I/O.

UNIT – IV STRING HANDLING AND APPLETS

String Handling- String Operations: Comparison – Modifying String – String Buffer - Applet Class – Applet Architecture – The HTML Applet Tag – Passing parameters in Applets – Applet Context – Improving the Banner Applet – get() Method - JDBC Concepts.

UNIT – V AWT

AWT classes – Window fundamentals – Working with Frame windows, Graphics – Controls – Layout Managers - Java Swing.

15 Hour

15 Hour

10 Hour

15 Hour

10 Hour

330

Credit : 5 Hour/Week : 5 Total Hour : 65

Text Books

• Herbert Schildt, Java - The Complete Reference, Tata McGraw Hill, 10th Edition,Nov 2017.

Reference Books

- E. Balagurusamy, Programming with Java A Primer, Tata McGraw Hill, FourthEdition, 2010.
- Cay S. Horst Mann & Gary Cornell, *Core java*, Volume II (9th ed.), Sun Microsystems Press Java Series, 2012.

e-Resources

- https://nptel.ac.in/courses/106105191
- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand object oriented programming features and concept	K1,K2
CO-2	Learn different types of inheritance, polymorphism, interfaces	K3
	and packages.	
CO-3	Identify the concepts of Multithreading and Exception	K4
	handling to develop efficient and error free codes.	
CO-4	Compare different string function.	K5
CO-5	Implement windows based application in java	K6

SOFTWARE ENGINEERING UCSM307

Semester	: III
Category	: Major Core (DSC) - VIII
Class & Major	: III B.Sc. Computer Science

Credit : 4 Hour/Week : 4 Total Hour : 52

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the significance of various process models.
CO-2	Familiarize on system engineering and data modeling concepts
CO-3	Explore the various design processes
CO-4	Analyze the project management, estimation, software quality and testing strategies
CO-5	Express the flow of any Software Project

UNIT-I SOFTWARE PROCESS AND AGILE DEVELOPMENT 10 Hour

Introduction to Software Engineering-Software Process-Perspective and Specialized Process Models-Introduction to Agility-Agile Process-Extreme Programming-XP Process

UNIT-II REQUIREMENTS ANALYSIS AND SPECIFICATION 10 Hour

Software Requirements: Functional and Non-Functional - User Requirements - System Requirements - Software Requirements Document - Requirement Engineering Process -Feasibility Study - Requirement Elicitation and Analysis - Requirements - Validation -Requirements Validation - Require Management - Classical Analysis - Structured System Analysis-Petri Nets, Data Dictionary.

UNIT-III SOFTWARE DESIGN

Design Process:Design Concepts-Design Models-Architectural Design: Architectural Design – Defining Archetypes-Refining the Architecture components – Architectural Design for Web Apps and Mobile Apps -User Interface Design-Interface Analysis-Component Level Design-Designing Class based Components-Traditional Components. Web-app Design: Design goals – WebApp Interface Design –Content Design – Architecture Design – Navigation Design. Mobile app Design: Developing MobileApps – MobileApp Design.

UNIT-IV TESTING AND MAINTENANACE

Software Testing Strategies: Strategic Approach – Testing Strategies for Conventional Software – WebApps – MobileApps. Validation Testing-System Testing and Debugging. Software Implementation Techniques-Coding Practices-Refactoring. Maintenance and Reengineering: BPR model-Reengineering Process Model-Reverse and Forward Engineering

10 Hour

UNIT-V PROJECT MANAGEMENT

Project Management: 4P's. Estimation for Software Projects: Software Project Estimation- Decomposition Techniques – LOC-FP based estimation. Empirical Estimation Models: COCOMO II Model. Project Scheduling: Project Scheduling-Earned Value Analysis-Planning-Project Plan-Planning Process. Risk Management: Risk Identification-RMMM plan-CASE TOOLS.

Text Books:

- Roger S.Pressman, Bruce R. Maxim(2014), *Software Engineering-A Practitioners* Approach. McGraw-hill International (8th Ed.)
- Richard E. Fairley (2016), *Principles of Software Engineering*, Wiley–Blackwell

Reference Books:

- Rajib Mall.(2009), *Fundamentals of Software Engineering*, PHI learning private limited. (3rd Ed.).
- Ian Sommerville.(2011), *Software Engineering*, Pearson Publication,(9th Ed.)

e-Resources:

- http://vlabs.iitkgp.ernet.in/se/
- http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/sw_engg/labs/index.php
- https://nptel.ac.in/courses/106105182

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Recall and understand various software processing models and requirement engineering	K1,K2
CO-2	Determine the requirements and design the process	K3
CO-3	Analyze project estimation, scheduling and software quality.	K4
CO-4	Evaluate various models and post development activities.	K5
CO-5	Design a software application that satisfies user requirements	K6

JAVA PROGRAMMING – PRACTICAL UCSR308 / UCAR304

Semester	: III
Category	: Core IX
Class & Major	: II B.Sc. Computer Science

Credit : 2 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire knowledge of designing process.
CO-2	Understand the 3D image objects
CO-3	Develop the visual image & messages.
CO-4	Create graphic design in Greetings with corel draw.
CO-5	Design the party invitation card & a story board.

Lab Exercises

- 1. Classes and Objects
- 2. Constructors
- 3. Method Overloading
- 4. Implementing Single and Multiple Inheritance concepts.
- 5. Method Overriding
- 6. Implementing Package Concepts.
- 7. Implementing Interfaces Concepts.
- 8. Implementing Exception Handling.
- 9. Implementing Thread Synchronization
- 10. Implementing String manipulation using string and string buffer classes
- 11. Implementing Graphics using Applet.
- 12. Implementing Swing Concepts.
- 13. JDBC Connectivity

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Recall and understand various software processing models and requirement engineering	K1,K2
CO-2	Determine the requirements and design the process	K3
CO-3	Analyze project estimation, scheduling and software quality.	K4
CO-4	Evaluate various models and post development activities.	K5
CO-5	Design a software application that satisfies user requirements	K6

OPERATING SYSTEM UCSM409/UCSM609

Semester	: IV
Category	: Core X
Class & Major	: III B.Sc. Computer Science

Credit : 5 Hour/Week : 5 Total Hour : 65

COURSE OBJECTIVES

CO No.	To enable the students	
CO-1	Understand different types and services of Operating Systems.	
CO-2	Explain the process, memory and various scheduling algorithms	
CO-3	Analyze the Memory management algorithms, allocation methods and virtual	
	memory implementations.	
CO-4	Determine the various algorithms using file organization techniques	
CO-5	Improve various issues in Inter Process Communication (IPC) and their	
	security in Linux operating system.	

UNIT – I OVERVIEW OF OPERATING SYSTEM

Operating system – Types of Computer Systems Computer-system operation – I/O structure – System components – System calls – System programs – Process concept – Process scheduling – Operations on processes –Interprocess communication – Multithreading models – Threading issues.

UNIT – II PROCESS MANAGEMENT

Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation – Process Scheduling Models - Synchronization hardware – Semaphores – Classic problems of synchronization – Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock

UNIT – III MEMORY MANAGEMENT

Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

UNIT – IV FILE CONCEPT

Access methods – Directory structure – File-System Mounting – Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management.

UNIT – V LINUX SYSTEM

History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Security

Text Books

• Silberschatz, Galvin and Gagne, Operating System Concepts, Sixth Edition, John Wiley & Sons Inc, New Delhi, 2012.

13 Hour

13 Hour

13 Hour

13 Hour

• Richard Fox, Linux with Operating System Concepts, Second Edition, Pearson Education, 2014.

Reference Books

- Andrew S. Tanenbaum, Operating system Design and Implementation, Fourth Edition, PHI, New Delhi, 2010.
- H M Deital, P J Deital and D R Choffnes, Operating Systems, Pearson Education, New Delhi, 2013.

e-Resources

- http://www.w3schools.com
- http://www.youtube.com

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the basic structure of Operating Systems	K1
CO-2	Apply various scheduling algorithms in process management	K2,K3
CO-3	Compare the various memory management techniques.	K4
CO-4	Classify the different disk scheduling and allocation methods.	K5
CO-5	Formulate Linux Kernel modules.	K6

OPERATING SYSTEM -PRACTICAL UCSR412

Semester	: IV	Credit : 3
Category	: Major Core (DSC) – XI	Hour/Week: 4
Class & Majo	r : II B.Sc Computer Science	Total Hour : 52

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	State and Understand the concepts, structure and design of operating
	systems
CO-2	Describe the memory management process.
CO-3	Classify the scheduling concepts.
CO-4	Determine the concept of String operations
CO-5	Develop skills of file handling operations& Process Management

LAB EXERCISES

- 1. Programs using the following system calls of UNIX operating system fork, getpid, exit, close, opendir, readdir.
- 2. Implement the concepts
 - a. Priority Scheduling Algorithm
 - b. Round Robin Scheduling Algorithm
 - c. FCFS Scheduling Algorithm

- 3. Producer-Consumer Problem Using Semaphores
- 4. Dead Lock
 - a. Avoidance
 - b. Prevention
- 5. Memory Management Techniques
 - a. Multi Programming with Fixed Number of Tasks(MFT)
 - b. Multi Programming with Variable Number of Tasks(MVT)
- 6. File Organization Techniques
 - a. Single Level Directory
 - b. Two Level Directory
- 7. File Allocation Strategies
 - a. Sequential
 - b. Indexed
 - c. Linked
- 8. Develop a shell program to
 - a.Check the given number is odd or even.
 - b.Find the factorial of a given number.
 - c.Swap two integer numbers.

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Examine knowledge about Operating System, Memory	K1
	Management and scheduling concepts.	
CO-2	Recall & Relate the concepts, structure and design of	K2
	operating systems	
CO-3	Discuss and compare the differing structures of operating	K4
	systems	
CO-4	Investigate the features of Unix Operating System to	K6
	implement, Memory Management and scheduling concepts	
CO-5	Compare the performance of various CPU Scheduling	K4/K5
	Algorithms & IPC, Process Management	

OBJECT ORIENTED PROGRAMMING UCSA307

Semester : III Category : Allied Class & Major: II B.com CA

Credit : 3 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand Object Oriented Programming concepts and basic
	characteristics of Java
CO-2	Explain the concepts of exceptions and use of virtual Functions
CO-3	Apply Constructors and overloading for java applications.
CO-4	Develop a java application with interfaces and generics classes
CO-5	Design and build simple Graphical User Interfaces

UNIT- I BASICS OF OOPS

Principles of Object Oriented Programming - Basic concepts of OOP - Benefits of OOP - Object Oriented Language Applications of OOP. Classes and Objects - Constructors and Destructors - Type Conversions.

UNIT- II INHERITANCE AND POLYMORPHISM

Inheritance - Polymorphism - Function and Operator Overloading - Virtual Functions – Arrays, Pointers and References – Exception Handling.

UNIT- III FUNDAMENTALS OF JAVA

Introduction : Data Types - Literals - Variables - Type Conversion and Casting – Operators and Expressions – Arrays – Strings. **Class Fundamentals:** Declaring Class Objects Constructors - Garbage Collection – The finalize () Method - Overloading Methods - Argument Passing – Recursion.

UNIT- IV INHERITANCE AND INTERFACES

Inheritance: Using Super - Method Overriding - Abstract Classes - The final Keyword. **Interfaces:** -Structure of an Interface – Interface Inheritance.

UNIT- V APPLET

The Java Applet Class and Interfaces – Sample Programs.

Text Books

- Herbert Schildt, "*The Complete Reference C++*", 5th edition, Tata McGraw-Hill Publishing, New Delhi, 2015
- Balagursamy E "Object Oriented Programming with C++", Tata McGraw Hill Publications, 6th Edition, 2013.

8 Hour

8 Hour

7 Hour

8 Hour

- Patric Naughtonand Herbert Schildt, "*The Complete Reference Java 2*", TataMcGraw Hill Publishers, 2017.
- E. Balagurusamy, "*Programming with Java A Primer*", Tata McGraw-Hill Publish., 5th Edition, 2013.

Reference Books

- Barbara Johnston, C++ Programming Today, Pearson education/Prentice-Hall of India, ISBN 81-317-1079-3, 2011.
- C. Xavier, "Programming with Java 2", Scitech Publications., 2005.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the basics of object-oriented programming concepts.	K1&K2
CO-2	Apply the concepts of inheritance.	K3
CO-3	Analyze the concepts of classes and objects.	K4
CO-4	Compare the difference between overloading and overriding	K5
CO-5	Develop Simple Java Programs using Applet	K6

OBJECT ORIENTED PROGRAMMING LAB UCSR311

Semester	: III	Credit	:2
Category	: Allied	Hour/Week	:3
Class & Major	: II B.com CA	Total Hour	: 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand and apply the concepts of classes, Constructors and Destructors in
	C++ and Java
CO-2	Apply the concepts of Inheritance, Overloading and exception handling in C++
	and Java
CO-3	Analyze the concepts of Abstract classes and Interfaces in C++ and Java
CO-4	Devise applications using generic programming and event handling in java
CO-5	Develop software development skills using java programming for real-world
	applications.

