

DEPARTMENT OF COMPUTER SCIENCE

PREAMBLE

UG : Course Profile- List of Courses offered to other departments and Syllabi of courses in the I and II semesters along with Evaluation Components III and IV (With effect from 2018-2021 batch onwards) and

PG : Course Profile- List of Courses offered and Syllabi of courses in the I and II semesters along with Evaluation Components III and IV (With effect from 2018-2020 batch onwards) and

M.Phil: Course Profile and Syllabi (With effect from 2018-2019 batch onwards) are presented in booklet.

COURSE PROFILE B.Sc. (Computer Science)

PSO1 : Ability to understand, analyze, design, develop and optimize solutions related to computer programming languages.

PSO2 : Application of concepts in core areas related to computer programming for efficient design of computer-based systems of varying complexity.

PSO3 : Ability to test the technical issues in Software Engineering and deliver a quality product for business success.

PSO4 : Ability to innovate and develop new technologies.

Semester	Part	Category	Course Code	Course Title	Contact Hrs/Week	Credit	
						Min	Max
I	I	Language	UTAL105 / UTAL106/	Basic Tamil-I / Advanced Tamil-I	4	2	3
			UHIL101/ UFRL101	Hindi-I / French-I			
	II	English	UENL105/ UENL106	General English-I / Advanced English-I	5	3	4
	III	Core I	UCSM106/ UCAM107	Programming in C	6	5	5
	III	Core II	UCSM107 / UCAM108	Fundamental of Computer Science	5	4	4
			UCSM108 / UCAM109	Advanced Computer Science			
	III	Core III	UCSR109/ UCAR105	Programming in C - Practical	3	2	2
III	Allied I	UMAA113	Statistical Methods	5	4	4	
IV	Value Education			2	1	1	
Total					30	21	23
II	I	Language	UTAL205/ UTAL206	Basic Tamil-II / Advanced Tamil-II	4	2	3
			UHIL201/ UFRL201	Hindi-II / French-II			
	II	English	UENL205/ UENL206	General English-II / Advanced English-II	5	3	4
	III	Core IV	UCSM206/ UCAM205	Data Structures	6	6	6
III	Core V	UCSR206/ UCAR204	Data Structures - Practical	4	3	3	

	III	Allied II	UMAA210	Mathematics for Computer Science	5	4	4
	IV	Non Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme / Physical Education			-	1	2
Total					30	22	25
III	I	Language	UTAL305/ UTAL306	Basic Tamil-II / Advanced Tamil-II	4	2	3
			UHIL301/ UFRL301	Hindi-II / French-II			
	II	English	UENL305/ UENL306	General English-II/ Advanced English-II	5	3	4
	III	Core VI	UCSM305/ UCAM310	Java Programming	6	6	6
	III	Core VII	UCSR308/ UCAR304	Java Programming – Practical	4	3	3
	III	Allied III	UPHA304	Digital Electronics	5	4	4
	III	Allied IV	UPHR304	Digital Electronics – Practical	4	2	2
	IV	Value Education			2	1	1
Total					30	21	23
IV	I	Language	UTAL405/ UTAL406/	Basic Tamil-IV / Advanced Tamil-IV	4	2	3
			UHIL401/ UFRL401	Hindi-IV / French-IV			
	II	English	UENL405/ UENL406	General English-III / Advanced English-III	5	3	4
	III	Core VIII	UCSM408/ UCSM507	System Analysis and Design	5	5	5
	III	Core IX	UCSM409	Open Source Technology	6	6	6
	III	Core X	UCSR411	Open Source Technology-Practical	5	3	4
	IV	Online Courses		NPTEL/Spoken Tutorial	3	2	2
		Soft skill			2	1	1
V	Extension Programme / Physical Education			-	-	2	
Total					30	22	27
V	III	Core XI	UCSM506	Middleware Technologies	5	5	5
	III	Core XII	UCSM509	Database Management System	5	4	4
	III	Core XIII	UCSM510	Computer Networks	5	5	5
	III	Core XIV	UCSM511	Software Engineering	5	4	4
	III	Core XV	UCSR509	Middleware Technologies – Practical	4	3	3
	III	Core XVI	UCSR511	Database Management System-Practical	4	3	3
	IV	Value Education			2	1	1
Total					30	25	25

VI	III	Core XVII	UCSM608	Multimedia System Design	5	5	5
	III	Core XVIII	UCSM609	Operating System	5	5	5
	III	Core XIX	UCSM610	Big Data Tools	4	4	4
	III	Core XX	UCSR606	Operating System – Practical	4	3	3
	III	Core XXI	UCSP601	Project	5	5	5
	III	Major-Optional	UCSO606/ UCSO607	Network Security / Mobile Computing	5	5	5
	III	Viva – Voce	UCSM611	Comprehensive Viva Voce	-	1	1
	IV	Soft skill			2	1	1
	V	Extension Programme / Physical Education			-	-	2
Total					30	29	31
Grand Total					180	140	154

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

Class & Major	Semester	Category	Course Code	New Course Title	Contact Hrs/Week	Credit
B.Com with Computer Applications	I	Allied	UCSA104	C Programming	3	3
	I	Allied Practical	UCSR110	C Programming Lab	3	2
	II	Allied	UCSA204	Object Oriented Programming	3	3
	II	Allied Practical	UCSR207	Object Oriented Programming – Lab	3	2
	III	Allied	UCSA305	Fundamentals of Block chain Technology	3	3
	III	Allied Practical	UCSR309	Blockchain Technology Using Solidity – Lab	3	2
	IV	Allied	UCSA406	Cryptocurrency	3	3
	IV	Allied Practical	UCSR412	Cryptocurrency Using BigchainDB / Naivecoin - Lab	3	2
	V	Allied	UCSA509	Business Analytics and Intelligence .	3	3
	V	Allied Practical	UCSR512	Business Analytics and Intelligence using SAS - Lab	3	2
BBA, B.Com and Economics	IV	Allied	UCSA407	Cyber Security in Finance	3	3
	IV	Allied Practical	UCSR413	Cyber Security Lab	3	2
Tamil	V	Allied	UCSA505	Tamil Kanini	3T + 2P	5
Maths	III	Allied	UCSA304	Mathematical Programming using C	3	3
	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
Physics	III	Allied	UCSA306	Computational Physics with Python	3	3
	III	Allied Practical	UCSR310	Computational Physics with Python – Lab (python)	3	2

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit
II	IV	Non Major Elective	UCSE206	Tableau Programming	2T+2P	2
			UCSE207	Python Programming	4P	2
			UCSE208	R Programming	4P	2
			UCSE209	Arduino Programming	4P	2

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course Code	Course Title	Contact Hrs/week	Credit	
						Min	Max
II	III	Core	UCSI201	Summer Internship / Working Model	-	-	1
IV	III	Core	UCSI401	Summer Internship	-	-	1
V	III	Self Study Paper	UCSS501/ UCAS501	Python Programming	2	-	2
V	III	Self Study Paper	UCSS502/ UCAS502	Android Applications	2	-	2
VI	III	Self Study Paper	UCSS601/ UCAS601	Angular JS	2	-	2
VI	III	Self Study Paper	UCSS602/ UCAS602	Green Computing	2	-	2

UCSM106/ UCAM107 PROGRAMMING IN C

Semester : I
Category : Core 1
Class & Major : I B.Sc (CS)

Credit : 5
Hours/Week : 6
Total Hours : 78

Objectives

To enable the Students

- Understand the concepts of structured Programming.
- Acquire Knowledge on Control Structure, Arrays, Functions, Pointers and Files
- Solve Logical problems using C language.

UNIT- I INTRODUCTION

15 Hrs

Overview of C – Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data Types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaring a Variable as Constant – Declaring a Variable as Volatile – Operators and Expressions.

UNIT- II DECISION AND LOOPING

15Hrs

Introduction – Decision making with if statement – Simple if statement – The if-else statement – Nesting of if-Else Statements – The Else if Ladder – The Switch Statement – The

Goto Statement - The Ternary Operator. **Looping:** The While statement – The Do-While Statement – The For Statement – Jumps in Loops.

UNIT- III ARRAYS AND FUNCTIONS **16 Hrs**

Introduction – One-Dimensional Arrays – Declaration of One-Dimensional Arrays – Initialization of One-Dimensional Arrays – Two-Dimensional Arrays – Initialization of Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays – Character Arrays and Strings – User-Defined Functions.

UNIT- IV STRUCTURES AND UNIONS **16 Hrs**

Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure Variables – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structure and Functions – Unions – Size of Structure.

UNIT- V POINTERS AND FILES **16 Hrs**

Introduction to Pointers – Accessing the Address of a Variable – Declaring Pointer Variables – initialization of Pointer Variables – Accessing a Variable through its Pointer – chain of Pointers – Pointer Expressions – Pointers Increments and Scale Factor – Pointer and Arrays – Pointers and Character Strings – Arrays of Pointers. **Files:** Introduction – Defining and opening a file – Closing a File – Input/Output Operations on files. Dynamic Memory Allocation – Allocating a Block of memory: Malloc – Allocating Multiple Blocks of Memory – Altering the size of Block .C Preprocessor-Directives - Macros - Working with Several Files - Command Line Arguments.

