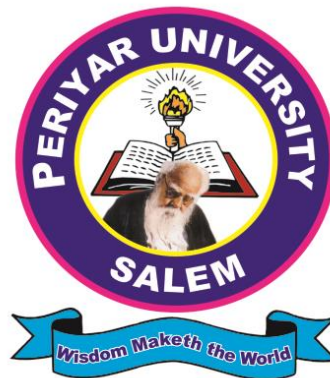# REGULATIONS AND SYLLABUS

(University Department)

(For the candidates admitted from the academic year 2015-2016 onwards)

MASTER OF COMPUTER APPLICATIONS (M.C.A)

(Under Choice Based Credit System)

PERIYAR UNIVERSITY

(Reaccredited with "A" Grade by the NAAC)

SALEM-636 011

TAMILNADU, INDIA

3OBJECTIVES OF THE PROGRAMME

➢ To prepare Post Graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms.

➢ To prepare Post Graduates who will contribute to the society as broadly educated, expressive, ethical and responsible citizens with proven expertise.

➢ To prepare Post Graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.

➢ To prepare Post Graduates who will thrive to pursue life-long learning to fulfill their goals.

1. ELIGIBILITY FOR ADMISSION TO THREE YEAR M.C.A. PROGRAMME

Candidates who have passed in any one of the following or equivalent are eligible to apply:

(i)   Bachelor's Degree (under 10+2+3/4) in any subject with Mathematics at +2 level

OR

(ii)   Bachelor's Degree (under10+2+3/4) in any subject with Mathematics / Statistics as one of the subjects.

2. DURATION OF THE PROGRAMME AND MEDIUM

The programme shall be of three years duration spread over six semesters under choice based credit system. The Maximum duration to complete the course shall be three academic years after normal completion of the programme. The medium of instruction/study is English.

3. DISTRIBUTION OF CREDITS

The **minimum** credit requirement for full time three year Master of Computer Applications programme shall be 138 credits. The break-up of credits is as follows:

        Core Courses   :   112
        Elective Courses   :   18
        Supportive Courses :   08

4. COURSE OF STUDY

The course of study for the degree Master of Computer Applications shall be with internal assessment according to the syllabus prescribed from time to time.

Total Marks	:	4600	
For each theory course	:	100 Marks (I.A: 25 + ESE: 75)	
For each practical course	:	100 Marks (I.A: 40 + ESE: 60)	
Industrial training	:	100 Marks (IA: 40 + ESE: 60)	

(Joint viva-voice by internal and external examiners)

Dissertation and Viva-voce   :   200 Marks

(I.A: 50 + Evaluation of the report by external 50 +Joint viva by internal and external examiners 100)

5. PROGRAMME STRUCTURE / SCHEME OF EXAMINATIONS

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester-I (Revised in 2015-16)						
Course - 15UPCSC1C01 Digital Principles and Computer Organization	4	4	3	25	75	100
Course - 15UPCSC1C02 Object Oriented Programming in C++	4	4	3	25	75	100
Course - 15UPCSC1C03A Data Structures	4	4	3	25	75	100
Course - 15UPCSC1C04 Front End Tool	4	4	3	25	75	100
Course - 15UPCSC1C05 Problem Solving Techniques using C	4	4	3	25	75	100
Course - 15UPCSC1C06 Object Oriented Programming in C++ - **Lab**	2	4	3	40	60	100
Course – 15UPCSC1C07 Data structures – **Lab**	2	4	3	40	60	100
Course – 15UPCSC1C08 Office Automation – **Lab**	1	2	3	40	60	100