(FINANCE ORIENTED CONCEPTS)

C++:

- 1. Classes and Objects
- 2. Constructors and Destructors.
- 3. Function and Operator overloading
- 4. Inheritance
- 5. Exceptions.

Java:

- 1. Classes and Objects
- 2. Constructors
- 3. Method Overloading and Method Overriding
- 4. Abstract Class and Interface
- 5. Applet

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the concepts of class, constructor and destructor in c++ and Java.	K1,K2
CO-2	Apply overloading concepts in oops.	K3
CO-3	Construct simple applications that make use of classes, packages and interfaces.	K4
CO-4	Develop and implement Java programs with array list, exception handling and multithreading.	K5
CO-5	Design applications using file processing, generic programming and event handling.	K6

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

UCSA408

Semester : IV Category : Allied Class & Major: II B.com CA

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the concepts of block chain and its architecture.
CO-2	Discuss the concepts of digital signatures.
CO-3	Acquire the knowledge of Bitcoin and block Mining.
CO-4	Analyze multicoin stream and explorer.
CO-5	Build applications on Hyperledger Fabric

UNIT - I INTRODUCTION TO BLOCKCHAIN - I (BASICS)

Block chain – History of Block chain 2.0 - Architecture : Block in a Block chain Transactions – How to create and connect to a Block chain - Concepts and benefits of block chain- Components in Blockchain design.

UNIT – II BLOCKCHAIN – II (BASICS)

Conceptualization - Cryptographic Hash Function - Properties of a Hash Function - Wallets - Digital Signature - Public Key Cryptography - Blockchain-as-a-Service (BaaS) – Decentralized Autonomous Organization (DAO) - DAO Structure – Smart Contract.

UNIT – III BITCOIN BASICS

Creation of Coins - Bitcoin scripting - Bitcoin P2P Network - Transaction in Bitcoin Network - Block Mining - Block propagation and block relay.

UNIT – IV MULTICHAIN

Multichain - Compatibility & Differences with Bitcoin Core - Working with Multichain Streams - Multichain Explorer - Checking PoE in using Multichain.

UNIT – V HYPERLEDGER FABRIC

Hyperledger Fabric - Comparison between Fabric & Other Technologies - Fabric Architecture - Components - Advantages - Goals of Hyperledger - Hyperledger Fabric Network Setup.

Case Study: Blockchain Applications Blockchain in Healthcare ,Blockchain in Energy Markets,Blockchain in Media

Text Books

- AndreasAntonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", Published December 27th 2014 by O'Reilly Media (first published July 1st 2014)
- Melanie Swan, "Blockchain", O'Reilly media, February- 2015

8 Hour

8 Hour

8 Hour

8 Hour

7 Hour

Credit : 3 Hour/Week : 3 Total Hour : 39

Reference Books

- Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", 2nd Edition, June, 2017.
- Alan T.Norman, "Blockchain Technology Explained: The Ultimate Beginner's Guide", Dec 12, 2017

e-Recourses

- https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralizedapplications/dp/1788994523
- https://github.com/HyperledgerHandsOn/trade-finance-logistics
- The Basics of Blockchain
- Hyperledger Fabric https://www.hyperledger.org/projects/fabric

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the concepts of block chain fundamental and its components.	K1,K2
CO-2	Demonstrate the application of hashing and public key cryptography in protecting the blockchain	К3
CO-3	Perform a transaction in bitcoin P2P Network	K4
CO-4	Explain the elements of trust in a Blockchain: validation, verification, and consensus.	K5
CO-5	Develop smart contracts in Hyperledger framework	K6

BLOCKCHAIN TECHNOLOGY USING SOLIDITY LAB

UCSR414

Semester	: IV	Credit	: 2
Category	: Allied	Hour/Week	:3
Class & Major	:: II B.com CA	Total Hour	: 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand primary principles of Blockchain technology
CO-2	Apply the Blockchain concepts in real time
CO-3	Analyze the concept of mapping used in block chain.
CO-4	Importing other source files
CO-5	Working with Ethereum Blockchain

Lab Exercises

- 1. Smart Contracts in Ethereum
- 2. Importing other Source Files
- 3. Value or Data Types
- 4. Strings & Operators
- 5. Arrays
- 6. Data Structures
- 7. Mappings
- 8. Control Structures
- 9. Functions
- 10. Inheritance

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand block chain technology	K1,K2
CO-2	Integrate ideas from various domains and implement them using block chain technology in different perspectives.	K3
CO-3	Analyze control structure and inheritance.	K4
CO-4	Compare different data structures used in block chain.	K5
CO-5	Develop block chain based solutions and write smart contract using Ethereum frameworks	K6

BUSINESS ANALYTICS AND INTELLIGENCE

UCSA409

Semester : IV Category : Allied Class & Major: II B.com, B.com (IAT), BBA

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the concepts of business problems and its solutions.
CO-2	Apply Excel and Excel add-instructions to solve business problems
CO-3	Analyze different strategy level
CO-4	Summarize data mining process
CO-5	Develop business intelligent system.

UNIT-I INTRODUCTION

Business Intelligence: overview-need for Business Intelligence-information and knowledge- Role of Mathematical models- characteristics of business intelligence -structure and components business intelligence.

UNIT- II ANALYTICS STRATEGY

Business Analytics at the strategic level: Strategy and BA-Link between strategy and Business Analytics-BA supporting strategy at functional level-Functions-information as strategic resource.

UNIT -III DATA VISUALIZATION

Data visualization-Online Analytical Processing (OLAP)-Reports and Queries -Multidimensionality Advanced Business Analytics.

UNIT -IV DATA MINING

Data Mining definition, objetives and benefits Methods-Applications of DM -Data Mining Software Tools-Data Mining Process-Text and Web DM. Business Analytics at Analytical level : Statistical data mining-descriptive Statistical methods-data mining with target variables.

7 Hour

8 Hour

8 Hour

8 Hour

Credit : 3 Hour/Week : 3 Total Hour : 39

UNIT-V BUSINESS INTELLIGENCE

Business Intelligence Architectures: Cycle of Business Intelligence Analysis-Development of Business Intelligence System- spread sheets. BI Tools: Concept of dashboard.BI Applications in different domains- CRM, HR.

Text Book

• Turban, Sharda. (2014). *Decision Support and Business Intelligence Systems*. (4thed).Delen, Pearson.

Reference Books

- Olivia Parr Rud. (2009). Business Intelligence Success Factors Tools for aligning your business in the global economy. John Wiley and Sons.
- Steve Williams and Nancy Williams. (2007). The Profit impact of Business Intelligence. Morgan Kauffman Publishers Elsevier.
- Gert H.N. Laursen & Jesper Thorlund. (2010). Business Analytics for Managers: Taking Business Intelligence beyond reporting. Wiley and SAS Business Series.

E-Resources

- http://www.w3schools.com/html/
- https://www.tutorialspoint.com/management_information_system/business_intel ligence_system.h tm

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand and critically apply the concepts and methods of business analytics	K1,K2
CO-2	Identify, model and solve decision problems is different areas.	K3
CO-3	Analyze different analytical processing	K4
CO-4	Interpret data mining tools	K5
CO-5	Develop business application in different domains	K6

BUSINESS ANALYTICS AND INTELLIGENCE USING SAS LAB UCSR415

Semester : IV Category : Allied Class & Major: II B.com, B.com (IAT), BBA Credit : 2 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the concepts of SAS platform for alter, manage and retrieve data
CO-2	Apply filtering methods
CO-3	Analyze the SAS provides of graphical point-and-click user interface.
CO-4	Import Excel to SAS
CO-5	Implement the statistical data for non-technical users

Lab Exercise

- 1. Logging on to the SAS platform via SAS Enterprise Guide
- 2. Creating and saving a project SAS Enterprise Guide
- 3. Importing an Excel File into SAS.
- 4. Output Formats.
- 5. Expression builder to create variable using query.
- 6. Exploring Output Formats and Setting Default
- 7. Exploring the Data and Creating a Basic Report
- 8. Summary statistics.
- 9. Filtering
- 10. Graphical Exploration

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the concept of a SAS Enterprise Guide.	K1,K2
CO-2	Identify, model and solve decision problems is different areas.	K3
CO-3	Analyze different analytical processing	K4
CO-4	Interpret the numerical and pictorial summaries of data for Distribution Analysis.	K5
CO-5	Develop the various applications for statistical analysis of data.	K6

MATHEMATICAL PROGRAMMING USING C UCSA304

Semester : III Category : Allied Class & Major: II B.Sc Maths

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the concept of Structured Programming Language.
CO-2	Apply the different operators in c programming language
CO-3	Analyze the control statements.
CO-4	Explain functions and pointers
CO-5	Implement structure and union in c

UNIT - I INTRODUCTION

Basic Structure of C programs - Executing C program -C fundamentals: character set – Identifiers and keywords – data types – constants – variables – declaration – expression – statements.

UNIT - II OPERATORS AND EXPRESSION

Operators and Expression: arithmetic operators – unary operators – relational and logical operators – assignment operators – conditional operators. Data input and Output statements: getchar and putchar functions – scanf and printf function – more about scanf and printf functions.

UNIT - III CONTROL STATEMENTS & ARRAY

Control statements: if-else, while, do-while, for-nested control structure – switch – break – continue- comma operator – goto statement. Arrays: definition of array – processing array-passing array to function – multidimensional arrays – arrays and strings.

UNIT - IV FUNCTIONS & POINTERS

Functions: definition – accessing and function – function prototype –passing argument to a function – recursion. Pointers: Fundamentals – pointer declaration – passing pointer to a function – array of pointers.

UNIT - V STRUCTURE AND UNIONS

Structure and Unions: Definition of structure – processing structure – user defined data types- Structure and pointers - passing structure to function – self referential structure- Unions - Bit wise operations. Data files: opening and Closing a data file – creating data file – processing a data file – unformatted data file.

Credit : 3 Hour/Week : 3 Total Hour : 39

8 Hour

8 Hour

7 Hour

8 Hour

Text Books

- Balagurusamy E., Programming in ANSI C, 6th Edition, TMH Publishers, New • Delhi, 2004.
- Ashok N. Kamthane, Programing in ANSI C and Turbo C, 3rd Edition, Pearson Education, New Delhi, 2006.

Reference books

- Byron S. Gottfried, Theory and Problems of Programming with C, 2nd Edition, Tata Mcgraw-Hill Ltd, New Delhi, 2008
- Pradip Dey and Ghosh Manas, Programming in C, Oxford University Press USA, 2009.

e-Resources

- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087practical- programming-in-c-january-iap-2010/lecture-notes/
- http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures/2
- http://www.powershow.com/view/d7c5Y2Y2N/OBJECT_ORIENTED_PROGRAM MING_powe rpoint_ppt_presentation

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the basic concept of Procedural language	K1,K2
CO-2	Examine input and output statement.	К3
CO-3	Compare different dimension array.	K4
CO-4	Interpret functions and pointers in c.	K5
CO-5	Categorize user defined data types.	K6

MATHEMATICAL PROGRAMMING USING C - LAB UCSR307

: 2

Semester : III Credit Category : Allied Hour/Week : 3 **Class & Major : II B.Sc Maths** Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire knowledge on Structured Programming Language
CO-2	Solve the real time problems using c programming.
CO-3	Analyze string manipulation
CO-4	Interpret matrix manipulation
CO-5	Design c program for different sorting algorithm

I ARITHMETIC AND TRIGONOMETRIC OPERATIONS 1. Solve Quadratic Equations. 2. Solve Taylor' Series for sin, cos and tan.

II STRING MANIPULATION

- 3. Counting the no. of vowels, consonants, words, white spaces in a line of text and array of lines.
- 4. Reverse a string & check for palindrome.

III RECURSION

- 5. nPr,nCr
- 6. GCD of two numbers
- 7. Fibonacci series

IV MATRIX MANIPULATION

- 8. Addition & Subtraction
- 9. Multiplication
- 10. Transpose, of a matrix

V SORTING AND SEARCHING

- 11. Bubble Sort
- 12. Linear Search

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand the concept of procedural language and structure.	K1,K2
CO-2	Apply string function and check the string is palindrome or not	K3
CO-3	Differentiate sorting and searching algorithm	K4
CO-4	Evaluate matrix manipulation.	K5
CO-5	Develop GCD and Fibonacci series using Recursion concept	K6

6 Hour

9 Hour

9 Hour

6 Hour

COMPUTATIONAL PHYSICS WITH PYTHON UCSA306

Semester : III

Category : Allied Class & Major : II B.Sc Physics

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the basics of algorithmic problem solving
CO-2	Interpret Python data structures lists, tuples, dictionaries
CO-3	Analyze the concept of different conditional statements.
CO-4	Explain least squares fitting.
CO-5	Develop Python programs with partial differential equations

UNIT- I ALGORITHMIC PROBLEM SOLVING

Algorithms - Building blocks of algorithms(Statements, State, Control Flow, Functions). -Notation (pseudo code, Flow chart) - Algorithmic problem solving-Iteration,Recursion(Towers of Hanoi).