Text Book

- Bala Gurusamy.E,” *Programming in ANSI C*”, 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

Reference Books

- Herbert Schildt.H, “*C The Complete Reference*”, 4th Edition, Tata McGraw-Hill Edition, New Delhi, 2000.
- Byron S. Gottfried,” *Programming with C*”, 4th Edition, Tata McGraw Hill Edition, New Delhi, 2006.
- Brian W. Kernighan and Dennis M.Ritchie, “*The C Programming Language*”, 2nd Edition, Prentice hall of India Pvt.ltd, New Delhi, 2005.

UCSM107/UCAM108 FUNDAMENTALS OF COMPUTER SCIENCE

Semester	: I	Credit	: 4
Category	: Core II	Hours/Week	: 5
Class &Major	: I B.SC(CS)	Total Hours	: 65

Objectives

To enable the students

- Obtain basic knowledge about Computer Classification and Applications.
- Acquire knowledge on Number systems , Elements of Computer Architecture

- Inculcate knowledge on Internet and E-Mail.

UNIT- I INTRODUCTION

13 Hrs

Introduction To Computers - Characteristics of computers - Evolution of computers- Generation of Computers - Classification of Computers - The Computer System- Applications of Computers.

UNIT- II PROGRAMMING LANGUAGES

13 Hrs

Introduction - Evolution of Programming Languages- Classification of Programming Languages - Generations of Programming Languages - Features of a Good Programming Language- Selection of a Programming Language.

UNIT- III NUMBER SYSTEMS

13 Hrs

Introduction - Decimal Number System - Binary Number System - Complements - Signed and Unsigned Number Representations - Fixed-Point Representation of Numbers - Floating-point Representation of Numbers - Binary Coded Decimal (BCD) - Gray Code - Excess-3 Code - ASCII Code - EBCDIC Code - Bits, Bytes, and Words - Octal number system - Hexadecimal Number System.

UNIT –IV FUNDAMENTALS OF COMPUTER ARCHITECTURE

13 Hrs

Introduction- Central Processing Unit (CPU) Memory- Communication between Various Units of a Computer System- The Instruction Format- Instruction Set- Processor Speed- Multiprocessor Systems. Primary Memory Introduction- Memory Hierarchy- Random Access Memory (RAM)- Types of RAM- Read Only Memory (ROM)- Types of ROM. Secondary Storage Introduction- Classification of Secondary Storage Devices- Magnetic Tape- Magnetic Disk- Optical Disk- Magneto Optical disk. Input Devices - Output Devices.

UNIT -V INTERNET AND E-MAIL

13 Hrs

Introduction - Internet Access - Internet protocols - Internet Addressing - World Wide Web - Web pages and HTML - Web Browsers - Searching the Web - Internet Chat - Overview of Electronic Mail - Internet - E-Commerce and E-Business.

Computer Program Introduction- Developing a Program- Algorithm- Flowchart- Pseudocode (P-Code)

Text Book

- Alexis Leon And Mathews Leon, “*Fundamentals of Information Technology*”, Vikas Publishing House Pvt. Ltd, 2009

Reference Books

- Dennis P. Curtin ,Kim foley, Kunal Sen and Cathleen Morin - “*Information Technology - the breaking wave*”, Tata-McGraw Hill Publications, 2005 Seventeenth Reprint., (ISBN 0-07- 463558-1)..
- Alexis Leon And Mathews Leon. “*Fundamentals of Information Systems*” co-published by Vijay Nicole Imprints Pvt Ltd, 2004.

UCSM108/UCAM109 ADVANCED COMPUTER SCIENCE

Semester	: I	Credit	: 4
Category	: Core II	Hours/Week	: 5
Class & Major	: I B.SC(CS)	Total Hours	:65

Objectives

To enable the Students

- Obtain knowledge on Object Oriented Programming concepts.
- Understand the basics Microprocessor and Compiler.
- Acquire knowledge on Information Security and Open Source Software.

UNIT - I INTRODUCTION TO OBJECT ORIENTED CONCEPTS **12 Hrs**

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 – Method Overloading – Inheritance - Exception Handling.

UNIT - II MICROPROCESSOR **12 Hrs**

Introduction to Microprocessor – Microcontroller - 8085 Microprocessor and Architecture - Opcode fetch - Machine cycle - Memory Read Machine Cycle - Memory Write Machine Cycle - IO Read Machine Cycle - IO Write Machine Cycle - Execution time of the Instruction Cycle.

UNIT - III INTRODUCTION TO COMPILERS **11 Hrs**

Compilers – Analysis of Source Program – The Phases of compilers – Cousins of Compilers – The grouping of Phases – Analysis of Source Program.

UNIT - IV INFORMATION SECURITY **15 Hrs**

Introduction to Information Security - Components of Information System - Balancing Information Security and Access - The Systems Development Life Cycle - The Security Systems Development Life Cycle - Security Professionals and Organization.

UNIT - V OPEN SOURCE SOFTWARES **15 Hrs**

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources. Open Source Operating Systems : LINUX – Introduction: MySQL - PHP – Python.

Text Books

- Michael E Whitman and Herbert J Mattord, “*Principles of Information Security*”, 4th Edition, Course Technology, Cengage Learning, 2012.
- Rasmus Lerdorf and LevinTatroe, “*Programming in PHP*”, Reilly, 2012
- Ramesh.S.Goankar, “*Microprocessor Architecture, Programming and Applications with 8085*”, Fifth Edition, Penram International, 2011.

Reference Books

- Alfred V.Aho, Ravi Sethi, Jeffery D.Ullman, “*Compilers, Principles and Techniques and Tools*”, Addison-Wesley, New Delhi, 2006.
- Herbert Schildt, “*The Complete Reference C++*”, Fifth edition, Tata McGraw-Hill Publishing, New Delhi, 2015.

UCSR109/UCAR105 PROGRAMMING IN C – PRACTICAL

Semester : I	Credit : 2
Category : Core Practical 1	Hours/Week : 3
Class & Major : I B.SC(CS)	Total Hours : 39

Objectives

To enable the Students

- Implement basic concepts of the C Programming language.
- Develop programs by using Control Structure, Arrays, Functions, Pointers and Files
- Design, build, Execute and Debug C programs.

I. Arithmetic and Trigonometric Operations	6 Hrs
1. Perform Arithmetic Operations	
2. Solve Quadratic Equations.	
3. Find the largest and smallest number.	
II. Looping	6 Hrs
1. Pascal Triangle	
2. Armstrong Number Checking	
3. Decimal to Binary Conversion	
III. Arrays and functions.	18 Hrs
1. Sorting and Searching	
2. Perform the operation of Matrix Manipulation.	
a. Addition and Subtraction. b. Multiplication	
3. Perform the operation Recursive and Non-Recursive functions to find	
a. Factorial	
b. Fibonacci	
4. Perform the String manipulation(without using string function)	
a. Concatenation	
b. Palindrome Checking	
c. Count the number of vowels, consonants, characters and white spaces in a line	

IV. Structure 3 Hrs

1. Generate mark sheet processing for set of students using Structure

V. Pointers and Files 6 Hrs

1. Perform Arithmetic Operation using Pointer.

2. Copies the contents of one file to another file using command line arguments.

UCSM206/ UCAM205 DATA STRUCTURES

Semester : II

Category : Core III

Class & Major : I B.SC(CS)

Credit : 6

Hours/Week : 6

Total Hours : 78

Objectives

To enable the Students

- Impart the basic concepts of data structures.
- Understand basic concepts about stacks, queues, Lists, trees and graphs.
- Understand concepts about searching and sorting techniques.

UNIT- I INTRODUCTION

15 Hrs

Introduction – Classification of Data Structure – Operations on Data Structures – Abstract Data Type – Algorithms – Different Approaches to Design an Algorithms – Time and Space Complexity – Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis.

UNIT- II STACKS, QUEUES AND LINKED LISTS

16 Hrs

Stacks: Definition – Array representation of Stacks – Evaluation of a Postfix Expression – Transforming Infix Expressions into Postfix Expressions. **Queues:** Definition – Array representation of Queues – Circular Queues.

Linear Lists: Linked Lists – Representation of Linear Lists in Memory – Traversing a Linked List – Searching a Linked List – Insertion into a Linked List – Deletion from Linked List – Circular Linked Lists – Doubly Linked Lists.

UNIT- III TREES

16 Hrs

Introduction and Definition of Trees – Tree terminology – Binary Tree – Representing Binary Trees in Memory – Traversing Binary Tree: preorder, in-order, post-order traversal – Binary Search Trees – Searching and Inserting in Binary Search Trees – Deleting in a Binary Search Tree.

UNIT- IV GRAPHS

16 Hrs

Introduction to Graph - Directed Graphs. Sequential representation of Graphs: Adjacent Matrix- Path Matrix - Linked representations of a Graph . Operations on Graphs:

Searching in a Graph - Inserting in a Graph. Traversing a Graph: Breadth- First Search - Depth-First Search.

UNIT –V SORTING AND SEARCHING

15 Hrs

Sorting: Bubble Sort - Insertion Sort - Quick Sort - Selection Sort - Merge-Sort.
Searching: Sequential and Binary Searches - Indexed Search - Hashing Schemes.

Text Book

- Ashok N Kamthane, “*Introduction to data structures in C*”, Pearson Education, Indian Print, Dorling Kindersley publications, New Delhi 2012.