Semester-II				(Revised in 2015-16)		
Course - 15UPCSC1C09 Relational Data Base Management Systems	4	4	3	25	75	100
Course - 15UPCSC1C10 Operating Systems	4	4	3	25	75	100
Course - 15UPCSC1C11 Software Engineering	4	4	3	25	75	100
Course - 15UPCSC1C12 Computer Networks	4	4	3	25	75	100
Supportive – I	4	4	3	25	75	100
Course - 15UPCSC1C13 Operating Systems–**Lab**	2	4	3	40	60	100
Course - 15UPCSC1C14 RDBMS–**Lab**	2	4	3	40	60	100
Course - 15UPCSC1C15 Financial Computing – **Lab**	1	2	3	40	60	100
Semester-III				(Revised in 2016-17)		
Course - 15UPCSC1C16 Discrete Mathematics	4	4	3	25	75	100
Course - 15UPCSC1C17 Java Programming	4	4	3	25	75	100
Course - 15UPCSC1C18 Web Technology	4	4	3	25	75	100
Elective Course – I	3	3	3	25	75	100
Supportive - II	4	4	3	25	75	100
Course - 15UPCSC1C19 Java Programming –**Lab**	2	3	3	40	60	100
Course – 15UPCSC1C20 Web Technology– **Lab**	2	3	3	40	60	100
Course - 15UPCSC1C21 Python Programming–**Lab**	1	2	3	40	60	100
Course - 15UPCSC1C22 Soft Skill Development-**Lab I**	1	2	3	100	-	100

Semester-IV				(Revised in 2016-17)		
Course - 15UPCSC1C23 Data Mining Techniques	4	4	3	25	75	100
Course - 15UPCSC1C24 Dot Net Programming	4	4	3	25	75	100
Course - 15UPCSC1C25 Network Management	4	4	3	25	75	100
Elective Course – II	3	3	3	25	75	100
Elective Course – III	3	3	3	25	75	100
Course - 15UPCSC1C26 Dot Net - **Lab**	2	3	3	40	60	100
Course - 15UPCSC1C27 Data Mining - **Lab**	2	3	3	40	60	100
Course - 15UPCSC1C28 Mobile Application Programming **Lab**	1	2	3	40	60	100
Course - 15UPCSC1C29 Soft Skill Development-**Lab II**	1	2	3	100	-	100
Course - 15UPCSC1C30 Industrial Training	2	-	-	40	60	100
Human Rights		2	3	25	75	100
Semester-V				**(Revised in 2017-18)**		
Course-15UPCSC1C31 Big Data Analytics	4	4	3	25	75	100
Course – 15UPCSC1C32 Cloud Computing	4	4	3	25	75	100
Elective Course –IV	3	3	3	25	75	100
Elective Course –V	3	3	3	25	75	100
Elective Course – VI	3	3	3	25	75	100
Course-15UPCSC1C33 Big Data Analytics - **Lab**	2	4	3	40	60	100

Course-15UPCSC1C34 Cloud Computing **- Lab**	2	4	3	40	60	100
Course-15UPCSC1C35 Mini Project	2	2	3	40	60	100
Semester-VI **(Revised in 2017-18)**						
Course-15UPCSC1C36 Dissertation and Viva-Voce	14	-	-	50	50 100*	200

Total no. of Credits
 	
         Core
         Elective
         Supportive
	112
	18
	8					

Grand Total	138					
Total Marks						4600

*Joint via-voce: **Internal Examiner**   :   **50 Marks**
                    External Examiner   :   **50 Marks**
                    External Evaluation   :   **50 Marks**

6.1 List of Electives:

Elective Course - I
Course 15UPCSC1E01   -   Microprocessors
Course 15UPCSC1E02   -   Parallel Processing
Course 15UPCSC1E03   -   System Software
Course 15UPCSC1E04   -   Theory of Computation

Elective Course - II
Course 15UPCSC1E05   -   Object Oriented Analysis and Design
Course 15UPCSC1E06   -   Design and Analysis of Algorithms
Course 15UPCSC1E07   -   Embedded Computing
Course 15UPCSC1E08   -   Distributed Computing

Elective Course - III
Course 15UPCSC1E09   -   Numerical Methods
Course 15UPCSC1E10   -   E-Commerce
Course 15UPCSC1E11   -   Information Security
Course 15UPCSC1E12   -   Bioinformatics

Elective Course – IV

Course 15UPCSC1E13	-	Internet of Things
Course 15UPCSC1E14	-	Software Project Management
Course 15UPCSC1E15	-	Network Programming
Course 15UPCSC1E16	-	Network Security and Cryptography

Elective Course – V

Course 15UPCSC1E17	-	Enterprise Resource Planning
Course 15UPCSC1E18	-	Mobile Computing
Course 15UPCSC1E19	-	Artificial Intelligence and Expert Systems
Course 15UPCSC1E20	-	WAP and XML