UNIT- II DATA, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode: values and types: - int, float, Boolean, string, and list - variables - expressions - statements - tuple assignment - precedence of operators comments; modules and functions - function definition and use - flow of execution

UNIT-III CONTROL, FUNCTIONS

Conditionals: Boolean values and operators - conditional (if) - alternative (if-else - chained conditional (if-elif-else) - Iteration: state, while, for, break, continue, pass.

Functions: return values - parameters - local and global scope - function composition

8 Hour

7 Hour

9 Hour

Credit : 3 Hour/Week : 3 Total Hour : 39

UNIT- IV-LEAST-SQUARES FITTING

Least-Squares Fitting -Derivation --Non-linear fitting .- Python curve-fitting libraries-Euler's Method -Standard Method for Solving ODE's -Problems with Euler's Method -Euler-Cromer Method -Visual Python- VPython Coordinates -VPython Controls and Parameters

UNIT- VPARTIAL DIFFERENTIAL EQUATIONS

Partial Differential Equations -Laplace's Equation -Wave Equation -Schrodinger's Equation-Monte Carlo Techniques - Random Numbers -Integration-Chaos - The Real Pendulum-Phase Space- Poincar'e Plots

Text Books

- Allen B. Downey, "*Think Python: How to Think Like a Computer Scientist*", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
- Guido van Rossum and Fred L. Drake Jr, An Introduction to Python Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books

- John V Guttag, Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
- Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python, 2013

e-References

- http://greenteapress.com/wp/think- python
- http://www.fizika.unios.hr/rf/wp-content/uploads/sites

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand basic algorithmic problem solving.	K1,K2
CO-2	Apply data, expression statement in python	К3
CO-3	Analyze the concept of control statement.	K4
CO-4	Compare different VPython control and parameters.	K5
CO-5	Formulate partial differential equations.	K6

8 Hour

COMPUTATIONAL PHYSICS WITH PYTHON LAB

UCSR310

Semester : III Category : Allied Class & Major: II B.Sc Physics Credit : 2 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand basic concepts of using data types in python
CO-2	Compute towers of Hanoi
CO-3	Analyze local and global variable in python.
CO-4	Compare different sorting algorithm.
CO-5	Create bouncing ball program using TRINKET

Lab Exercises

- 1. Compute the Towers of Hanoi.
- 2. Find the square root of a number (Newton's method)
- 3. To define an integer, floating point number, Strings are defined either with a singlequote or double quotes and Assignments can be done on more than one variable "simultaneously".
- 4. Find the maximum of a list of numbers.
- 5. Find the semester marks using Elif condition.
- 6. Find the Global and Local variable program using function.
- 7. Programs that take command line arguments (word count).
- 8. Find the most frequent words in a text read from a file.
- 9. Selection sort, Merge sort.
- 10. Simulate bouncing ball using TRINKET.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Understand block chain technology	K1,K2
CO-2	Integrate Towers of Hanoi in python	K3
CO-3	Analyze control structure and statement.	K4
CO-4	Compare different sorting algorithm in python	K5
CO-5	Develop creative software applications in python	K6

DIGITAL DESIGN- PRACTICAL

UCSE406

Semester	: IV	Credit	:2
Category	: NME	Hour/Week	:4
Class & Major	: II UG	Total Hour	: 52

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire knowledge of designing process.
CO-2	Understand the 3D image objects
CO-3	Develop the visual image & messages.
CO-4	Create graphic design in Greetings with corel draw.
CO-5	Design the party invitation card & a story board.

LAB EXERCISES

GIMP

- 1. Develop an application for LOGO creation for any business purpose.
- 2. Develop Simple Text Animation

Audacity

- 3. Create an application to do Silencing, Trimming and duplicating the audio signal
- 4. Develop the application to give the advanced effect to the Audio signal

Windows Movie Maker

- 5. Create a video and Apply effect to video.
- 6. Develop an application to Create Titles in video

Swish

- 7. Develop Text Effects using swish.
- 8. Develop an application for Pre Loader

Flash

- 9. Implement the program for Changing the shape of the object
- 10. Implement the Imaging viewing using mask.
 - a. Apply various Text effects to an image or photo
 - b. Implement Image slicing

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's
		level
CO-1	Solve communication problems.	K1 /K2
CO-2	Gained graphic design in Greetings with coral draw.	K3
CO-3	Apply tools and technology in creation, reproduction, and	K4
	distribution of visual messages.	
CO-4	Determine the party invitation card & a story board.	K5
CO-5	Create & demonstrate the 3D image objects using digital	K6
	design.	

DATA VISUALIZATION -PRACTICAL UCSE407

Semester	: IV	Credit : 2
Category	: NME	Hour/Week : 4
Class &Major	: II UG	Total Hour : 52

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire knowledge in data analytics in visualization.
CO-2	Understand the mathematical and statistical models and concepts to detect patterns
	in data.
CO-3	Create a bar chart in seaborn functions
CO-4	Design venn diagram with tree map.
CO-5	Develop the matplotlib in python

LAB EXERCISES

To implement the below programs in python Matplotlib

1.Create a Bar Chart, Grouped Bar Chart using Matplotlib in Python
2.Create a Pie Chart, Area Chart using using Matplotlib in Python
3.Create a Column Chart using matplotlib in python
4.Create a Stacked Bar chart using seaborn
5.Create a Scatter Plot using python Matplotlib in Python
6.Create a Bubble Chart for your dataset Matplotlib in Python
7.Create a Box Plot and Water Fall Chart Matplotlib in Python
8.Create a Venn Diagram and Tree Map Matplotlib in Python
9.Create a Marginal Plots with open data set Matplotlib in Python

e-Resource :

• Data Visualization and Matplotlib | by Dilara Şahan | Analytics Vidhya | Medium https://www.analyticsvidhya.com/blog/2021/08/effective-data-visualization-techniques-in-data-science-using-python/

CO No.	On completion of the course the student will be able to	Bloom's level
CO-1	Define & understand data analytics in visualization.	K1&K2
CO-2	Apply & differentiate the matplotlibin python.	K2
CO-3	Determine the mathematical and statistical models and concepts to detect patterns in data.	К3
CO-4	Create the bar chat in sea born functions.	K5
CO-5	Demonstrate the venn diagram with tree map.	K6

Semester	Part	Category	Course code	Course title	Component III	Component IV
ш	III	Major	UCSM307	Software	Case Study	Seminar
		core(DSC)-		Engineering		
		VIII				
111	IV	Major Core	UCSR412	Operating	DPA	Viva Voce
		(DSC) - XI		System		
				Practical		

III and IV Evaluation Components of CIA

ALLIED COURSES OFFERED TO OTHER DEPARTMENT

Semester	Part	Category	Course	Course title	Component	Component	
			code		III	IV	
				Object		Problem	
	III	Allied	UCA307	Oriented	Assignment	Solving	
III				Programming		Solving	
111				Object			
	III	Allied	UCSR311	Oriented	DIA	Viva Voce	
				Programming			
	11.7			Fundamentals			
	IV	Allied	UCSA408	of Blockchain	Assignment	Seminar	
				Technology			
IV	IV	Allied	UCSR414	Blockchain			
				Technology	DPA	Viva Voce	
				Using Solidity			
				– Lab			
	11.7			Business			
	IV	Allied	UCSA409	Analytics and	Assignment	Seminar	
IV				Intelligence			
				Business			
	IV	Allied	UCSR415	Analytics and	DPA	Viva Voce	
				Intelligence -			
				LAb			

	III	Allied	UCSA304	Mathematical Programming	Assignment	Seminar
III		Amed	005/1304	using C	Assignment	Semma
111				Mathematical		
	111	Allied	UCSR307	Programming	DFA	Viva Voce
				using C Lab		
				Computational		
	111	Allied	UCSA306	Physics with	Assignment	Seminar
TT				Python		
111				Computational		
	III	Allied	UCSR310	Physics with	DrA	Viva Voce
				Python - Lab		

NON-MAJOR ELECTIVES

Semester	Part	Category	Course	Course title	Component	Component
			code		III	IV
117	IV	NME	UCSE406	Digital	DPA	Viva Voce
				Design		
1 V	IV	NME	UCSE407	Data	DPA	Viva Voce
				Visualization		

M.Sc. (COMPUTER SCIENCE) PROGRAMME PROFILE

- **PSO 1:** Learnt the theoretical aspects of modern techniques in computing systems.
- **PSO 2:** Gained fundamental knowledge in computational methods and tools for solving realtime problems and implanting the quest for continual learning of novel and in-demand skills.
- **PSO 3:** Apply the industry oriented concepts and practical knowledge of computer science design, development and management of information processing systems and applications in the interdisciplinary domain.
- **PSO 4:** Recognized the ability to act as a leader, or as a part of a team to create multifunctional Software Solutions.
- **PSO 5:** Demonstrated appropriate techniques, skills, and tools necessary for computing practice.
- **PSO 6:** Motivated the students to accept new challenges for multi-disciplinary projects.
- **PSO 7:** Directed the individual and societal professionals in the development of computing in lifelong that benefits everyone.

Semester	Category	Course Code	Course Title	Previous Course Code	Contact Hour/ Week	Credit Min/Ma x
	Core I	PCSM113	Principles of Concurrent Programming	-	5	4
	Core II	PCSM116	Digital Image Processing	PCSM404	4	4
	Core III	PCSM117	TCP / IP Networks	PCSM213	5	4
	Core IV	PCSM118	Compiler Design	-	4	3
T	Core V	PCSM119	Mobile Computing	-	4	3
	Core VI	PCSR107	Digital Image Processing – Practical	-	4	3
	Core VII	PCSR108	TCP/IP Networks – Practical	-	3	2
	Extra Credit		Online Course (NPTEL/SWAYAM)		-	1/2
			Library		1	-
	30	24/25				

	Core VIII	PCSM214	Big Data Analytics	PCSM315	4	3
	Core IX	PCSM215	Machine Learning	-	4	4
	Core X	PCSM216	Blockchain Technology	-	4	3
	Core XI	PCSM217	Software Testing	PCSM211	4	3
	Core XII	PCSR208	Big Data Analytics – Practical	PCSR306	4	3
II	Core XIII	PCSR209	Machine Learning using Google CoLab – Practical	-	4	3
	Non	PALE201/				
	Major	PALE301		-	5	4
	Elective					
	Service	PCSX201/		-	-	1
	Learning	PCAX201				_
			Library	-	1	-
	30	24				
	Core XIV	PCSM314	Cyber Security	-	4	4
	Core XV	PCSM316	Augmented Virtual Reality	-	4	4
	Core XVI	PCSM317	Artificial Intelligence and Robotics	PCSM406	4	3
	Core XVII	PCSM313	Research Methodology	-	4	4
III	Core XVIII	PCSI301	Fuzzy Set and Systems	-	5	4
	Core XIX	PCSR307	Cyber Security Practical	-	3	2
	Core XX	PCSR308	Artificial Intelligence – Practical	-	3	3
	Core XXI	PCSR303	Project	-	2	2
			Library	-	1	-
				Total	30	26
	Core XXII	PCSM407	Fog Computing	-	5	4
IV	Core XXIII	PCSM408	Natural Language Processing	-	4	3
	Core XIV	PCSP402	Project		20	10
			Library		1	-
	30	17				
	120	91/92				

Minimum one MOOC (Compulsory Audit Course) has to complete during the first year.
Semester	Category	Course Code	Course Title	Hour/W	Credit	
				eek	Min	Max
III	Self Study Paper	PCSS301/PCAS502	R-Programming	2	-	2
III	Self Study Paper	PCSS302/PCAS503	Rich Internet Applications	2	-	2
IV	Self Study Paper	PCSS401/PCAS601	Silver Light Applications	2	-	2
IV	Self Study Paper	PCSS402/PCAS602	Extreme Programming	2	-	2

EXTRA CREDIT EARNING PROVISION

EXPERIENTIAL LEARNING (Mandatory)

Course Mapping			Collaborating Agency			
Sem	Course Code	Course Title	Assessment	Course Title	Hour/Days /Month	Mode of Evaluation
III	PCSM31 6	Augmented Virtual Reality	Component IV	Augmented Virtual Reality certification	10 Days	Reflection

COURSES OFFERED TO OTHER DEPARTMENTS (Major and Major Elective)

Course	Semester	Category	Course Code	Course Title	Contact Hour/We ek	Credit
M.Sc	IV	Major Elective	PTAM4	KaniniPayanpattiyal	5	2
Tamil			06		5	5

CYBER SECURITY

PCSM314

Semester : III Category : Core XIV Class & Major: II M.Sc Computer Science Credits :4 Hour/weeks :4 Total Hour :52

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Remember the difference between threat, harms, attack and vulnerability.
CO -2	Understand how Design of Operating Systems in Rootkit.
CO -3	Apply information about Reliability and Integrity, Data Mining and Big Data.
CO -4	Analyze the Authentication and Privacy and the motivations behind them
CO -5	Create difference between The Internet of Things and cyber warfare

UNIT - I INTRODUCTION TO CYBER SECURITY

Introduction -Computer Security - Threats -Harm - Vulnerabilities – Controls. Authentication - Access Control - Cryptography. Web - User Side: Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT - II SECURITY IN OPERATING SYSTEM & NETWORKS 10 Hour

Security in Operating Systems - Security in the Design of Operating Systems –Rootkit. Network security attack: Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT - III DEFENCES: SECURITY COUNTERMEASURES 10 Hour

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT - IV PRIVACY IN CYBERSPACE

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.