Reference Book

- Ellis Horowitz and Sartaj Sahni, “*Fundamentals of data structures*”, Galgotia Book Source, 2005.

UCSR206/UCAR204 DATA STRUCTURES – PRACTICAL

Semester : II

Credit : 3

Category : Core Practical II

Hours/Week : 4

Class & Major : I B.SC(CS)

Total Hours : 52

Objectives

To enable the Students

- Implement basic concepts of Linear Data Structures.
- Develop programs using the Non Linear concept.
- Solve the sorting and searching algorithms.

To implement the Programs

I. Linear Data Structures

16 Hrs

1. Stack using arrays.
2. Queue using arrays.
3. Single linked list.

II. Non-Linear Data Structures

4 Hrs

4. Binary tree.
5. Graph Using Adjacency Matrix.

III. Sorting

16 Hrs

6. Merge sort using arrays.
7. Insertion sort using arrays.
8. Quick sort using arrays.
9. Selection Sort using arrays.

IV. Searching	16 Hrs
10. Linear search using arrays.	
11. Binary search using arrays.	
12. Depth first search.	
13. Breadth first search.	

ALLIED COURSES OFFERED TO OTHER DEPARTMENTS

UCSA104 C PROGRAMMING

Semester : I	Credit : 3
Category : Allied	Hours/Week : 3
Class & Major : I B.Com CA	Total Hours : 39

Objectives

To enable the students

- Understand the Basic computer knowledge
- Implement basic concepts of the C programming language.
- Design, build, execute and debug C applications.

UNIT- I COMPUTER BASICS 8 Hrs

Introduction – Evolution, Generation and Classification of Computers – Computer system – Application of computers. Input devices, output devices, storage devices. **Information – Technology:** IT- Role of IT – IT and Internet – Careers in IT Industry. **Internet Tools:** Web Browser – Browsing Internet – Email – Search Engines – Instant Messaging. E-commerce – Electronic Data Interchange (EDI) – Mobile Communication – Bluetooth – Global Positioning System.

UNIT- II OVERVIEW OF C 8 Hrs

Importance of C - C program structure - sample C program. Constants - Variables and Data Types - Character set - C tokens - keywords and identifiers - declaration of variables - Assigning values to variables - Operators – Expression - Arithmetic - Relational - Logical - Assignment - Increment - Decrement – Conditional - bitwise and special operators - Arithmetic expressions - Operator precedence - Type conversions.

UNIT- III DECISION MAKING AND BRANCHING 7 Hrs

Decision making with If - Simple IF - IF ELSE - nested IF ELSE - ELSE IF ladder – switch - GOTO statement. **Looping:** While - Do-While – For - Jumps in loops.

UNIT- IV ARRAYS, STRINGS AND USERDEFINED FUNCTIONS 8 Hrs

Declaration and Accessing of one and two-dimensional Arrays - initializing two-dimensional Arrays - multidimensional Arrays. Declaring and Initializing String Variables – Reading Strings from terminal – Writing strings to screen – Putting strings together – Comparison of two strings – String handling functions. User defined Functions -Recursion.

UNIT- V STRUCTURES, UNIONS AND POINTERS

8 Hrs

Defining - Giving values to members - initialization and comparison of Structure variables - Arrays of Structure - Structure and Functions – Unions – Pointers.

Text Book

- Bala Gurusamy.E, “*Programming in ANSI C*”, 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

Reference Books

- Ashok N. Kamthane, “*Programming in ANSI C and Turbo C*”, 3rd Edition, Pearson Education, New Delhi, 2006.
- Yashavant Kanetkar.Y, “*Let us C*”, 10th Edition, BPB Publication, New Delhi, 2010.

e-Resources

- <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-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_PROGRAMMING_powerpoint_ppt_presentation

UCSR110 C PROGRAMMING – LAB

Semester : I

Category : Allied

Class & Major : I B.Com CA

Credit : 2

Hours/Week : 3

Total Hours : 39

Objectives

To enable the students

- Implement basic concepts of the C Programming language.
- Develop programs by using Control Structure, Arrays, Functions, Pointers and Files
- Design, build, Execute and Debug C programs.

Lab Exercises

39 Hrs

1. Operators
2. Decision Making
3. Decision Looping
4. Arrays
5. Strings
6. Functions
7. Recursion
8. Structures.

- 9. Union
- 10. Pointers

UCSA204 OBJECT ORIENTED PROGRAMMING

Semester	: II	Credit	: 3
Category	: Allied	Hours/Week	: 3
Class & Major	: I B.Com CA	Total Hours	: 39

Objectives

To enable the students

- Understand the concepts of Object Oriented Programming.
- Acquire knowledge on C++ and Java
- Develop programming skills on OOPs concept.

UNIT- I BASICS OF OOPS 7 Hrs

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 8 Hrs

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

UNIT- III FUNDAMENTALS OF JAVA 8 Hrs

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 8 Hrs

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

UNIT- V APPLET 8 Hrs

The Java Applet Class and Interfaces – Sample Programs.

Text Books

1. Herbert Schildt, “*The Complete Reference C++*”, 5th edition, Tata McGraw-Hill Publishing, New Delhi, 2015
2. Balagurusamy E - “*Object Oriented Programming with C++*”, Tata McGraw Hill Publications, 6th Edition, 2013.
3. Patric Naughton and Herbert Schildt, “*The Complete Reference Java 2*”, Tata McGraw Hill Publishers, 2017.
4. E. Balagurusamy, “*Programming with Java - A Primer*”, Tata McGraw-Hill Publish., 5th Edition, 2013.

Reference Books

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

UCSR207 OBJECT ORIENTED PROGRAMMING LAB

Semester	: II	Credit	: 2
Category	: Allied	Hours/Week	: 3
Class & Major	: I B.Com CA	Total Hours	: 39

Objectives

To enable the students

- Understand and implement OOPS concepts.
- Impart practical training in object oriented programming in C++ and Java.
- Develop compile and run programs in C++ and Java.

Lab Exercise (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

NON-MAJOR ELECTIVES

UCSE206 TABLEAU PROGRAMMING

Semester	: II	Credit	: 2
Category	: NON MAJOR ELECTIVE	Hours/Week	: 2T+ 2P
Class & Major	: I UG	Total Hours	: 52

Objectives

To enable the students

- Learn basic concepts of Tableau statistics and Tableau interactive dashboard.
- Acquire Knowledge in Master Tableau Reporting, Graphs, Maps, Table Calculation.

- Implementing the concepts in Tableau

UNIT- I INTRODUCTION 5 Hrs

Introduction Tableau – Design Flow – File Types – Data Types - Connecting to Databases -Working with Data – Analyzing - Formatting.

UNIT- II CALCULATIONS 6 Hrs

Introduction to Calculations - Dashboard Development – Sharing - Data Calculations -Aggregate Calculations - User Calculations - Table Calculations - Logical Calculations - String Calculations - Number Calculations – LOD Expressions.

UNIT- III OPERATORS AND FUNCTIONS 5 Hrs

Type Conversion – Operators – Functions - Data Joining - Data Blending - Trendlines.

UNIT- IV SORTING AND FILTERING 5Hrs

Add Worksheets – Paged Workbook – Sorting – Filtering Conditions - Filtering Measures - Grouping – Sets.

UNIT- V CHARTS 5 Hrs

Histograms - All types of Charts - Tree maps- Pareto Charts-Waterfall Charts-Bump Charts-Funnel Charts-Bollinger Bands.

Lab Exercise

1. Data Visualization with Tableau - Tableau, Installation.
2. Basic Visualization Design - Exporting Data, Connecting Sheets, Loading into Tableau visualization engine.
3. Visualizations Deep Dive - to make Advance Charts and Graphs (Circle Plots, Side by Side Bars, Dual Charts, Area Charts, Tree Maps).
4. Data Organization - Calculated Metrics, Sorting, Filtering, Totals and Sub Totals, Various Aggregated Measures, Percentages.
5. Data Organization - Date and time functions, String Functions and logical functions.
6. Playing with Time Dimension - Table Calculations, Moving Averages, Running totals, Window Averages.
7. Incremental Loading and Blending - Custom SQL Queries, Creating Incremental Loads, Creating File Extractions.
8. Macros in tableau – Parameters, Global Parameters.
9. Sharing Insights with Enterprise Dashboards - Creating Dashboards.

Text Book

- Joshua N. Milligan, " *Learning Tableau* ", Packt Publishing, 2015

e-Resource

- <https://www.tutorialspoint.com/tableau/>

UCSE207 PYTHON PROGRAMMING**Semester : II****Category : NON MAJOR ELECTIVE****Class & Major : I UG****Credit : 2****Hours/Week : 4****Total Hours : 52****Objectives****To enable the students**

- Implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.

Lab Exercise

1. Strings and Lists

- To calculate the length of a string
- To get the largest number from a list
- To remove duplicates from a list

2. Dictionary and Tuple

- To sort (ascending and descending) a dictionary by value
- To print a dictionary line by line
- To create a tuple with different data types

3. Sets

- To create a intersection ,union, and difference of sets

4. Array

- To append a new item to the end of the array.
- To remove the first occurrence of a specified element from an array

5. Conditional Statements

- To get the Fibonacci series between 0 to 50.
- To accepts a string and calculate the number of digits and letters.