10 Hour

UNIT - V MANAGEMENT AND INCIDENTS

Security Planning – Business Continuity Planning – Handling Incidents – Risk Analysis – Dealing with Disaster. Emerging Technologies: The Internet of Things – Economics – Electronic Voting – Cyber Warfare. **IT Act:** Salient Feature of IT Act 2000, Legal Provisions under the Information Technology Act, Recent amendments by the IT (Amendment Act) 2008, Act Section66(A, B, C, D, E, F), ITAct Section 67(A,B,C).

Text Book

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

Reference Books

- George K.Kostopoulous Cyber Space and Cyber Security CRC Press 2013.
- Martti Lehto Pekka Neittaanmäki Cyber Security: Analytics Technology and Automation edited Springer International Publishing Switzerland 2015.
- Nelson Phillips and Enfinger Steuart Computer Forensics and Investigations Cengage Learning New Delhi 2009.

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	State the cyber security needs of an organization.	K1
CO-2	Discuss software vulnerabilities and security solutions to reduce the risk of exploitation.	K2,K3
CO-3	Classify security issues in networks and computer systems to secure an IT infrastructure.	K4
CO-4	Decide policies and procedures to manage enterprise security risks.	K5
CO-5	Develop secure software.	K6

COURSE OUTCOMES

AUGMENTED VIRTUAL REALITY

PCSM316

Semester	: III	Credit	:4
Category	:Core XV	Hour/Week	:4
Class & Major	: II M.SC Computer Science	Total Hour	:52

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Understand virtual reality, augmented reality and using them to build Biomedical
	applications
CO -2	Interpret virtual reality, augmented reality and using them to build Biomedical
	engineering applications
CO -3	Analyze and understand the working of various state of the art AR devices.
CO -4	Develop PDA applications with better optimality.
CO -5	Demonstrate case studies and applications with a futuristic vision along with socio-
	economic impact and issues.

UNIT-I INTRODUCTION TO VIRTUAL REALITY 10 Hour

Virtual Reality & Virtual Environment: Computer Graphics- Real-time computer graphics-Flight simulation-Virtual environments-Requirements for VR- benefits of Virtual reality. **The historical development of VR:** Scientific landmarks **Virtual Reality Applications**: Science, Medical, Education.

UNIT-II HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES 11 Hour

3D User Interface Output Hardware: Visual Displays – Auditory Displays – Haptic Displays. **Design Guidelines:** Choosing Output Devices for 3D User Interfaces. **3D User Interface Input Hardware:** Input device characteristics- Desktop input devices – Tracking Devices- 3D Mice – Special Purpose Input Devices – Direct Human Input –Home Brewed Input Devices- Choosing Input Devices for 3D Interfaces.

UNIT-III 3D INTERACTION TECHNIQUES

Selection and Manipulation: 3D Manipulation tasks – Manipulation Techniques and Input Devices – Interaction Techniques for 3D Manipulation – Design Guidelines. **Travel:** 3D Travel Tasks – Travel Techniques – Design Guidelines. **WayFindings:** Theoretical Foundations of Wayfinding – User Centered Wayfinding Support – Environment Centered Wayfinding Support – Evaluating Wayfinding Aids – Design Guidelines. **System Control:** Classification – Graphical

Menus – Voice Commands – Gestural Commands – Tools – Mutimodal System Control Techniques.

Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry.

UNIT-IV AR TECHNIQUES- MARKER BASED & MARKERLESS TRACKING

10 Hour

Marker-based approach: Introduction to marker-based tracking – types of markers – marker camera pose and identification – visual tracking. **Marker types:** Template markers – 2D barcode markers – imperceptible markers. **Marker-less approach:** Localization based augmentation – real world examples. **Tracking methods:** Visual tracking – feature based tracking – hybrid tracking – initialization and recovery.

UNIT-V AR – MIXED REALITY

10 Hour

Augmented and Mixed Reality: Taxonomy – technology and features of augmented reality- difference between AR and VR – Challenges with AR – AR systems and functionality – Augmented reality methods – visualization techniques for augmented reality. **Augmented Reality Software:** Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

Case Study: Design real-time models in vrml such as car, house, globe, 3d helix, etc., to submit it for Component III.

Text Books:

- Alan B Craig, William R Sherman and Jeffrey D Will,(2009). *Developing Virtual Reality Applications: Foundations of Effective Design*, Morgan Kaufmann, (Unit-5: Chapter-4,5,6)
- Gerard Jounghyun Kim, (2005). Designing Virtual Systems: The Structured Approach, .

• Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev,(2005).3D User Interfaces, Theory and Practice, Addison Wesley, USA, (Unit-2: Chapter-3,4 ; Unit-3: Chapter-5,6,7,8 ; Unit-4: Chapter-10).

Reference Books:

- Kharis O'Connell .(2016).*Designing for Mixed Reality*, Published by O'Reilly Media, Inc., ISBN: 9781491962381
- Sanni Siltanen- *Theory and applications of marker-based augmented reality*. Julkaisija Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

• John Vince, (1995). Virtual Reality Systems, Addison Wesley.

• Howard Rheingold,(1991). Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society, Simon and Schuster.

• William R Sherman and Alan B Craig,(2002). Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics). Morgan Kaufmann Publishers, San Francisco, CA.

• Alan B. Craig,(2013). Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann.

e-Resource:

- http://lavalle.pl/vr/book.html
- https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf
- https://docs.microsoft.com/en-us/windows/mixed-reality/

MOOC Courses:

- https://www.coursera.org/learn/ar
- https://www.udemy.com/share/101Xpi/
- https://nptel.ac.in/courses/106/106/106106138/
- https://www.coursera.org/learn/introduction-virtual-reality

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Demonstrate a system or process to meet given specifications with realistic constraints.	K1,K2
CO-2	Discover problem statements and function as a member of design team.	К3
CO-3	Analyze technical resources	K4
CO-4	Summarize technical documents and technical oral presentations related to design mini project results	K5
CO-5	Formulate virtual reality, augmented reality and using them to build Biomedical engineering applications	K6

COURSE OUTCOMES

ARTIFICIAL INTELLIGENCE & ROBOTICS PCSM317

Semester	: III	Credit	:3
Category	:Core XVI	Hour/Week	:4
Class & Major	: II M.SC Computer Science	Total Hour	:52

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Study the concepts of Artificial Intelligence.
CO -2	Learn to represent knowledge in solving AI problems
CO -3	Determine general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty.
CO -4	Characterize planning agent.
CO -5	Design the path planning and navigation of Robots.

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 10 Hour

Introduction: Intelligent Agents-Search Strategies-Solving Problems by Searching -Breadth – First Depth-First- Depth-Limited –Iterative Deepening –Bidirectional- Informed Search Methods -A* -AO* -Games as Search Problems -Alpha-Beta Pruning.

UNIT II REPRESENTATION

Representation: Propositional Logic - First - Order Logic - Frame Systems and Semantic Networks.

UNIT III REASONING

Reasoning: Inference in First-Order Logic – Forward and Backward Chaining –Resolution Unification-Logical Reasoning Systems.

UNIT IV PLANNING

Planning: Simple Planning Agent - From Problem Solving to Planning - Basic Representations for Planning - Practical Planners - Hierarchical Decomposition - Resource Constraints – Uncertainty – Probabilistic Reasoning Systems.

UNIT V LEARNING & ROBOTICS

Learning: General Model of Learning Agents - Inductive Learning - Computational

10 Hour

10 Hour

12 Hour

Learning Theory – Learning in Neural and Belief Networks – Reinforcement Learning – Types of Communicating Agents – Robotics: Tasks – Parts – Configurations Spaces – Navigation and Motion Planning.

Text Book

• StuartJ.Russell and Peter Norvig – Artificial Intelligence – Tata Mc Graw Hill Publisher3rd Edition 2017.

Reference Books

• Elaine Rich and Kevin Knight – Artificial Intelligence – Tata Mc Graw Hill Publisher – 3rdEdition 2017.

• Dan W.Patterson – Introduction to Artificial Intelligence and Expert Systems – Prentice Hall of India -2009.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the concept of Artificial Intelligence.	K1,K2
CO-2	Represent a problem using first order and predicate logic	K3
CO-3	Provide the apt agent strategy to solve a given problem	K4
CO-4	Interpret plan to solve a problem	K5
CO-5	Devise path planning method for navigation	K6

RESEARCH METHODOLOGY PCSM313

Semester	: III	Credit	:4
Category	:Core XVII	Hour/Week	:4
Class & Major	: II M.SC Computer Science	Total Hour	:52

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	understand the concepts of Research and its types
CO -2	Discuss Problem formulation, analysis and solutions
CO -3	Analyze data collection tools and packages.
CO -4	Technical paper writing / presentation without violating professional ethics
CO -5	Devise techniques for research and uses of tools

UNIT-I INTRODUCTION TO RESEARCH METHODOLOGY

Meaning of research; objective of research; motivation in research; types of research-Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical- research approaches; significance of research, research methods versus methodology; Research and scientific methods; Importance of knowing how research is done; Research process; Criteria for good research.

10 Hour

UNIT-II RESEARCH PROBLEM AND RESEARCH DESIGN 10 Hour

Research problem: Selecting research problem; necessity of defining a problem; techniques of defining problem; formulation of research problem, objectives of research problem. Meaning of research design; need for research design; important concept related to research design; different research designs; basic principles of experimental design; important experimental design.

UNIT-III SAMPLING DESIGN, DATA COLLECTION AND ANALYSIS 12 Hour

Census and sample surveys, Characteristics of good sample design Different types of sample designs, Techniques of selecting a random sample-Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma

UNIT-IV INTERPRETAION, REPORT WRITING, RESEARCH ETHICS AND IPR

10 Hour

Interpretation and report writing; Meaning of interpretation; techniques of interpretation; precautions in interpretation; significance of report writing, layout of research report, types of reports; Presentation of research work-oral, poster and writing research paper; Precautions for writing research report, conclusion. Ethics-ethical issues, related to research, IPR-Intellectual Property Rights in Research and Development-Patents and Patent Laws: Objectives of the patent system – Basic, principles and general requirements of patent law.

UNIT-V TOOLS FOR ANALYSIS

Interpretation of data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism, Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

Text Books

- Kothari, C. R. (1980). *Research Methodology: Research and techniques*, New Delhi:New Age International Publishers.
- Carlos, C.M. (2000) Intellectual property rights. The WTO and developing countries: the TRIPS agreement and policy options. Zed Books. New York.
- Beier F.K, Crespi R.S and Straus T. *Biotechnology and Patent protection*. Oxfordand IBH Publishing Co. New Delhi.
- Darren George and Paul Mallery SPSS for Windows. Pearson Education.
- Darren George & Paul Mallery . SPSS for Windows. Pearson Education

References

- Singh, Y. K. (2006). Fundamental of Research Methodology and Statistics. New Delhi. New International (P) Limited. Publishers.
- Wallinman, N. (2006). Your Research Project: A step-by-step guide for the first-time
- researcher. London: Sage Publications.
- Senthil Kumar Sadasivam and Mohammed Jaabir M. S. (2008). IPR. Bio safety and

Biotechnology Management. Jasen Publications. India.

- Wilkilson , T.S. & Bhandarkar . P.L., (2000). Methodology and Techniques of Social Research. Mumbai. Himalaya Publishing House.
- Leslie Lamport. LaTeX: A Document Preparation System. Second Edition.