6. Functions

- To calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument
- To reverse the digits of an integer

- To add two binary numbers
7. Data structure
 - To create an Enum object and display a member name and value
 - To compare two unordered lists (not sets).
 - To push three items into the heap and print the items from the heap.
 8. Searching and Sorting
 - Binary search
 - Insertion sort

UCSE208 R PROGRAMMING

Semester	: II	Credit	: 2
Category	: NON MAJOR ELECTIVE	Hours/Week	: 4
Class & Major	: I UG	Total Hours	: 52

Objectives

To enable the students

- Understand the different data types in R
- Use of vectorized calculations and control statements
- Write user-defined R functions and Loop constructs in R

Lab Exercise

1. Vectors and Matrices
2. Lists
3. Factors
4. Data frame
5. Array
6. Time series
7. Storing data as Textual and Binary Format
8. Reading and Writing data in Files
9. Functions
10. Control Structures
11. Debugging
12. Simulations
- 13.

UCSE209 ARDUINO PROGRAMMING

Semester : II
Category : NON MAJOR ELECTIVE
Class & Major : I UG

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

Objectives

To enable the students

- Understand the basic of Arduino Programming
- Develop a basic program in Arduino
- Gain Knowledge in Arduino Software

Lab Exercise

1. Structure and Flow
2. Variables
3. Operators - Arithmetic Operators, Relational Operators, Logical Operators, Conditional Operator, and Increment Operator and Commenting
4. Decision Statement - if Statement , if-else, and if-else-if
5. Switch and Break
6. Looping - For Loop and While Loop
7. Functions – Calling Function and Returning a Value from a Function
8. Arrays
9. Strings
10. Serial Input

e-Resource

- <https://startingelectronics.org/software/arduino/learn-to-program-course/>

III and IV Evaluation Components of CIA

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
I	III	Core I	UCAM106/ UCAM107	Programming in C	Assignment	Problem Solving
	III	Core II	UCSM107 / UCAM108	Fundamental of Computer Science	Number Conversion	Assignment
			UCSM108 / UCAM109	Advanced Computer Science	Assignment	Assignment
	III	Core Practical I	UCSR109 / UCAR105	Programming in C- Practical	DPA	Viva-voce

II	III	Core III	UCSM206	Data Structures	Assignment	Problem Solving
	III	Core Practical II	UCSR206 / UCAR204	Data Structures - Practical	DPA	Viva-voce

ALLIED COURSES OFFERED TO OTHER DEPARTMENT

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
I	III	Allied	UCSA104	C Programming	Assignment	Problem Solving
	III	Allied Practical	UCSR110	C Programming Lab	DPA	Viva-voce
II	III	Allied	UCSA204	Object Oriented Programming	Assignment	Problem Solving
	III	Allied Practical	UCSR207	Object Oriented Programming – Lab	DPA	Viva-voce

NON-MAJOR ELECTIVES

Semester	Part	Category	Course Code	Course Title	Component III	Component IV
II	IV	Non Major Elective	UCSE206	Tableau Programming	Assignment	Problem Solving
			UCSE207	Python Programming	DPA	Viva-voce
			UCSE208	R Programming	DPA	Viva-voce
			UCSE209	Arduino Programming	DPA	Viva-voce

COURSE PROFILE M.Sc. (Computer Science)

PSO1: Demonstration of the knowledge of advanced programming skills and distributed environmental need for sustainable development.

PSO2: Ability to design and develop hardware and software in emerging technology environments.

PSO3: Ability to solve problems using the techniques of data analytics like pattern recognition and knowledge discovery.

PSO4 : Ability to work out effective and efficient real time solutions using acquired knowledge in various domains.

Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credit	
					Min	Max
I	Core I	PCSM111/ PCSM403	Internet of Things	5	4	4
	Core II	PCSM112	Object Oriented Software Engineering	4	4	4
	Core III	PCSM113/ PCAM314	Data Mining	5	4	4
	Core IV	PCSM114/ PCSM210	Design and Analysis of Algorithm	4	3	3
	Core V	PCSM115	Virtual Reality	4	4	4
	Core VI	PCSR106/ PCAR405	UML - Practical	3	2	2
	Core VII	PCSR107/ PCAR306	Data Mining using WekaTool - Practical	4	3	3
			Library	1	-	-
Total				30	24	24
II	Core VIII	PCSM212	Multimedia and its Applications	4	3	3
	Core IX	PCSM211	Software Testing	4	3	3
	Core X	PCSM213/ PCSM309	TCP / IP Networks	4	3	3
	Core XI	PCSM214	Biometrics	4	4	4
	Core XII	PCSR206/ PCSR304	Networking – Practical	4	3	3
	Core XIII	PCSR207	Biometrics Using Matlab- Practical	4	3	3
	Non Major Elective	PALE201/ PALE301		5	4	4
	Service Learning	PCSX201/ PCAX201		-	1	1
			Library	1	-	-
Total				30	24	24
III	Core XIV	PCSM311	Cloud Computing	4	4	4
	Core XV	PCSM315	Big Data Analytics	5	4	4
	Core XVI	PCSM313	Artificial Intelligence and Robotics	5	4	3
	Core XVII	PCSM314	Cyber Security	4	4	4
	Core XVIII	PCSI301	Fuzzy Set and Systems	5	4	4

	Core XIX	PCSR306	Big Data Analytics - Practical	4	3	3
	Core XXI	PCSR302	Project	2	2	2
			Library	1	-	-
Total				30	25	25
IV	Core XXII	PCSM404	Digital Image Processing	5	4	4
	Core XXIII	PCSM406/ PCSM208	Research Methodology	4	3	3
	Core XIV	PCSP402	Project	20	10	10
			Library	1	-	-
Total				30	17	17
Grand Total				120	90	90

**COURSES OFFERED TO OTHER DEPARTMENTS
(Major and Major Elective)**

Course	Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credit
M.Sc Tamil	IV	Major Elective	PTAM406	Kaninipayanpattiyal	5	3
M.Sc Bio Informat ics	I	Core III	PBIM103	Introduction to Computer Programming	6	4
	I	Core Practical I	PBIR102	Introduction to Computer Programming- Practical	6	4
	II	Core VI	PBIM203	Computer Programming in Perl and CGI	5	4
	II	Core Practical II	PBIR201	Computer Programming in Perl and CGI- Practical	4	2
	IV	Core XII	PBIM401	Database Management Systems	5	5

NON-MAJOR ELECTIVE

Semester	Category	Course Code	Course Title	Contact Hrs/week	Credit
I	Non Major Elective	PCSE205	Programming in J2EE	3T+2P	4
		PCSE206	Mobile Computing Lab	5P	4

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course Code	Course Title	Hrs/week	Credit	
					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	Silverlight Applications	2	-	2
IV	Self Study Paper	PCSS402/PCAS602	Extreme Programming	2	-	2

PCSM111/PCSM403 INTERNET OF THINGS

Semester	: I	Credits	: 4
Category	: Core I	Hours/Week	: 5
Class & Major	: I M. Sc Computer Science	Total Hours	: 65

Objectives:

To enable the students

- Understand the basic issues- policy and challenges in the Internet.
- Examine the components and the protocols in Internet.
- Build a small low cost embedded system with the Internet.

UNIT - I INTRODUCTION

12 Hrs

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy. Components in internet of things: Control Units – Sensors – Communication Modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication.

UNIT - II PROGRAMMING THE MICROCONTROLLER FOR IOT

13 Hrs

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors- Communication: Connecting microcontroller with mobile devices – communication throughBluetooth and USB – connection with the internet using wifi / Ethernet.

UNIT - III RESOURCE MANAGEMENT IN THE INTERNET OF THINGS

14 Hrs

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – DataSynchronization- Types of Network Architectures - Fundamental Concepts of Agility andAutonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements forSatisfying the New Demands in Production.

UNIT - IV BUSINESS MODELS FOR THE INTERNET OF THINGS 13 Hrs

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as aBasis for a DiY Service Creation Framework - Device Integration - Middleware TechnologiesNeeded for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation-Ontology- The Internet of Things in Context of EURIDICE - Business Impact

UNIT - V FROM THE INTERNET OF THINGS TO THE WEB OF THINGS 13 Hrs

Resource-oriented Architecture and Best Practices- Designing REST ful Smart Things - Web- enabling Constrained Devices - The Future Web of Things - Set up cloud environment – send datafrom microcontroller to cloud – Case studies – Open Source e-Health sensor platform – Be CloseElderly monitoring – Other recent projects.

Text Books

- CharalamposDoukas- *Building Internet of Things with the Arduino*- Create space- April 2002.
- Dieter Uckelmann et.al- *Architecting the Internet of Things*- Springer- 2011.

References Book

- Luigi Atzor et.al- *The Internet of Things: A survey*- Journal on Networks- ElsevierPublications- October - 2010.

e-Resources

- <http://postscapes.com/>
- <http://www.theinternetofthings.eu/what-is-the-internet-of-things>

PCSM112 OBJECT ORIENTED SOFTWARE ENGINEERING

Semester	: I	Credits	: 4
Category	: Core II	Hours/Week	: 4
Class &Major	: I M. Sc Computer Science	Total Hours	: 52

Objectives:

To enable the students

- Learn about software prototyping- analysis and design
- Learn the various OO Design models and Testing Objects
- Case studies to apply the principles

UNIT- I INTRODUCTION**9 Hrs**

Software Engineering Paradigms - Software Development Process Models - Project and Process - Project management – Process and Project metrics - Object Oriented Concepts and Principles.

UNIT- II PLANNING AND SCHEDULING**10 Hrs**

Software prototyping - Software project planning – Scope – Resources - Software Estimation - Empirical Estimation Models-Planning-Risk Management - Software Project Scheduling – Object Oriented Estimation and Scheduling.

UNIT- III ANALYSIS AND DESIGN**14 Hrs**

Analysis Modeling - Data Modeling - Functional Modeling and Information Flow- Behavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis- Object Oriented Analysis process - Object Relationship Model - Object Behavior Model. Design Concepts and Principles - Design Process - Design Concepts - Modular Design – Design Effective Modularity - Introduction to Software Architecture - Data Design – Transform Mapping – Transaction Mapping – OOD - Design System design process- Object design process -Design Patterns.

UNIT- IV IMPLEMENTATION AND TESTING**10 Hrs**

Top-Down - Bottom-Up - Object Oriented Product Implementation and Integration. Software Testing methods-White Box- Basis Path-Control Structure –Black Box- Unit Testing- Integration Testing-Validation and System Testing. Testing OOA and OOD models- Object Oriented Testing Strategies.

UNIT- V MAINTENANCE**9 Hrs**

Maintenance Process-System Documentation-Program Evolution Dynamics- Maintenance Costs- Maintainability Measurement - Case Studies.

Text Books

- Bruegge and Dutoit's." *Object-Oriented Software Engineering Using UML*", *Patterns, and Java – Third Edition*, published by Pearson Education - 2013.
- Ivar Jacobson- "*Object-Oriented Software Engineering*"- Pearson Education- 2009.

Reference Books

- Stephen R. Schach- "*Object-Oriented Classical Software Engineering*"- Mc Graw Hill- 2010.
- Yogesh Singh- "*Object-Oriented Software Engineering*"- 2012.

PCSM113/PCAM314 DATA MINING**Semester : I****Credits : 4****Category : Core III****Hours/weeks : 5****Class & Major: I M.Sc Computer Science****Total Hours : 65****Objectives:****To enable the students**

- Gain knowledge in Data warehouse and Data mining Techniques
- Analyze patterns in Data

- Depth Knowledge in Classification and Clustering algorithms.

UNIT- I DATA WAREHOUSE 12 Hrs

Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries and Tools.

UNIT- II DATA MINING AND DATA PREPROCESSING 13 Hrs

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT- III ASSOCIATION RULE MINING 13 Hrs

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

UNIT- IV CLASSIFICATION AND PREDICTION 14 Hrs

Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT- V CLUSTERING 13 Hrs

Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint Based Cluster Analysis – Outlier Analysis.

Text Books

- Jiawei Han and Micheline Kamber- *“Data Mining Concepts and Techniques”*-Second Edition- Elsevier- Reprinted 2011.
- K.P. Soman- ShyamDiwakar and V. Ajay- *“Insight into Data mining Theory and Practice”*- Easter Economy Edition- Prentice Hall of India- 2006.

Reference Book

- G. K. Gupta- *“Introduction to Data Mining with Case Studies”*- Easter Economy Edition 2012.

PCSM114 /PCSM210 DESIGN AND ANALYSIS OF ALGORITHM

Semester	: I	Credit	: 4
Category	: Core IV	Hours/Week	: 4
Class &Major	: I M.Sc Computer Science	Total Hours	: 52

Objectives:

To enable the students

- Understand the concept of Algorithm.
- Solve problems on Greedy and backtracking
- Analysis the algorithm.

UNIT- I INTRODUCTION

10 Hrs

Introduction – Algorithm – Specification – Performance Analysis – Divide and Conquer – General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick sort.

UNIT- II GREEDY ALGORITHMS

11 Hrs

The Greedy Method – General Method – Knapsack problem – Tree Vertex Splitting Dynamic Programming – General Method – Multistage Graphs – All pairs shortest path – Single – Source Shortest paths – The Traveling Salesperson problem – Flow Shop Scheduling.

UNIT- III TREES AND GRAPHS

10 Hrs

Basic Traversal and Search techniques – Binary Trees – Graphs – Connected Components and Spanning trees – Biconnected Components.

UNIT- IV PROBLEM SOLVING ALGORITHMS

10 Hrs

Backtracking – General Method – 8 Queens Problem – Graph Coloring – Branch and Bound Method – 0/1 Knap sack Problem.

UNIT- V NP HARD AND NP COMPLETE PROBLEM

11 Hrs

Basic Concepts – Cooke’s Theorem – NP Hard Problem – Clique Decision Problem – Job Shop Scheduling – Code Generation with Common Sub Expressions – Approximation Algorithms – Introduction – Absolute Approximations – E-Approximations.

Text Book

- Ellis Horowitz- SartajSahni and Sanguthevar Rajasekaran -*Computer Algorithms*- Galgotia Publications Pvt. Ltd.- 2002.

Reference Books

- Sara Baase and Allen Van Gelde- *Computer Algorithms- Introduction to Design and Analysis*- Third Edition- New Delhi- Pearson education- 2002.
- Aho- Hoproft and Ullman- *The Design and Analysis of Computer Algorithms*- New Delhi- Pearson Education- 2001.
- Basu S.K.- *Design Methods and Analysis of Algorithms*- PHI- 2006.

PCSM115 VIRTUAL REALITY

Semester : I
Category : Core V
Class & Major : I M.Sc Computer Science

Credits : 4
Hours/weeks : 4
Total Hours : 52

Objectives:

To enable the students

- Understand the basic concept and framework of virtual reality.
- Learn the technology for multimodal user interaction and perception in VR- in particular the visual- audio and haptic interface and behavior.
- Manage large scale VR environment in real time

UNIT - I INTRODUCTION 10 Hrs

The three I's of virtual reality - Short History of Early Virtual Reality - Early Commercial - VR Technology commercial VR technology - The five classic components of a VR system.

UNIT - II INPUT DEVICES 10 Hrs

Trackers - Navigation - and Gesture Interfaces: Three-dimensional position trackers: Tracker Performance Parameters - Mechanical Trackers - Magnetic Trackers - Ultrasonic Trackers - Optical Trackers - Hybrid Inertial Trackers - **Navigation and manipulation:** Tracker-Based Navigation/Manipulation Interfaces - Trackballs - Three-Dimensional Probes. **Gesture Interfaces:** The Pinch Glove - The 5DT Data Glove-The DidjiGlove- The CyberGlove.

UNIT -III OUTPUT DEVICES 10 Hrs

Graphics displays: The Human Visual System- Personal Graphics Displays-Large-Volume Displays - **Sound displays:** The Human Auditory System-The Convolvotron-Speaker-Based Three-Dimensional Sound - **Haptic feedback:** The Human Haptic System-Tactile Feedback Interfaces-Force Feedback Interfaces.

UNIT- IV MODELING AND HUMAN FACTORS 11 Hrs

Geometric Modeling: Virtual Object Shape-Virtual Object Appearance - **Kinematics Modeling:** Homogeneous Transformation Matrices-Object Position-Transformation Invariants-Object Hierarchies-Viewing the Three-Dimensional World. **Physical Modeling:** Collision Detection- Surface Deformation-Force computation- Force Smoothing and Mapping- Haptic Texturing. **Behavior Modeling:** Model Management-Level-d-Detail-Management-Cell-Management.

UNIT -V APPLICATIONS 11 Hrs

Medical applications of VR: Virtual Anatomy- Triage and Diagnostics- Surgery- **Military VR Applications:** Army Use of VR- VR Applications in the Navy- Air Force Use of VR - **Applications of VR in Robotics:** Robot Programming-Robot Teleoperation.

Text Books

- Virtual Reality Technology - Second Edition - Gregory C. Burdea and Philippe Coiffet - John Wiley and Sons - Inc. – 2003.
- Killer Game Programming in Java - Andrew Davison - O'Reilly-SPD - 2005.

Reference Books

- Understanding Virtual Reality - interface - Application and Design - William R.Sherman - Alan Craig - Elsevier(Morgan Kaufmann) 2018.
- 3D Modeling and surfacing - Bill Fleming - Elsevier(Morgan Kauffman).
- 3D Game Engine Design - David H.Eberly - Elsevier.
- Virtual Reality Systems - John Vince - Pearson Education.

PCSR106/PCAR405 UML PRACTICAL

Semester	: I	Credits	: 2
Category	: Core Practical I	Hours/Week	: 4
Class & Major	: I M.Sc Computer Science	Total Hours	: 52

Objectives:

To enable the students

- Acquire practical skills on various tools in UML Language.
- Analyze and test the project using UML diagrams.
- Design the project and provide solution to the applications.

Prepare the following documents for two or three of the experiments listed below and develop the software engineering methodology.

1. Program Analysis and Project Planning.

Thorough study of the problem – Identify project scope – Objectives –Infrastructure.

2. Software requirement Analysis

Describe the individual Phases / Modules of the project – Identify Deliverables.

3. Data Modeling

Use work products – Data dictionary – Use diagrams and activity Diagrams build and test class diagrams – Sequence diagrams and add Interface to class diagrams.