E-Resources

- http:// www.ptt.ed/-super7/430114401/4391.ptt/.
- https://www.heacademy.ac.uk/system/files/msor.3.Is.pdf
- 164.100.133.129.81/econtent/uploads/research-methods.pdf

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understanding research and its goals, Critical thinking, Techniques for generating research topics	K1
CO-2	Compare different research design.	K2
CO-3	Apply and analyze different methods of data collection	K3,K4
CO-4	Justifying the interpretation and report writing.	K5
CO-5	Summarize the techniques for research.	K6

COURSE OUTCOMES

FUZZY SET AND SYSTEMS

PCSI301

Semester	: III
Category	:Core XVIII
Class & Major	: II M.SC Computer Science

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Acquire the knowledge of fundamental concepts such as fuzzy sets, operations and
	fuzzy relations.
CO -2	Describe fuzzy relations and classical relations
CO -3	Learn about the fuzzification of scalar variables and the defuzzification of
	membership functions.
CO -4	Analyze fuzzy arithmetic and fuzzy logics
CO -5	Categorize different fuzzy classification methods.

UNIT -I INTRODUCTION

Introduction - Background - Uncertainty and Imprecision - Statistics and Random Processes - Uncertainly and Information - Fuzzy Sets and Membership - Chance versus Ambiguity - Sets as Points in Hypercubes - Classical Sets and Fuzzy Sets: Classical Sets -Fuzzy Sets.

UNIT -II CLASSICAL RELATIONS AND FUZZY RELATIONS 13 Hour

Cartesian product - Crisp Relations - Fuzzy Relations - Tolerance and Equivalence Relations -Fuzzy Tolerance and Equivalence Relations - Value Assignments.

UNIT –III MEMBERSHIP FUNCTIONS

Features of the Membership Functions - Standard Forms and Boundaries -Fuzzification – Lambda(λ) Cut for Fuzzy Relations – Defuzzification to scalars – Membership Value Assignments – Fuzzy to Crisp Conversions.

UNIT- IV FUZZY ARITHMETIC AND EXTENSION PRINCIPLE 13 Hour

Fuzzy Arithmetic - Numbers - Vectors and the Extension Principle - Extension Principle - Fuzzy Numbers - Interval Analysis in Arithmetic - Approximate Methods of Extension.Classical Logic and Fuzzy logic: Fuzzy Tautologies - contradictions - Equivalence

13 Hour

Hour/Week :5 **Total Hour** :65

:4

Credit

- and Logical Proofs - Classical Predicate Logic - Fuzzy Logic - Approximate Reasoning - other Forms of the Implication Operation - Other Forms of the Composition Operation.

UNIT V FUZZY SYSTEMS AND CLASSIFICATION

Fuzzy Rule Based systems: Natural Language – Linguistic Hedges – Rules Based Systems – Graphical Techniques of Inference. Fuzzy Classification: Classification by Equivalence Relations – Cluster Analysis – cluster Validity – c-Means Clustering – Classification Metric – Hardening the Fuzzy c-Partition – Similarity Relations from Clustering.

13 Hour

Text Books

- Timothy J Ross "*Fuzzy Logic with Engineering Applications*" McGraw Hill Inc 4thEdition 2016.
- Timothy J. Ross, *Fuzzy Logic with Engineering Applications*, Wiley India, II Edition, 2010reprint. Chapters 1,2,3,4,5,6,Chapter 11 (Part I only), 12

Reference Books

- John Yen, Reza Langari, Fuzzy Logic- Intelligence, Control, and information, Pearson Education, 2004.
- George J.Klir, Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall of India, 2000.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.	K1,K2
CO-2	Demonstrate the concepts of fuzzy relations.	К3
CO-3	Analyze the features of membership functions, fuzzification process and defuzzification process.	K4
CO-4	Compare different forms of fuzzy logic operation	K5
CO-5	Summarize about fuzzy C-Means clustering.	K6

CYBER SECURITY PRACTICAL

PCSR307

Semester : III Category : Core XIX Class & Major: II M.Sc Computer Science Credit : 2 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Understand the concepts of Breadth First Search
CO -2	Develop Programming skills by algorithm using Depth First Search.
CO -3	Apply the Design Concept to various intelligent agents as Robot Traversal Problem
	using Means End Analysis
CO -4	Demonstrate intellectual tasks using Water-Jug problem
CO -5	Develop human Robotics agent as Tower of Hanoi.

LAB EXERCISES

- 1. Develop an application for creating a Virtual Environment.
- 2. Develop an application that uses Linux terminal basics.
- 3. Write an application for Linux command line interface.
- 4. Develop an application for proxy chains.
- 5. Develop an application for Virtual Private Networks
- 6. Develop a application which changes the mac address with mac changer
- 7. Implement an application SSL Strip
- 8. Implement an application that cracks a password using Brute force method
- 9. Develop an application to crack windows software with john the ripper
- 10. Develop an application to upload a reverse shell on to a web server

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Demonstrate the models, and algorithms of AI	K2
CO-2	Analysis and design of information systems using sensors	K3
CO-3	Develop the structures and algorithms of a selection of techniques.	K4
CO-4	Create several applications using sensors and actuators	K5
CO-5	Quantify uncertainties to make the best decisions for the company.	K6

ARTIFICIAL INTELLIGENCE – Practical

PCSR308

Semester : III Core : Core XX Class & Major: II M.Sc Computer Science Credit : 3 Hour/Week : 3 Total Hour : 39

COURSE OBJECTIVES

CO No.	To enable the students
CO -1	Understand the components and structure of cyber security.
CO -2	Understand how to work with various Linux commands
CO -3	Learn the basic and important design concepts and issues of cyber security
CO -4	Protect and defend computer systems and networks
CO -5	Monitor cyber security mechanisms to help and ensure the protection of
	information technology assets.

LAB EXERCISES:

Develop a Program using Prolog or Python

- 1. Implement Breadth First Search.
- 2. Implement Depth First Search.
- 3. Implement Robot Traversal Problem using Means End Analysis.
- 4. Implement Water-Jug problem.
- 5. Implement Tic-Tac-Toe game.
- 6. Implement 8-Puzzle problem.
- 7. Implement Tower of Hanoi.
- 8. Implement Monkey Banana Problem.
- 9. Create a Bi-directional Associative Memory (BAM) for ID and telephone number.
- 10. Implement simple Chatbot.

e-Resource:

• https://www.studocu.com/row/document/national-university-of-modernlanguages/artificial-intelligence/ai-lab-manual-fall-2018/13242207

COURSE OUTCOMES

СО	On completion of the course the student will be able to	Bloom's
No.		Level
CO-1	Describe the cyber security needs of an organization.	K1,K2
CO-2	Illustrate software vulnerabilities and security solutions to reduce the risk of exploitation.	K3
CO-3	Classify security issues in networks and computer systems to secure an IT infrastructure.	K4
CO-4	Decide policies and procedures to manage enterprise security risks.	K5
CO-5	Develop secure software.	K6

FOG COMPUTING

PCSM407

Semester	: IV
Core	:Core XXII
Class & Ma	jor: II M.Sc Computer Science

Credit :4 Hour/Week :5 Total Hour :65

13 Hour

COURSE OBJECTIVES:

CO No.	To enable the students about
CO-1	Remember the fundamental concepts of Fog and Application Scenarios
CO-2	Understand the Clusters for Lightweight Edge Cloud
CO-3	Design and develop Scalability, Interoperability, Fog, IOT
CO-4	Analyze the conceptual framework for IoT Based System with Fog Computing.
CO-5	Discuss the protocols of Fog.

UNIT- I INTRODUCTION TO FOG COMPUTING

Fog Computing – Characteristics – Application Scenarios – Issues and challenges. **Fog Computing Architecture:** Communication and Network Model – Programming Models – Fog Architecture for Smart Cities – Healthcare and Vehicles. **Fog Computing Communication Technologies:** Introduction – IEEE 802.11 - 4G - 5G standards - WPAN - Short-Range Technologies - LPWAN and other medium and Long-Range Technologies.

UNIT- II MANAGEMENT AND ORCHESTRATION OF NETWORK SLICES IN 5G -FOG - EDGE - AND CLOUDS 13 Hour

Introduction - Background - Network Slicing in 5G - Network Slicing in Software-Defined Clouds - Network Slicing Management in Edge and Fog - Middleware for Fog and Edge Computing - Need for Fog and Edge Computing Middleware - Clusters for Lightweight Edge Clouds - IOT Integration - Security Management for Edge Cloud Architectures. **Fog Computing Realization for Big Data Analytics:** Introduction to Big Data Analytics – Data Analytics in the Fog – Prototypes and Evaluation.

UNIT- III FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT 13 Hour

Scalability - Interoperability - Fog-IOT architectural model - Challenges on IOT Stack Model via TCP/IP Architecture - Data Management - Filtering - Event Management - Device Management - Cloudification - Virtualization - Security and Privacy Issues. Integrating IoT. **Fog - Cloud Infrastructures:** Methodology - Integrated C2F2T Literature by Modeling Technique – Integrated C2F2T Literature by Use-Case Scenarios - Integrated C2F2T Literature by Metrics.

UNIT- IV HEALTH MONITORING AND APPLICATIONS IN FOG COMPUTING

13 Hour

An Architecture of a Health Monitoring: IoT Based System with Fog Computing – Fog Computing Services in Smart E-Health Gateways – Discussion of Connected Components. Fog Computing Model for Evolving Smart Transportation Applications: Introduction – Data-Driven Intelligent Transportation Systems – Fog Computing for Smart Transportation Applications. Case Study: Intelligent Traffic Lights Management (ITLM) System

UNIT –V SOFTWARE DEFINED NETWORKING AND APPLICATION IN FOG COMPUTING 13 Hour

Open Flow Protocol – Open Flow Switch – SDN in Fog Computing – Home Network using SDN. **Security and Privacy Issues**: Trust and Privacy Issues in IoT Network – Web Semantics and trust Management for Fog Computing – Machine Learning based Security in Fog Computing – Cyber Physical Energy Systems over Fog Computing.

Text Books:

- Samee U. Khan, Albert Y. Zomaya .(2017). *Fog Computing: Theory and Practice by Assad Abbas*. (Unit -1 chapter 1,Unit-5 chapter 16)
- Rajkumar Buyya, Satish Narayana Srirama .(2019).*Fog and Edge Computing*. Wiley Publications. (Unit-2 Chapter 4,Unit-3 chapter 11, Unit-4 chapter 12,14)

Reference Books:

- Amir Vahid Dastjerdi and RajkumarBuyya.Fog Computing: Helping the Internet of Things Realize its Potential. University of Melbourne.
- SudipMisra, Subhadeep Sarkar, Subarna Chatterjee. (2019).Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperback.CRC Press.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Describe and Explore research, frameworks, applications in edge and fog computing.	K1
CO-2	Explain underlying technologies, limitations, and challenges along with future Research Direction and Discuss generic Conceptual Framework for Optimization Problems in Fog Computing.	K2
CO-3	Apply the General Data Protection Regulation (GDPR), and discuss how these legal constraints affect the design and Operation of IOT Applications in fog and Cloud Environments.	K3
CO-4	Evaluate and analyze the Protocols related to Fog.	K4,K5
CO-5	Construct the Data Management and Security Principles.	K6

NATURAL LANGUAGE PROCESSING PCSM408

Semester	: IV	Credit	:3
Category	: CoreXXIII	Hour/Week	:4
Class & Major	: II M.Sc Computer Science	Total Hour	:52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Learn the fundamentals of Language Modeling: Grammar-based LM
CO-2	Understand the use Smoothing, Interpolation and Backoff Word Classes
CO-3	Apply the Treebanks, Normal Forms for grammar.
CO-4	Discover approaches to syntax and semantics.
CO-5	Construct current methods for statistical approaches to Tagger, WordNet,
	PropBank

UNIT-I INTRODUCTION

09 Hour

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for

lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT-II WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff -Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar - Dependency Grammar - Syntactic Parsing, Ambiguity, Dynamic Programming parsing - Shallow parsing - Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT-IV SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments - Word Senses, Relations between Senses, Thematic Roles, Selectional Restrictions - Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods - Word Similarity using Thesaurus and Distributional methods.

UNIT-V DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm - Co-reference Resolution - Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

- Daniel Jurafsky, James H. Martin—(2014). Speech and Language Processing: An • Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication.
- Steven Bird, Ewan Klein and Edward Loper, -(2009). Natural Language Processing with *Python*, Oreilly Media, (1st Ed.)

Reference Books:

- Breck Baldwin.(2015). —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher.
- Richard M Reese .(2015).Natural Language Processing with Java, Oreilly Media.
- Nitin Indurkhya and Fred J. Damera. (2010). Handbook of Natural Language Processing, 2nd Ed., Chapman and Hall/CRC Press.
- Tanveer Siddiqui, U.S. Tiwary, (2008).Natural Language Processing and Information • Retrieval, Oxford University Press.