4. Software Developments and Debugging

5. Software Testing

Prepare test plan – perform validation testing – Coverage analysis – Memory leaks – develop test case hierarchy – Site check and Site Monitor.

Suggested List of Applications

1. Student Marks Analyzing System
2. Quiz System
3. Online Ticket Reservation System

4. Payroll System
5. Course Registration System
6. Online Shopping
7. ATM Systems
8. Stock Maintenance system
9. Library Management System
10. Remote Monitoring System

PCSR107/ PCAR306 DATA MINING USING WEKATOOL - PRACTICAL

Semester : I
Category : Core Practical II
Class & Major : I M.Sc Computer Science

Credits : 3
Hours/Week : 4
Total/Hours : 52

Objectives:

To enable the students

- Understand the concepts in Data mining.
- Apply programming skills in Weka tool.
- Analyze the dataset.

Lab Exercise

Create a Dataset with ‘n’ number of tuples for the following

1. Student Details
2. Super Market Details
3. Library Details
4. Employee Details
5. Recruitment Details
6. Patient Laboratory Details
7. Social Networking Reviews Details

To implement the Dataset in WekaTool

- 1. Preprocessing on Dataset**
- 2. Classification Rule Process of Dataset**
 - a. J48 Algorithm
 - b. ID3 Algorithm
 - c. Naïve Bayes Algorithm
- 3. Clustering Rule Process of Dataset**

- a. Simple k-means
- 4. Association Rule Process on Dataset**
 - a. APriori Algorithm
 - b. FPgrowth Algorithm
- 5. Data Visualiazation**

PCSM212 MULTIMEDIA AND ITS APPLICATIONS

Semester : II	Credits : 3
Category : Core VI	Hours/Week : 4
Class & Major : I M.Sc Computer Science	Total/Hours : 52

Objectives:

To enable the students

- Analyze and compare various compressions - multimedia file formats and storage media.
- Understand basics of front end design as well as composition strategies for digital texts and environments
- Study to create and critique digital text and its central role in human – computer interactions.

UNIT- I MULTIMEDIA AN OVERVIEW 7 Hrs

Introduction-Characteristic of Multimedia Presentation-Hardware and Software Requirements-Uses of Multimedia-Analog and Digital Representation-Digitization-Text-Image-Graphics-Audio-Video.

UNIT- II MULTIMEDIA ANIMATION AND COMPRESSION 12 Hrs

Use of Animation-Traditional Animation-principal of animation-computer based animation-3D Animation-Rendering-Animation file format-Animation Software-Lossless compression techniques-Lossy compression techniques-Image - Audio - Video compression techniques-MPEG standard overview-Fractal compression.

UNIT- III MULTIMEDIA DATABASE AND DOCUMENT 12 Hrs

CBSR-Designing a basic multimedia Database-Image color - Texture - Shape - Audio - Video Feature-Classification of Data-Artificial neural network-Semantic in multimedia Data-Document and Document architecture-Hypermedia concept-Hypermedia Design-Digital library-Multimedia application development-Virtual Reality.

UNIT- IV ACTION SCRIPT IN FLASH AND FLEX 12 Hrs

Programming Concepts – Variables - Data types - conditionals - loops - arrays - functions - Custom objects - Properties - Methods and Events – Display List - Timeline Control.- Setting up the environment –Using Design mode and Source mode –Adding Interactivity –Using Data Binding –Layout –Creating Rich Forms.

UNIT -VADVANCE CONCEPTS IN ACTION SCRIPT USING FLASH BUILDER

9 Hrs

OOP –Motion –Drawing with Vectors and Pixels –Text –Sound and Video – Understanding XML .

Text Books

- Ranjan Parekh - “Principles of Multimedia “ - Publisher: McGraw Hill Education; 2 edition (1 July 2017)
- Michael Labriola - “Breaking out of Web Browser With Adobe AIR” - Prentice Hall - Inc. - 2011.
- Joseph Lott - Kathryn Rotondo - Sam Ahn and Ashley Atkins - “Adobe AIR in Action” - Manning Publications Co - 2011

Reference Books

- Rich Shupe and Zevan Rosser - “Learning ActionScript 3.0: A Beginner’s Guide” - Adobe Developer Library.
- Chafic Kazoun and Joey Lott - “Programming Flex 3” - Adobe Developer Library.

e-Reference

- <http://www.niecdelhi.ac.in/uploads/Notes/btech/6sem/cse/multimedia.pdf>

PCSM211 SOFTWARE TESTING

Semester : II

Credit : 4

Category : Core VIII

Hours/Week : 4

Class &Major : I M.Sc Computer Science

Total Hours : 52

Objectives

To enable the students

- Acquire the knowledge in software Testing.
- Gain knowledge in Quality assurance and Control.
- Analyze the quality of the project.

UNIT- I SOFTWARE TESTING TECHNIQUES

8 Hrs

Software Testing Fundamentals- Psychology of testing - Testing economics- White box testing techniques- Black box testing techniques -Weyuker's adequacy axioms.

UNIT – II SOFTWARE TESTING STRATEGIES

8 Hrs

SDLC and Testing- Strategic Approach to Software Testing- Unit Testing- Integration Testing- validation Testing- System Testing- The art of debugging- Testing Maturity Models TMM and TMMI.

UNIT – III TESTING OBJECT ORIENTED SOFTWARE

8 Hrs

Challenges - Differences from testing non-OO Software - Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification- Difference between design based and code testing- Interdependency Testing Models in OO software.

UNIT IV QUALITY CONTROL

8 Hrs

Introduction to Quality and Quality Control - Evolution of Quality Control - Quality assurance - Quality circles and Quality improvement teams - Benefits of Quality control- Quality and Reliability - Quality costs - Measuring Quality costs - Total Quality Management- Quality Metric Models - McCall s model- FURPS model and ISO 9126 model.

UNIT V CMM Model

7 Hrs

CMM Model and its stages - Introduction to PCMM- CMMI and Six Sigma concepts. Introduction to ISO 9000- ISO 9000 Part3 for software Quality.

Text Books

- Roger S. Pressman- *Software Engineering. A Practitioners Approach* - Seven Edition- 2012.
- William E.Perry- *Effective Methods for Software Testing (2nd Edition)* - John Wiley and Sons- 2000.
- Robert V.Binder- *Testing Object-Oriented Systems: Models Patterns and Tools* - Addison Wesley- 2000.

Reference Book

- GlenfordJ.Myers- *"The Art of Software Testing "*- John Wiley and Sons- 1997.

PCSM213/PCSM309 TCP/IP NETWORKS

Semester : II

Credit : 4

Category : Core VIII

Hours/Week : 4

Class &Major: I M.Sc Computer Science

Total Hours : 52

Objectives

To enable the students

- Understand the concepts of TCP/IP.
- Examine the process of TCP/IP.
- Implement TCP/IP concepts in network.

UNIT I INTRODUCTION

11 Hrs

Internetworking Concepts and Architectural Model - Classful Internet addresses – CIDR-Subnetting and Supernetting –ARP- RARP- IP – IP Routing –ICMP – Ipv6

UNIT II TCP

11 Hrs

Services – Header – Connection Establishment and Termination- Interactive Data Flow- Bulk Data Flow- Timeout and Retransmission – Persist Timer - Keepalive Timer- Futures and Performance.

UNIT III IP IMPLEMENTATION

10 Hrs

IP Global Software Organization – Routing Table- Routing Algorithms- Fragmentation and Reassembly- Error Processing (ICMP) –Multicast Processing (IGMP).

UNIT IV TCP IMPLEMENTATION - I **10 Hrs**

Data Structure and Input Processing – Transmission Control Blocks- Segment Format-Comparison-Finite State Machine Implementation-Output Processing- Mutual Exclusion-Computing the TCP Data Length.

UNIT V TCP IMPLEMENTATION - II **10 Hrs**

Timers-Events and Messages- Timer Process- Deleting and Inserting Timer Event- Flow Control and Adaptive Retransmission-Congestion Avoidance and Control – Urgent Data Processing and Push Function.

Text Books

- Douglas E.Comer- *Internetworking with TCP/IP Principles- Protocols and Architecture* -Vol.1 and 2 6th editions- Pearson Education Asia- 2013. (Unit I in Comer Vol. I- Units II- IV and V – Comer Vol. II)
- W.Richard Stevens- *TCP/IP illustrated-* Volume 1- 6th edition- Pearson Education 2011. (Unit II)

Reference Books

- Forouzan- *TCP/IP protocol suite-* 2ndedition- TMH- 2003.
- W.Richard Stevens- *TCP/IP illustrated-* Volume 2- Pearson Education- 2003.

PCSM214 BIOMETRICS

Semester	: II	Credit	: 4
Category	: Core IX	Hours/Week	: 4
Class &Major	: I M.Sc Computer Science	Total Hours	:52

Objectives

To enable the students

- Understand the concepts of Image Processing.
- Examine the process of Biometrics.
- Implement Biometrics concepts in security.

UNIT- I INTRODUCTION **10 Hrs**

Biometric Fundamentals –Biometric Technologies–Biometrics Vs Traditional Techniques – Characteristics of a Good Biometric System – Benefits of Biometrics – Key Biometric Processes: Verification - Identification and Biometric Matching.

UNIT- II FINGERPRINT BIOMETRICS **10 Hrs**

Fingerprint Patterns- Fingerprint Features- Fingerprint Image- width between two Ridges - Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification- Matching Policies.

UNIT- III FACE RECOGNITION

10 Hrs

Detection and Location of Faces: Statistics-Based method- Knowledge-Based method - Feature Extraction and Face Recognition: Gray Value Based Method- Geometry Feature Based Method- Neural Networks Method.

UNIT- IV IRIS BIOMETRICS

11 Hrs

Iris System Architecture- Definitions and Notations - Iris Recognition: Iris Location- Doubly Dimensionless Projection- Iris Code- Comparison - Coordinate System: Head Tilting Problem- Basic Eye Model- Searching Algorithm - Texture Energy Feature.

UNIT- V FUSION IN BIOMETRICS

11 Hrs

Introduction to Multibiometrics - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor Level - Feature Level- Rank Level- Decision Level Fusion - Score Level Fusion.

Text Books

- Anil K Jain - Patrick Flynn - Arun A Ross - “*Handbook of Biometrics*” - Springer - 2008
- David D. Zhang- “*Automated Biometrics: Technologies and Systems*”- Kluwer Academic Publishers- New Delhi- 2000.
- Rafael C.Gonzalez- Richard E.Woods- Steven L.Eddins- “*Digital Image Processing using MATLAB*”- 2e Pearson Education- New Delhi- 2011
- Arun A. Ross -KarthikNandakumar- A.K.Jain- “*Handbook of Multibiometrics*”- Springer- New Delhi- 2011.

e- Resources

- <http://www.mlmu.cz/wp-content/uploads/2014/09/Iris-MLMU.pdf>
- https://webcache.googleusercontent.com/search?q=cache:HppWfW4ovnkJ:https://www.springer.com/cda/content/document/cda_downloaddocument/9780387222967-c2.pdf%3FSGWID%3D0-0-45-321290-p52104448+&cd=3&hl=en&ct=clnk&gl=in

PCSR206/PCSR304 Networking - PRACTICAL

Semester : II
Category : Core Practical III
Class &Major: I M.Sc Computer Science

Credits : 3
Hours/Week : 4
Total Hours : 52

Objectives

To enable the students

- Understand concepts in Network.
- Apply programming skills in network.
- Develop application in network.

Lab Exercise

1. Implementation of ECHO server using Socket Programming
2. Programs using UDP Sockets (like simple DNS)

3. Programs using TCP (like packet capturing and filtering)
4. Programs using RPC
5. Implementation of RMI
6. Simulation of sliding window protocol
7. Implementation of ARP
8. Implementation of RARP
9. Network Simulator
 - a. Study of network simulator –NS2
 - b. Network simulator GloMoSim
10. Simulation of Dynamic Routing Protocol

PCSR207 BIOMETRIC USING MATLAB - PRACTICAL

Semester	: II	Credits	: 3
Category	: Core Practical IV	Hours/Week	: 4
Class & Major	: I M.Sc Computer Science	Total Hours	: 52

Objectives

To enable the students

- Understand concepts in Biometric.
- Apply programming skills in Biometric Image Processing.
- Develop application using Matlab

Lab Exercise

1. Image Enhancement
2. Image Segmentation
3. Image Acquisition - Fingerprint
4. Feature Extraction - Fingerprint
5. Image Acquisition - Face
6. Feature Extraction - Face
7. Image Acquisition - Iris
8. Feature Extraction - Iris

NON-MAJOR ELECTIVE

PCSE205 PROGRAMMING IN J2EE

Semester : II

Category : NON MAJOR ELECTIVE

Class &Major : I PG

Credits : 4

Hours/Week : 3T+2P

Total Hours : 39T+26 P

Objectives

To Enable the Students

- Understand the fundamental concepts of the J2EE Technologies
- Communication of client and server in the programming paradigm - Component and Framework model.
- Provide experience in developing distributed enterprise applications using J2EE.

UNIT- I INTRODUCTION

8 Hrs

Introducing J2EE basics: Need for enterprise programming– J2EE advantages – Enterprise architecture types – J2EE Multi-Tier Architecture – Architecture of J2EE.

Introducing J2EE components: J2EE containers – Types of J2EE technologies

UNIT -II DATABASES

8 Hrs

JDBC objects –concept of JDBC – JDBC driver types – JDBC packages –overview of JDBC process-Database connection-statement objects - Resultset.

UNIT -III PRESENTATION SERVICES

7 Hrs

Java server pages: Introduction- JSP tags – variables and objects – methods – control statements – loops – tomcat -cookies – session objects.

UNIT- IV SERVLETS

8 Hrs

Java servlets: simple java servlet – anatomy of a java servlet – deployment descriptor – session tracking with servlets – cookies.

UNIT -V STRUTS

8 Hrs

Struts Framework: Introduction – Building a simple struts – Model layers –View layer – controller layer – Validator – Tiles –Declarative Exception Handling –Struts Modules.

Lab Exercise

1. Creating tables as per specification.

- Creating a transaction referencing any number of local or remote tables.
- Extracting only the necessary data from remote tables - process that data and send the results to the local site for final processing.
- Updating records in a table based on a query.
- Adding a new record to a table.
- Calculating the total number of records in a table as per query.

- Listing records based on a query.
 - Deleting an item based on a query.
2. To Create a java application for manipulating the Student details with database connectivity in MS Access using JDBC objects
 3. A web page for login verification using HTML and Servlets.
 4. A J2EE application that displays the current date and time using JSP.
 5. A web page for calculating mark percentage of a student using HTML and JSP.

Any two web application

6. A web application for College Administration System.
7. A web application for Software Development System.
8. A web application for ATM Banking system.
9. A web application for Library Management system

Text Books:

- “Java server programming (J2EE 1.4) Black Book” - 2007 - Kogent Solutions Inc
- Jim Keogh - **J2EE1.4 Complete Reference** - Tata McGraw–Hill Publishing Company - NewDelhi - 2006.
- James Holmes “The Complete References Struts Second Edition“ Tata McGrawHill Edition-2007.

Reference Books:

- James McGoven - Rahim Adatis & Group- **J2EE 1.4 Bible** - Dreamtech Publishing - 2006 .
- Paul Tremblett - “Instant Enterprise Java Y-Beans” - Tata McGraw Hill Publishing Company - New Delhi - 2001.

PCSE206 MOBILE COMPUTING LAB

Semester	: II	Credits	: 4
Category	: NON MAJOR ELECTIVE	Hours/Week	: 5
Class &Major	: I PG	Total Hours	: 65

Objectives:

To Enable the students

- Understand the concepts mobile technologies
- Develop and deploy effective mobile applications.
- Impart practical training in Mobile Application Development.

Lab Exercise (Any 10):

1. Create an application which deals with the Android Content Providers.
2. Create an application using Android Layouts - Views and Events.

3. Create an application which uses Files - Preferences and Notifications.
4. Create an application to Create - Modify and Query an SQLite Database.
5. Create an application for Querying web services and Parsing response.
6. Create an application which uses the concept of Services and Background Threats.
7. Creating Android Audio Video Application.
8. Create an application which uses Map Activity and points the locations onto the Map Locations.
9. Create an application with One-Time - Repeating Alarms - and Long-Running Background Task as Service.
10. Create an Application for Simple Mobile Game.
11. Develop an application that uses GUI components - Font and Colours.
12. Develop an application that uses Layout Managers and event listeners.
13. Develop a native calculator application.
14. Write an application that draws basic graphical primitives on the screen.
15. Develop an application that makes use of database.
16. Implement an application that implements Multi threading.
17. Develop a native application that uses GPS location information.
18. Implement an application that writes data to the SD card.
19. Implement an application that creates an alert upon receiving a message.
20. Write a mobile application that creates alarm clock.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
	Core I	PCSM111/ PCSM403	Internet of Things	Problem Solving	Seminar
	Core II	PCSM112	Object Oriented Software Engineering	Assignment	Seminar
II	Core III	PCSM113/ PCAM314	Data Mining	Assignment	Seminar
	Core IV	PCSM114/ PCSM210	Design and Analysis of Algorithm	Case Study	Seminar
	Core V	PCSM115	Virtual Reality	Assignment	Seminar
	Core VI	PCSR106/ PCAR405	UML - Practical	DPA	Viva Voce
	Core VII	PCSR107/ PCAR306	Data Mining using WekaTool -Practical	DPA	Viva Voce
	Core VIII	PCSM212	Multimedia and its Applications	Case study	Seminar
	Core IX	PCSM211	Software Testing	Assignment	Seminar
II	Core X	PCSM213/ PCSM309	TCP / IP Networks	Working Model	Seminar
	Core XI	PCSM214	Biometrics	Assignment	Seminar
	Core XII	PCSR206/ PCSM304	Networking – Practical	DPA	Viva Voce
	Core XIII	PCSR207	Biometrics Using Matlab - Practical	DPA	Viva Voce

NON-MAJOR ELECTIVE

Semester	Category	Course Code	Course Title	Component III	Component IV
II	Non Major Electives	PCSE205	Programming in J2EE	Assignment	Problem Solving
		PCSE206	Mobile Computing - Practical	DPA	Viva Voce

COURSE PROFILE M.Phil (Computer Science)

PSO1 : Ability to analyze and apply the latest technologies in the concepts of key areas in computer science.