11 Hour

11 Hour

11 Hour

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the fundamental of natural language processing	K1,K2
CO-2	Apply innovative application using NLP components.	K3
CO-3	Analyze NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.	K4
CO-4	Estimate a rule based system to tackle morphology/syntax of a language	K5
CO-5	Formulate the problems and their solutions using appropriate descriptions, visualizations, and statistics.	K6

III and IV Evaluation Components	of	CIA
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Semester	Part	Category	Course code	Course title	Component III	Component IV
	III	Core XIV	PCSM314	Cyber Security	Assignment	Seminar
	III	Core XV	PCSM316	Augmented Virtual Reality	Design a real time model using VRML	Experiential Learning
III	III	Core XVI	PCSM317	Artificial Intelligence and Robotics	Assignment	Seminar
	III	Core XVII	PCM313	Research Methodology	Case Study	Seminar
	III	Core XVIII	PCS1301	Fuzzy Set and Systems	Assignment	Seminar
	III	Core XIX	PCSR307	Cyber Security Practical	DPA	Viva-voce
	III	Core XX	PCSR308	Artificial Intelligence – Practical	DPA	Viva-voce
IV	III	Core XXIII	PCSM408	Natural Language Processing	Assignment	Problem Solving
	III	Core XXII	PCSM407	Fog Computing	Case Study	Seminar

DEPARTMENT OF COMPUTER APPLICATION

Preamble

UG: Programme profile, list of courses offered to the other departments and the syllabi of courses in the III&IV semesters along with evaluation components III & IV (with effect from 2021-2024 batch onwards)

PROGRAMME PROFILE BCA (LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK)

- **PSO1:** Understanding of the key concepts and principles of programming languages.
- **PSO2:** Capacity to analyze a problem, identify the computing requirements and using Procedures find a solution.
- **PSO3:** Development of practical skills to solve problems and provide solutions using current trends in the discipline of Computer Applications.
- **PSO4:** Ability to apply the algorithmic principles, mathematical foundations and computer science theory for designing computer-based systems.

Semester	Part	Category	Course Code	Course Title	Previous Course Code	Contact Hour/ Week	Credit Min/Max
	Ι	Language	UTAL107/U TAL108	Languages/ AECC-II Tamil-I/ Hindi-I/French-I (2 Levels)	UTAL105/ UTAL106/ UHIL101/ UFRL101	5	3/4
	II	English	UCEL101/U CEL102	Communicative English-/ English/AECC-I (2 Levels)	UENL107/ UENL108	5	3/4
1	III	Major Core (DSC) - I	UCAM110	Principles of Information Technology	-	5	4
	III	Major Core (DSC) - II	UCAM111/ UCSM109	Programming Methodology	-	4	4
	III	Major Core (DSC) - III	UCAR106/ UCSR110	Programming Methodology - Practical	-	3	2

	III	Allied (GE) - I	UMAA110	Mathematical Methods I	-	6	4
	III	Professional English	UPEM101	Professional English I	-	6	4
	IV	Value Education (SEC)				2	1
				Total		36	25/27
	Ι	Language	UTAL207/U TAL208	Languages/ AECC-II Tamil-II/ Hindi-II/French-II (2 Levels)	UTAL205/ UTAL206/ UHIL201/ UFRL201	5	3/4
	II	English	UCEL201/U CEL202	Communicative English-/ English/AECC-I (2 Levels)	UENL207/ UENL208	5	3/4
	III	Major Core (DSC) - IV	UCAM206/ UCSM207	Data Structures	UCAM205	4	4
	III	Major Core (DSC) - V	UCAM207/ UCSM208	Python Programming	UCAM407	4	4
		Major Core (DSC) - VI	UCAR205/ UCSR207	Data Structures using Python - Practical	-	3	2
П	III	Allied (GE) - II	UMAA216	Mathematical Methods-II	-	6	4
	III	Professional English	UPEM201	Professional English II	-	6	4
	III	Internship	UCAI201	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)
	IV	Non-Major Elective (Skill Enhancement Course)				3	2
	IV	Soft skill				2	1
	V	Extension Programme / Physical Education/NCC				-	1/2
	-		•	Total		38	28/32
	III	Major Core (DSC) - VII	UCAM310/ UCSM305	Java Programming	UCAM307	5	4
TTT	III	Major Core (DSC) - VIII	UCAM312	Object Oriented Analysis and Design	UCAM403	5	4
111	III	Major Core (DSC) - IX	UCAM311	Data Communication Networks	UCAM309/ UCAM405	5	4
	III	Major Core (DSC) - X	UCAR304/ UCSR308	Java Programming - Practical	UCAR303	4	2

	III	Allied (GE) - III	UCOA303	Financial Accounting	-	6	4
IV Online		Online course		NPTEL/Spoken Tutorial/Swayam		3	1/2
	IV	Value Education		Tutoriai/Swayani		2	1
				Total		30	20/21
	III	Major Core (DSC) - XI	UCAM404	Database Management System	-	4	4
	III	Major Core (DSC) - XII	UCAM408	Operating System	UCAM507	5	4
	III	Major Core (DSC) - XIII	UCAM409	Software Engineering	UCAM509	4	4
	III	Major Core (DSC) - XIV	UCAR405	Database Modeling - Practical	UCAR402	3	2
	III	Major Core (DSC) - XV	UCAR406	Operating System- Practical	-	3	2
IV	III	Allied (GE) - V	UCOA403	Accounting Package	-	3	2
	III	Allied (GE) - VI	UCOR403	Accounting Package - LAB	-	3	2
	III	Internship	UCAI401	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)
	IV	Non-Major Elective (Skill Enhancement				3	2
	IV	Soft skill				2	1
	v	Extension Programme/ Physical Education				-	1/2
				Total		30	24/26
	III	Major Core (DSC) - XVI	UCAM510	Cloud Computing	UCAO604	4	4
	III	Major Core (DSC) - XVII	UCAM511	R Programming	-	4	4
	III	Major Core (DSC) - XVIII	UCAM508	Open Source Technology	UCAM501	4	4
V	III	Major Core (DSC) - XIX	UCAR506	Open Source Technology - Practical	UCAR504	3	2
	III	Major Core (DSC) - XX	UCAR507	R Programming - Practical	-	3	2
	III	MAJOR ELECTIVE (Discipline	UCAO501/ UCAO502/ UCAO503	Computer Ethics/ Artificial Intelligence / Software Testing	-	5	4

		Major Core (DSC) - XXII	UCAP501	Project	UCAP601	5	5
	IV	Value Education				2	1
			•	Total		30	26
	III	Major Core (DSC) - XXIII	UCAM609	Data Mining	UCAM606	5	4
	III	Major Core (DSC) - XXIV	UCAM612	Computer Graphics and Image Processing	UCAM610	5	5
	III	Major Core (DSC) - XXV	UCAM613	Internet of Things	UCAM611	5	4
	III	Major Core (DSC) - XXVI	UCAR603	Data Mining - Practical	UCAR602	4	3
X/X	III	Major Core (DSC) - XXVII	UCAR604	Computer Graphics and Image Processing - Practical	-	4	3
VI	III	MAJOR ELECTIVE (Discipline Specific Elective) - XXVIII	UCAO607/ UCAO608/ UCAO609/ UCAO610	Data Analytics/ Mobile Computing / Network Security/ Machine Learning	-	5	4
	III	Viva-Voce	UCAM601	Comprehensive Viva Voce	-	-	1
	III	Internship	UCAI601	Internship/ Field work/ Field Project		-	-/1 (Extra Credit)
	IV	Soft Skill				2	1
VI	v	Extension Programme/ Physical Education/NCC				-	0/2
	Total						25/28
				194	148/160		

NON-MAJOR ELECTIVES-UG

Semester	Part	Category	Course Code	Course Title	Contact / Week	Credit
			UCAE207	Data Science using R	4P	2
			UCAE208	Cyber Forensics	4P	2
TT	IV	NME	UCAE209	PyMOL	4P	2
11			UCAE210	Qlik View	4P	2
			UCAE211	Internet Lab	4P	2
			UCAE212	Data Analytics Tools	4P	2
			UCAE401	Multimedia Techniques	4P	2
IV	IV	NME	UCAE402	Web Programming	4P	2
			UCAE403	Mobile App Development	4P	2

Seme Part		t Category	Course Code	Course Title	Contact	Cı	redit
ster	1 ai i	Category	Course Coue	Course Thie	/ Week	Min	Max
II	III	Summer Internship	UCAI201	Summer Internship	-	-	1
IV	III	Summer Internship	UCAI401	Summer Internship	-	-	1
V	III	Self Study	UCAS503	IOT Projects	2	-	2
V	III	Self Study	UCSS502/ UCAS502	Android Applications	2	-	2
VI	III	Self Study	UCSS601/ UCAS601	Angular JS	2	-	2
VI	III	Self Study	UCSS602/ UCAS602	Green Computing	2	-	2

EXTRA CREDIT EARNING PROVISION

Inclusion of Experiential Learning A. Experiential Learning (Mandatory)

	Cou	irse Mapping		Collabo	rating Agency	- MSME
Semes ter	Course Code	Course Title	Assessment	Course Title	Hour/Days/M onth	Mode of Evaluation
Π	UCAM310	Java Programming	Component III	Java Programming	4 Days	Reflection
П	UCAM407	Python Programming	Component III	Python Programming Training	4 Days	Reflection
Ш	UCAM505	Web Programming	Component III	Web designing Certification	4 Days	Reflection
III	UCAM610	Computer Graphics	Component III	Computer Graphics Certification	4 Days	Reflection

B. Skill Orientation Programme (Only for Interested students) – Extra Credit Earning Provision

Sem ester	Category	Course Code	Course Title	Collaboratin g Agency	Hour/ Days/Mont h	Mode of Evaluatio n	Credits (Min/Ma x)
v	Core	UCAT50 1	Excel Analytics with R- Language	MSME	4 Days	Reflection	1

JAVA PROGRAMMING

UCAM305/ UCSM310

Semester	: III	Credit	: 4
Category	: Core VII	Hour/Week	: 5
Class & Major : II	BCA	Total Hour	: 65

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Acquire the knowledge of OOPs.
CO-2	Understand the concepts of class and methods.
CO-3	Learn java's exception handling mechanism, multithreading, packages and interfaces.
CO-4	Analyze different string function
CO-5	Develop Graphical User Interface (GUI) or windows-based applications in java.

UNIT -I INTRODUCTION

10 Hour

Fundamentals of Object Oriented Programming: Java Evolution – Overview of Java Language – Data Types, variables, arrays – Operators – Control statements.

UNIT –II CLASSES AND METHODS

Introduction to classes – class fundamentals – Declaring objects – Constructors – Methods and Classes – Overloading methods – static - final - Nested and Inner classes – Inheritance – Method Overriding – Abstract Classes – Packages – Interfaces.

UNIT – III EXCEPTION HANDLING AND FILES

Exception handling – Types of Exception – try and catch – nested try – throw and throws – Multithreading Programming –I/O Streams – Reading and Writing files – Reading and writing Console I/O.

UNIT – IV STRING HANDLING AND APPLETS

String Handling- String Operations: Comparison – Modifying String – String Buffer - Applet Class – Applet Architecture – The HTML Applet Tag – Passing parameters in Applets – Applet Context – Improving the Banner Applet – get() Method - JDBC Concepts.

UNIT – V AWT

AWT classes – Window fundamentals – Working with Frame windows, Graphics – Controls – Layout Managers - Java Swing.

Text Books

• Herbert Schildt, Java - The Complete Reference, Tata McGraw Hill, 10th Edition, Nov 2017.

Reference Books

- E. Balagurusamy, Programmingwith Java A Primer, Tata McGraw Hill, FourthEdition, 2010.
- Cay S. Horst Mann & Gary Cornell, *Core java*, Volume II (9th ed.), Sun Microsystems Press Java Series, 2012.

e-Resources

- http://www.w3schools.com/html/
- https://www.youtube.com/watch?v=oqJy4e6Aa0M
- https://www.youtube.com/watch?v=7r3Vln4bGLk

15 Hour

15 Hour

15 Hour

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand object oriented programming features and concept	K1,K2
CO-2	Learn different types of inheritance, polymorphism, interfaces and packages.	К3
CO-3	Identify the concepts of Multithreading and Exception handling to develop efficient and error free codes.	K4
CO-4	Compare different string function.	K5
CO-5	Implement windows based application in java	K6

OBJECT ORIENTED ANALYSIS AND DESIGN UCAM312

Semester	: III	Credit	:4
Category	: Core VIII	Hour/Week	: 5
Class & Major	: II BCA	Total Hour	: 65

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Understand the class based object oriented systems.
CO-2	Design the recurring problems by various methods.
CO-3	Develop robust object-based models for Systems
CO-4	Inculcate necessary skills to handle complexity in software design
CO-5	Apply the various design in object-Oriented solutions for Real-World Problems.