PSO2 : Critical analysis of problems and thorough evaluation of potential benefits of alternative solution in designing software and/or hardware systems.

PSO3 : Ability to analyze and synthesize computing systems through quantitative and qualitative techniques.

PSO4 : Ability to use knowledge in various domains to identify research gaps and provide solution to new ideas and innovations.

Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credit	
					Min	Max
I	Core Paper I	MCSM108	Research Methodology	6	5	5
	Core Paper II	MCSM109	Advanced Topics in Computer Science	6	5	5
	Core Paper III	MCSM107	Special Area Study	6	5	5
II	Core Paper IV	MCSD201	Dissertation and Viva-voce	30	15	15
Total				48	30	30
<ul style="list-style-type: none"> • Paper presentation (minimum one) and / or publication of articles in journals (minimum one) are mandatory for submission of dissertation. 						

MCSM108 RESEARCH METHODOLOGY

Semester : I
Category : Core I
Class & Major: M.Phil Computer Science

Credit : 5
Hours/Week : 6
Total Hours :78

Objectives

To enable the students

- Understand the basic knowledge and concepts required for research and thesis writing.
- Analyze the Research Design - Sampling and Data analysis.
- Gain Knowledge on research ethics and tools

UNIT- I FOUNDATIONS AND PROBLEM IDENTIFICATION

16 Hrs

Foundations of Research: Meaning - Objectives - Motivation - Utility. Concept of theory - empiricism - deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept - Construct - Definition - Variable. Research Process.

Problem Identification and Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis and Alternative Hypothesis. Hypothesis Testing – Logic and Importance.

Recent Issues in Computer Science: Identification and Biometrics, Telemedicine, Healthcare, Data privacy. Green computing, Cyberspace.

UNIT- II RESEARCH DESIGN

16 Hrs

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept - types and uses - Descriptive Research Designs – concept - types and uses.

Experimental Design: Concept of Independent and Dependent variables.

Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement - causality - generalization - replication. Merging the two approaches.

UNIT- III DATA COLLECTION AND DATA ANALYSIS

16 Hrs

Data Collection: Methods of Data Collection – Collection of primary data – Collection of data through questionnaires – Schedules – Differentiation between questionnaires and schedules – Other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection – Guidelines for constructing questionnaire/Schedule – Guidelines for successful Interviewing – Difference between survey and experiment – Data Collection using Journals

Data Analysis: Data Preparation – Univariate analysis (frequency tables - bar charts - pie charts - percentages) - Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association

UNIT- IV DATA INTERPRETATION

16 Hrs

Interpretation of Data – Meaning of Interpretation - Technique of Interpretation - Precaution in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports - Oral Presentation - Mechanics of Writing a Research Report - Precautions for Writing Research Reports - Conclusions.

UNIT -V RESEARCH ETHICS - IPR - SCHOLARY PUBLISHING AND TOOLS

14 Hrs

Ethics: Ethical issues in research paper.

IPR: Intellectual Property Rights and Patent Law - Commercialization - Copy Right - Royalty - Trade Related aspects of Intellectual Property Rights (TRIPS).

Scholarly Publishing: Layout of a Research Paper - Ethical issues related to publishing - Citation and Acknowledgement - Plagiarism and Self-Plagiarism - Reproducibility and Accountability.

Use of tools / techniques for Research: methods to search required information effectively - Reference Management Software: Zotero/Mendeley

Software for paper formatting: LaTeX

Software Design: - Rational Suite

Software for detection of Plagiarism: Online - EduBirdie - smallseotools

Statistical Data Analysis: SPSS – SAGEMATH LAB

Text Books

- C.R.Kothari - Gaurav Garg - “Research Methodology- Methods and Techniques” - new edition - (New Age International (P) Limited)- 2018.
- Wadehra - B.L. - Law relating to patents - trademarks - copyright designs and geographical indications. Universal Law Publishing - 2004.
- Satarkar - S.V. - Intellectual property rights and Copy right. Ess Ess Publications - 2002.

MCSM109 ADVANCED TOPICS IN COMPUTER SCIENCE

Semester : I

Category : Core II

Class &Major: M.Phil Computer Science

Credit : 5

Hours/Week: 6

Total Hours : 78

Objectives

To enable the students

- Understand the concepts of Cloud Networking
- Implement the Digital Image processing and Data mining.
- Gain deep knowledge on Bigdata analytics and Data Science.

UNIT- I DIGITAL IMAGE PROCESSING

15 Hrs

Introduction – Digital Image representation – Fundamental steps and components in DIP. Digital Image Fundamentals: Elements of Visual Perception - Sensing and acquisition. Sampling and Quantization – Basic relationship between pixels – Intensity Transformations and Spatial Filtering: Intensity Transformations – Basic Intensity Transformation Functions – Histogram Processing – Fundamentals of Spatial Filtering – Filtering in the Frequency Domain.

Self Learning Practice: SAGEMATH LAB

UNIT- II DATA MINING

15 Hrs

Introduction - Data Mining and Data Preprocessing – Mining Frequent Patterns.

Classification: Statistical-Based Algorithms - Distance-Based Algorithms - Decision Tree-Based Algorithms - Neural Network-Based Algorithms - Rule-Based Algorithms - Combining Techniques.

Clustering: Similarity and Distance Measures - Hierarchical Algorithms - Partitional - Algorithms - Clustering Large Databases - Clustering with Categorical Attributes.

Association Rules: Basic Algorithms - Parallel and Distributed Algorithms - Incremental Rules - Advanced Association Rule Techniques - Measuring the Quality of Rules.

Data Mining Trends and Research Frontiers.

Self Learning Practice: WEKA / RapidMiner / DB Miner .

UNIT- III CLOUD NETWORKING

16 Hrs

Introduction to Cloud Networking: Networking Basics - The network stack - Packets and frames - Network equipment - Interconnect - Cloud Data Center - Cloud Networking - Characteristics of Cloud Networking - Ethernet usage - Virtualization - Convergence - Scalability - Software.

Data Center Evolution: Mainframes to the Cloud: The Data Center Evolution - Computer Networks - Ethernet - Enterprise versus Cloud Data Centers - Movement to the Cloud.

Cloud Data Center Networking Topologies: Data Center Network Switch Types - Flat Data Center Networks - Rack Scale Architectures - Network Function Virtualization.

Data Center Networking Standards: Ethernet Data Rate Standards - Virtual Local Area Networks - Data Center Bridging - Improving Network Bandwidth - Remote Direct Memory Access.

Network Virtualization: Multi-tenant Environments - Traditional Network Tunneling Protocols - VXLAN - NVGRE - Tunnel Locations - Load Balancing.

Storage Networks: Advanced Storage Technologies - Storage Communication Protocols - Network Convergence - Software-Defined Storage - Storage in Cloud Data Centers.

Self Learning Practice VMware / Cloud Foundry / Open Stack.Globus Toolkit / Eucalyptus / Open Nebula.

UNIT- IV BIGDATA ANALYTICS with R Programming 16 Hrs

Big Data Processing Architectures - Big Data Technologies - Data Driven Architecture - Information Management and Lifecycle - Big Data Analytics - Visualization and Data Scientist - Implementing The "Big Data" Data. Writing Hadoop Map Reduce Programs - Integrating R and Hadoop - Learning Data Analytics with R and Hadoop - Understanding Big Data Analysis with Machine Learning - The Evolution of Analytic Scalability - The Evolution of Analytic Processes.

R: R for Business Analytics - R Interfaces - Manipulating Data - Exploring Data - Building Regression Models - Forecasting and Time Series Models..

Self Learning Practice:VMWare / Hortonsandbox / R Programming

UNIT -V DATA SCIENCE 16 Hrs

Introduction – Data Science Process - Three Machine Learning Algorithms: Linear Regression - K-Nearest Neighbors - k-means. Feature Generation and Feature Selection - Mining Social - Network Graphs (Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs) - Data Visualization - Data science and Ethical Issues.

Self Learning Practice One More Machine Learning Algorithm and Usage in Applications

1. Motivating application: Filtering Spam -
2. Why Linear Regression and k-NN are poor choices for Filtering Spam
3. Naive Bayes and why it works for Filtering Spam
4. Data Wrangling: APIs and other tools for scrapping the Web

For Term Paper Writing:

* **Self Learning Practice** – One Problem is given to the scholar they have to solve it in any one of the tool.

Text Books

- Anil K Jain - “*Fundamentals of Digital Image Processing*” - 2nd Edition - Prentice Hall of India Private Limited - NewDelhi - 2011.
- Jiawei Han- Micheline Kamber- Jian Pei- - "*Data Mining: Concepts and Techniques*"-Third Edition- Elsevier- 2011

- Gary Lee - “*Cloud Networking - Understanding Cloud-based Data Center Networks*” - Elsevier - 2014
- Boris lublinsky- Kevin t. Smith- Alexey Yakubovich- “*Professional Hadoop Solutions*”- Wiley- ISBN: 9788126551071- 2015.
- Nina Zumel- John Mount- “*Practical Data Science with R*”- Manning Publications- 2014.

e_Resources

- http://www.johndcook.com/R_language_for_programmers.html
- Big Data Analytics with R and Hadoop by Vignesh Prajapati - 2013.
- Cathy O’Neil and Rachel Schutt. Doing Data Science - Straight Talk From The Frontline. O’Reilly. 2014.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
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