UNIT-I INTRODUCTION

An overview – Object basics – Object state and properties – Behavior – Methods -Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations-Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle.

UNIT - II UML

Introduction – Survey – Rambough, Booch, Jacobson methods – Patterns – Frameworks -Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Use case diagrams – Dynamic modeling – Model organization – Extensibility-UML Meta model.

UNIT - III USE CASE APPROACH

Identifying Use case – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility.

Case Study: Library Management System, Mark Analysis System, Ticket Reservation System, Banking Transaction.

UNIT - IV UML DESIGN PROCESS

Design process – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface-- Multidatabase System.

UNIT - V TESTING STRATEGIES

Quality assurance – Testing strategies – Object Orientation Testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction Testing.

Text Book:

• Ali Bahrami,(2017). Object Oriented System Development. McGraw Hill International Edition.

Reference Book:

- Grady Booch, Robert Maksimchuk,(2007). Object Oriented Analysis and Design. Pearson Education.
- Satzinger, Jackson and Burd(2007), "Object oriented Analysis and design with the Unified Process", CENGAGE Learning.
- Michael Blaha and J. Rumbugh(2019), "Object oriented Modeling and design with UML", Pearson Education
- O'Docherty (2005), "Object Oriented Analysis and Design Understanding, System Development with UML2.0", Wiley India.

13 Hour

13 Hour

13 Hour

e-Resource:

- https://nptel.ac.in/courses/106105153
- http://vlabs.iitkgp.ac.in/se/3/references/

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the class based object-oriented methods.	K1
CO-2	Sketch the various methods in use case driven approach.	K2
CO-3	Analyze the basic object-oriented design patterns for problems.	K3.K4
CO-4	Create an application by various UML diagrams.	K5
CO-5	Apply the applications using object oriented methods.	K6

DATA COMMUNICATION NETWORKS UCAM311

Semester	: III	Credit	:4
Category	: Core IX	Hour/Week	: 5
Class & Major	: II BCA	Total Hour	: 65

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Learn the basic concepts of data communications.
CO-2	Interpret types of error.
CO-3	Classify different types of switching techniques.
CO-4	Justifying the packet layer protocol.
CO-5	Devise network and application layer.

UNIT - I INTRODUCTION

Introduction to Data Communication, Network. Protocols & standards and standards organizations - Line Configuration - Topology - Transmission node - Classification of Network OSI Model - Layers of OSI Model.

UNIT - II TRANSMISSIONS

Parallel and Serial Transmission - Modems - Guided Media Unguided Media - Performance - Types of Error - Error Detection - Error Corrections.

15 Hour

UNIT – III MULTIPLEXING APPLICATIONS

Multiplexing - Types of Multiplexing - Multiplexing Application - Telephone systems project 802 - Ethernet - Token Bus - Token Ring FDD IEEE 802.6 - SMDS - Circuit Switching -Packet switching.

UNIT – IV LAYERS

History of Analog and Digital Network - Access to ISDN - ISDN Layers - Broadband ISDN X.25 Layers - Packet Layer Protocol - ATM - ATM Architecture - ATM Applications.

UNIT – V NETWORKS

Repeaters –Bridges- Routers - Gateway - Routing algorithms - TCP/IP Network, Transport and Application Layers of TCP/IP- SMTP - SNMP - World Wide Web- Frame relay- ATM- ATM LANs –X.25 - relay.

Text Books

- B. Forouzan, Introduction to Data Communications in Networking, Fourth Edition, TataMcGraw-Hill, New Delhi, 2017
 - Unit I : Chapter 1,2,3
 - Unit II : Chapter 6,7,9
 - Unit III : Chapter 8,12,14
 - Unit IV : Chapter 16,19
 - Unit V : Chapter 21,24,25
- William Stallings, Data and Computer Communication, Tenth Edition, Prentice Hallof India, Sep 2013

Reference Books

• A. S.Tanenbaum, Computer Networks, Fourth Edition, Pearson Education, (Prenticehall of India Ltd), New Delhi, 2011.

E-Resources

- http://www.w3schools.com/dcn.html/
- http://freevideolectures.com/Course/2278/Data-Communication

15 Hour

15 Hour

COURSE OUTCOMES:

CO	On completion of the course the student will be able to	Bloom's
No.		Level
CO-1	Understand and Contrast the concept of Signals, OSI & TCP/IP	K1,K2
	reference models and discuss the functionalities of each layer in these	
	models.	
CO-2	Determine the various modulation and error detection and correction	K3
	techniques and their application in communication systems.	
CO-3	Compare different multiplexing techniques.	K4
CO-4	Explain layered architecture of communication protocols.	K5
CO-5	Developing the common networking & Application Protocols.	K6

JAVA PROGRAMMING - PRACTICAL UCAR304/UCSR308

Semester	: III	Credit	: 2
Category	: Core X	Hour/Week	:4
Class & Major	: II BCA	Total Hour	: 52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Write programs using abstract classes.
CO-2	Implement the multithreaded programs.
CO-3	Develop programs for solving real world problems using java collection frame
	work
CO-4	Design GUI programs using swing controls in Java.
CO-5	Construct and access using JDBC in Java.

Lab Exercises

- 1. Classes and Objects
- 2. Constructors
- 3. Method Overloading
- 4. Implementing Single and Multiple Inheritance concepts.
- 5. Method Overriding

- 6. Implementing Package Concepts.
- 7. Implementing Interfaces Concepts.
- 8. Implementing Exception Handling.
- 9. Implementing Thread Synchronization
- 10. Implementing String manipulation using string and string buffer classes
- 11. Implementing Graphics using Applet.
- 12. Implementing Swing Concepts.
- 13. JDBC Connectivity

COURSE OUTCOMES:

СО	On completion of the course the student will be able to	Bloom's
No.		Level
CO-1	write programs for solving real world problems using java collection	K1
	frame work.	
CO-2	Apply multithreaded concepts in java programs.	K2
CO-3	Analyze GUI programs using swing controls in Java.	K3.K4
CO-4	Implement Exception Handling.	K5
CO-5	Develop programs using graphics and applet.	K6

DATABASE MANAGEMENT SYSTEM

UCAM404

Semester	: IV	Credit	:4
Category	: Core XI	Hour/Week	:4
Class & Major	: II BCA	Total Hour	:52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Understand the basic concepts and the applications of database systems.
CO-2	Describe the fundamentals of database systems and data models and apply the E-
	R model for several practical examples.
CO-3	Construct and access database using normal forms
CO-4	Create a database using SQL queries.
CO-5	Demonstrate and design the various database software's (SQL/PL-SQL) in order
	to manage large complex database systems.

UNIT – I DATABASES AND DATABASE USERS

Introduction –Characteristics of the database approach –Database Actors – Advantages of using DBMS approach - Database Applications - Database System Concepts and Architecture: Data models, schemas and Instances- three schema architecture and data independence - Data Base Languages and interfaces – Database architecture.

UNIT – II DATA MODELING USING ENTITY RELATIONSHIP MODEL 10 Hour

Conceptual data models – Entity types, Entity sets, Attributes and key – Relationship types, Relationship sets, Roles & Structural constraints – ER diagrams. Relational model: Relational model concepts – Relational model constraints & Relational database schemas –Update operations & Dealing with constraint violations. Relational Algebra & Calculus: Unary Relational operations – Relational Algebra operations from set theory – Binary relation operations.

UNIT – III RELATIONAL DATABASE DESIGN & TRANSACTION PROCESSING CONCEPTS 12 Hour

Informal Design guidelines for relational schemas – Functional Dependencies – Normal forms based on primary keys – second & third Normal forms – Boyce-Codd Normal Form.Introduction – Transaction & System concepts – Characterizing schedules – Concurrency control techniques – Database Recovery concepts. Database Security & Authorization: Introduction to Database security issues – Discretionary Access control based on Granting & Revoking privileges.

UNIT – IV SCHEMA DEFINITION, BASIC CONSTRAINTS & QUERIES 10 Hour

SQL Data Definition – specifying Basic Constraints in SQL – Schema change statements in SQL – Basic queries in SQL – More complex SQL queries – insert, delete and update statements in SQL – Views in SQL – Embedded SQL, Dynamic SQL.

UNIT – V PL/SQL

10 Hour

Introduction to PL/SQL- Creating and running PL/SQL Code- Navigating the Database-Creating and Editing the source code- SQL* Plus- Running a SQL statement- Running a PL/SQL-Running a script

Text Books

- Shamkant B.Navathe, Ramez Elmasri, Fundamentals of Database Systems, Sixth Edition, Pearson Education, New Delhi, 2011.
 - Unit I: Chapter 1 to Chapter 2Unit II: Chapter 3,4,5Unit III: Chapter 8,11,12

394

: Chapter 7

• Steven Feuerstein & Bill Pribyl, Oracle PL/SQL programming, Sixth Edition, O'Reilly Media, 2014.

Unit V : Chapter 1 & 2

Unit IV

Reference Books

- Silberschatz, Korth and Sudarshan, Database System Concepts, Sixth Edition, McGraw Hill, New Delhi, 2010.
- Raghu Ramakrishnan, Database Management System, Third Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2012.

E-Resources

- http://www.w3schools.com/dbms.html/
- https://www.youtube.com/watch?v=aR44FbeeFH8
- https://www.youtube.com/watch?v=1057YmExs

COURSE OUTCOMES:

CO	On completion of the course the student will be able to	Bloom's
No.		Level
CO-1	Acquire Knowledge and Discuss relational database theory.	K1
CO-2	Understand and design ER-models based on scenarios which	K2
	represent in database application	
CO-3	Demonstrate the normalization for the development of	K3.K4
	application software.	
CO-4	Select the SQL queries based on the commercial database	K5
	system.	
CO-5	Design the various database software's PL-SQL	K6
OPERATING SYSTEM UCAM408

Semester : IV Category : Major Core (DSC) – XII Class & Major: II BCA

COURSE OBJECTIVES:

СО	To enable the students
No.	
CO 1	
CO-1	Define the layouts of the Operating Systems.
CO-2	Understand the operations and services provided by the Operating System.
CO-3	Acquire the basic knowledge of Scheduling and Deadlock.
CO-4	Evaluate the various memory allocation methods and free space management.
CO-5	Apply the various algorithms for creation of the file organization.

UNIT-I INTRODUCTION

Operating System – Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems - Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments. COMPUTER-SYSTEM STRUCTURES: Computer-System Operation – I/O Structure – Storage Structure – Storage Hierarchy – Hardware Protection –Network Structure. OPERATING-SYSTEM STRUCTURES: System Components – Operating-System Services – System Calls – System Programs – System Structure – Virtual Machines.

UNIT-II PROCESSES

PROCESS: Process Concept – Process Scheduling – Operation on Processes – Cooperating Processes – Interprocess Communication. THREADS: Overview – Multithreading Models -Threading Issues. CPU SCHEDULING: Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple–Processor Scheduling – Real-Time Scheduling – Algorithm Evaluation.

UNIT-III PROCESS SYNCHRONIZATION

Background - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic Problems of Synchronization. DEADLOCKS: System Model–Deadlock Characterization – Methods for Handling. Deadlocks – Deadlock Prevention–Deadlock Avoidance–Deadlock Detection–Recovery from Deadlock.

13 Hour

13 Hour

13 Hour

Credit : 4 Hour/Week : 5 Total Hour : 65

UNIT-IV MEMORY MANAGEMENT

Background – Swapping – Contiguous Memory Allocation – Paging - Segmentation – Segmentation with Paging. VIRTUAL MEMORY: Background - Demand Paging – Process Creation - Page Replacement – Allocation of Frames – Thrashing.

UNIT-V FILE-SYSTEM INTERFACE AND THE LINUX SYSTEM 13 Hour

File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – Free-Space Management –THE LINUX SYSTEM: History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – Input and Output – Inter-process Communication –Security.

Text Book:

• Abraham SilberSchatz and Peter Baer Galvin,(2018). *Operating System*. Addison Wesley Longman Inc. (10th Ed.).

Reference Book:

• William Stallings, (2006). *Operating Systems – Internals and Design Principles*. Pearson Education Publications. Singapore.

e-Resources:

- https://nptel.ac.in/courses/106105214
- <u>http://edclap.com/pluginfile.php/13305/mod_resource/content/1/OS%20Book%20Galvin.p</u> df
- http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/CRUX/labs/index.html

COURSE OUTCOMES:

CO No	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the basic structure of Operating Systems	K1
CO-2	Apply various scheduling algorithms in process management	K2,K3
CO-3	Compare the Prevention & Avoidance algorithms in Deadlock	K4
CO-4	Classify the various memory management techniques.	K5
CO-5	Create the file using file system management	K6

13 Hour

SOFTWARE ENGINEERING **UCAM409**

: **IV** Semester Category : Major Core (DSC) - XIII Class & Major: II BCA

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Discuss the significance of process models.
CO-2	Familiarize on system engineering and data modeling concepts.
CO-3	Explore the various design process in software life cycle.
CO-4	Analyze the project management, software quality and testing strategies.
CO-5	Evaluate the process of Project management, formal technical reviews.

UNIT-I INTRODUCTION TO EVOLVING SOFTWARE

Evolving Role of Software – Nature of Software – Software Engineering – The Software Process– Software Engineering Practices – Software Myths – A Generic View of Process Model - Process Assessment and Improvement - Process Models : Waterfall Model - Incremental Process Models - Evolutionary Process Models - Concurrent Models.

UNIT-II REQUIREMENTS PROCESS

Establishing the Groundwork - Initiating the Requirements Engineering Process -Eliciting Requirements – Collaborative Requirements Gathering – Quality Function – Building the Requirements Model – Elements of Requirements Model – Analysis Pattern – Requirements Analysis - Data Modeling Concepts.

UNIT-III DATA PROCESS

Design Process and Design Quality – Design Concepts – The Design Model - Creating an Architectural Design – Software Architecture – Data Design – Architectural style – Architectural Design – Architectural Mapping Using Data Flow – Performing User Interface Design – Golden Rules.

UNIT-IV TESTING STRATEGIES

Testing Strategies: Strategic Approach to Software Testing - Strategic Issues - Test Strategies for Conventional and Object Oriented Software – Validation Testing – System Testing - Art of Debugging. Software Testing Fundamentals - White Box Testing - Basis Path Testing -Control Structure Testing – Black Box Testing – Model Based Testing.

10 Hour

10 Hour

10 Hour

10 Hour

Credit :4 Hour/Week :4

Total Hour : 52

UNIT-V PROJECT MANAGEMENT

12 Hour

Project Management: Management Spectrum – People – Product – Process – Project – Critical Practices – Estimation: Project Planning Process – Software Scope and Feasibility – Resources – Software Project Estimation – Project Scheduling – Quality Concepts – Software Quality Assurance – Elements of Software Quality Assurance – Formal Technical Reviews.

Text Books:

- Richard Fairley (2011). Software Engineering Concepts. Tata McGraw-Hill Education.
- Roger S Pressman,(2014). *Software Engineering A Practitioner's Approach*. McGraw Hill International Edition. New York.(8th Ed.).

Reference Book:

• Ian Somerville,(2006). *Software Engineering*. Pearson Education. (7th Ed.).

e-Resources:

- http://vlabs.iitkgp.ernet.in/se/
- http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/sw_engg/labs/index.php
- https://nptel.ac.in/courses/106105182

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Describe the nature of software, software process and software	K1,K2
	engineering practice and various models.	
CO-2	Demonstrate the current theories, models, and techniques that	K3
	provide a basis for the software life cycle	
CO-3	Analyze the techniques and tools for engineering practice	K4
CO-4	Summarize the concepts of quality, Software Quality	K5
	Assurance tasks, strategies and types of testing	
CO-5	Develop the Product, process, project estimation modeling and	K6
	emerging trends using recent applications	

DATABASE MODELLING UCAR405

Semester : IV Category : Major Core (DSC) – XIV Class & Major:II BCA Credit : 2 Hour/Week : 3

Total Hour : 39

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Understand the concepts of table creations, aggregate functions, set operators
	using queries
CO-2	Examine the partition table using nested queries
CO-3	Sketch the E-R diagrams using relational database modeling
CO-4	Analyze the relations by applying normalization techniques.
CO-5	Apply PL/SQL queries using functions, procedures, cursors and triggers

LAB EXERCISES

- 1. Concept design with ER Model.
- 2. Creation of Relational Model.
- 3. Apply Normalization to given Application
- 4. Using SQL commands for
 - a. Data Definition and
 - b. Data Manipulation.
- 5. Using SQL Queries
 - a. Sub Query,
 - b. Nested Query,
 - c. SET Operators
 - d. Constraints.
- 6. Using SQL Queries Group Functions
 - a. Aggregate functions,
 - b. GROUP BY,
 - c. HAVING

- 7. Creation and dropping of Views.
- 8. Creation of Triggers insert, delete and update.
- 9. Creation of Procedures.
- 10. Usage of Cursors.

Note: Models to be trained in Real time Application minimum 5 to be present.

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand database schema for a given problem-domain	K1,K2
CO-2	Construct and maintain tables using PL/SQL	K3
CO-3	Select SQL queries to access the data for data processing.	K4
CO-4	Evaluate the SQL queries using aggregate and group function	K5
CO-5	Develop PL/SQL queries using procedures, functions, cursors	K6
	and triggers.	

OPERATING SYSTEM -PRACTICAL UCAR406

Semester	: IV	Credit	:2
Category	: Major Core (DSC) – XV	Hour/Week	:3
Class & Major	:II BCA	Total Hour	: 39

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Identify the main components and services of Operating Systems.
CO-2	Explain the process, memory, file management and various scheduling
	algorithms
CO-3	Analyze various issues in Inter Process Communication (IPC) and their
	solutions.
CO-4	Evaluate the Memory management algorithms, allocation methods and virtual
	memory implementations.
CO-5	Create the various algorithms using file organization techniques

LAB EXERCISES

- 1. Programs using the following system calls of UNIX operating system fork, getpid, exit, close, opendir, readdir.
- 2. Develop shell simple programs.
- 3. Develop a menu driven shell program to copy ,edit, rename and delete a file
- 4. Implement the concepts
 - a. Priority scheduling algorithm
 - b.Round robin scheduling algorithm
 - c.FCFS scheduling algorithm
- 5. Producer-Consumer Problem Using Semaphores
- 6. Dead Lock
 - a. Avoidance
 - b.Prevention
- 7. File Organization Techniques

a.Single Level Directory

b.Two Level Directory

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the processes, resource control, physical and virtual	K1,K2
	memory, scheduling, I/O and files.	
CO-2	Calculate waiting time, response time, turnaround time and disk	K3
	seeks time in disk scheduling.	
CO-3	Analyze the best CPU scheduling algorithm for a given	K4
	problem instance	
CO-4	Summarize the performance of various page replacement	K5
	algorithms	
CO-5	Develop the algorithm for deadlock avoidance, detection and	K6
	file allocation strategies.	

MULTIMEDIA TECHNIQUES UCAE401

Semester : IV Category : NME Class &Major: II UG Credit : 2 Hour/Week : 4

Total Hour : 52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Explore the basic tools and components of a multimedia
CO-2	Understand the basic tools found in Adobe Photoshop to create and edit images.
CO-3	Create time-based and interactive multimedia components
CO-4	Discuss about multimedia scripting and programming
CO-5	Demonstrate proficiency in developing the multimedia presentations.

LAB EXERCISES

Using Photo Editing Software,

- 1. Design a visiting card containing at least one graphic and text information.
- 2. Given a picture of a garden as background. Extract the image of a butterfly from another picture and organize it on the background.
- 3. Make three copies of .jpeg picture. On one of these pictures, adjust the brightness and contrast, so that it gives an elegant look. On the second picture, change it to gray scale and the third is the original one.
- 4. Convert an image imported from My Pictures, to a pencil sketch.
- 5. Mask the background image given through your name.
- 6. Import two pictures, one that of sea and another of clouds. Morph, merge and overlap these images.

Using Animation Software

7. Shows the gradual conversion of a square to a circle.

- 8. Highlight a neatly formatted text by a spotlight from left to right.
- 9. Show the effect of a Virtual Drumbeat with suitable audio and visual effects.
- 10. Simulate a Raindrop with a splash effect.

COURSE OUTCOMES:

CO	On completion of the course the student will be able to	Bloom's Level
No.		
CO-1	State the techniques of photo editing.	K1,K2
CO-2	Apply layer masks, filters and blending modes, share and save your images in various formats.	К3
CO-3	Compare various retouching and repairing techniques to correct images.	K4
CO-4	Summarize a range of concepts, techniques and tools for creating and editing the interactive multimedia applications.	K5
CO-5	Prepare multimedia applications in several areas	K6

WEB PROGRAMMING

UCAE402

Semester	: IV	Credit	: 2
Category	: NME	Hour/Week	:4
Class & Major	: II UG	Total Hour	: 52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Explain the tags of HTML and scripting language
CO-2	Apply the SCRIPT element and CSS for creating dynamic web pages
CO-3	Develop the basic handling of tables, executing queries using Javascript
CO-4	Formulate planning and designing syntactically correct effective web pages.
CO-5	Evaluate the techniques behind responsive web design

LAB EXERCISES

HTML

- 1. Create an HTML Documents, and establish adequate formatting for presentation purposes
- 2. Managing images in HTML document.
- 3. Insert and manipulate tables
- 4. Establish and maintain internal and external link to available resources
- 5. Frames
- 6. Forms
- 7. Special Effects in HTML Documents (eg: Marquee)

CASCADING STYLE SHEET

- 1. CSS Background
- 2. CSS text and fonts
- 3. CSS Links
- 4. CSS Lists
- 5. CSS tables

JAVASCRIPT

- 1. Basic Syntax.
- 2. Control Structures.
- 3. Writing Functions.
- 4. Working with Arrays.
- 5. Events Handling.

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	List out the steps in the creation of static webpage using HTML	K1,K2
CO-2	Construct a web page and identify its elements and attributes	K3
CO-3	Analyze the SCRIPT element and CSS for creating dynamic	K4
	web pages	
CO-4	Summarize XML documents and Schemas	K5
CO-5	Compose a Rich Internet Application	K6

MOBILE APP DEVELOPMENT UCAE403

Semester	: IV
Category	: NME
Class & Major	:: II UG

Credit : 2 Hour/Week : 4 Total Hour : 52

COURSE OBJECTIVES:

CO No.	To enable the students
CO-1	Create the components and structure of mobile application development
	frameworks for Microsoft and windows OS based mobiles.
CO-2	Learn the basic and important design concepts and issues of development of
	mobile applications.
CO-3	Develop the capabilities and limitations of mobile devices.
CO-4	Design the skills in creating draw tables and animation
CO-5	Acquire knowledge on user interface design to develop frameworks

LAB EXERCISES

- 1. Install the mobile development app using Microsoft power apps.
- 2. Create Development of Hello World Application
- 3. Design a mobile app for calendar control using popular items.
- 4. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
- 5. Design a mobile app for blank page using add icon.
- 6. Create a search icon and search the products.
- 7. Design the mobile app with radio buttons, check box and list box.
- 8. Design a mobile app with media item.
- 9. Design a mobile app and create a different shapes using shapes item.
- 10. Develop a Simple App like calculator/feedback/MCQ etc.,

e-Resources:

- https://powerapps.microsoft.com/en-us/
- https://make.powerapps.com/e/Default-0e623c6d-eeaf-473e-8245ec72dd3c7e5d/canvas/?ScenarioId=signup&action=new-blank&formfactor=phone&name=demo

COURSE OUTCOMES:

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Identify the basic knowledge on mobile application	K1
	environment and technology.	
CO-2	Explain and apply the concepts of mobile application	K2,K3
	development.	
CO-3	Point out the design and development issues specific to	K4
	mobile applications.	
CO-4	Evaluate mobile applications, using development tools and	K5
	environments.	
CO-5	Develop applications to the Android marketplace for	K6
	distribution.	

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
III	III	Major Core (DSC) - VII	UCAM310 / UCSM305	Java Programming	Assignment	Presentation using ICT Technique
		Major Core (DSC) - VIII	UCAM312	Object Oriented Analysis and Design	Assignment	Problem solving in Rationale rose tool
		Major Core (DSC) - IX	UCAM311	Data Communication Networks	Assignment	Presentation using ICT Technique
		Major Core (DSC) - X	UCAR304/ UCSR308	Java Programming - Practical	DPA	Viva-voce

		Core VII	UCAM404	Database	Assignment	Presentation
	III			Management System		using ICT
						Technique
	III	Major Core		Operating System	Assignment	Seminar
IV		(DSC) - VIII	00/101+00			Semma
	III	Major Core	UCAM409	Software Engineering	Assignment	System
		(DSC) - XII	001101109			Modeling
	III	Major Core	UCAR405	Database Modeling -	ΠΡΔ	Viva-voce
		(DSC) - XIV	00/10/	Practical	DIA	
	III	Major Core		Operating System-	ΠΡΛ	Viva-voce
		(DSC) - XV	UCAR400	Practical	DIA	

NON-MAJOR ELECTIVES

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
IV	IV	Non Major Elective	UCAE401	Multimedia Techniques	DPA	Viva-voce
			UCAE402	Web	DPA	Viva-voce
			UCAE403	Mobile App Development	DPA	Viva-voce