Elective Course –VI

Course 15UPCSC1E21	-	Soft Computing
Course 15UPCSC1E22	-	Digital Image Processing
Course 15UPCSC1E23	-	Machine Learning Techniques
Course 15UPCSC1E24	-	Functional Programming in Java

IA   – Internal Assessments
ESE– End Semester Examinations

Core Course Code   : 15UPCSC1C   -
Elective Course Code   : 15UPCSC1E   -

6. **EXAMINATIONS**

7.1 THEORY EXAMINATION

7.1.1 Evaluation of Internal Assessment

Test	:	5 Marks (Best one out of Two Tests) :
Model Examination	:	5 Marks
Seminar	:	5 Marks
Assignment	:	5 Marks
Attendance	:	5 Marks

Total	:	25 Marks

There is no Minimum for Internal Assessment

7.1.2 Evaluation of End Semester Examinations

QUESTION PAPER PATTERN

Time Duration: 3 Hours   Max. Marks: 75

PART- A: 15 x 1 = 15
Answer all the questions
Objective type three questions from each unit

PART- B: 5 x 4 = 20
Answer all the questions
Either or type from each unit

PART- C: 5 x 8 = 40
Answer all the questions
Either or type from each unit

7.2 PRACTICAL \ MINI PROJECT EXAMINATION

7.2.1 Evaluation of Internal Assessment

Test 1	:	20 Marks
Test 2	:	20 Marks (Best one out of Two Tests)
Test 3	:	20 Marks

Total	:	40 Marks

No Internal Minimum

7.2.2 Evaluation of End Semester Examinations

QUESTION PAPER PATTERN

Time duration: 3 Hours   Max. Marks: 60

Questions may be taken from the list of practical problems: 60 Marks

Distribution of the Marks

(i) Practical

➢	Record Note Book	10
➢	Problem Understanding	10
➢	Implementation	20
➢	Debugging and Modification	10
➢	For correct output and viva	10

(ii) Industrial Training/Mini project

➢	Internal Assessment	40
➢	Joint Viva-voce	60

(Internal Examiner 30 and External Examiner 30)

(iii) Dissertation

➢	Internal Assessment	50
➢	Report Evaluation by External Examiner	50
➢	Joint Viva-voce	100

(Internal Examiner 50 and External Examiner 50)

8. REGULATIONS FOR DISSERTATION WORK

➢ Students should attach themselves with well reputed Industry/Company/Institutions to do their five months dissertation work.

➢ The students should submit the filled in format of the project proposal to the department for approval during the First week of December.

➢ The review of the dissertation will be carried out periodically.

➢ The student should submit three copies of their dissertation work.

➢ The students may use OHP/Power Point presentation during their dissertation Viva-Voce examinations.

9. PASSING MINIMUM

The candidate shall be declared to have passed in the theory/practical/dissertation examination if the candidate secures:

(i) 50% marks in the ESE and
(ii) 50% in ESE and IA put together

10. CLASSIFICATION OF SUCCESSFUL CANDIDATES

✓ Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the programme at the first appearance.

✓ Candidates who secure not less than 60% of the aggregate marks in the examination shall be declared to have passed the examination in First Class.

✓ All other successful candidates shall be declared to have passed in Second Class.

✓ Candidates who pass all the examinations prescribed for the programme in first instance and within a period of three academic years from the year of admission are only eligible for University Ranking.

11. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2015-16, i.e., for students who are admitted to the first year of the programme during the academic year 2015-16 and thereafter.

12. TRANSITORY PROVISION

Candidates who were admitted to the PG programme of study before 2015-16 shall be permitted to appear for the examinations under those regulations for a period of three years after the completion of the programme i.e., up to and inclusive of the examination of April/May 2018. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

Course-15UPCSC1C01   **4 Credits**

Course Objective:
- **To understand the role of basic number systems, Logic Gates, Flip Flops and data processing circuits.**

- **To prepare number system conversion and simplification problems**

- **This course enables the students to learn with the advanced concept of Central Processing Unit, Input/output Unit and Memory Unit.**

Unit-I
Number Systems: Decimal, Binary, Octal, Hexadecimal-Conversion from one another-Binary Addition, Subtraction, Multiplication and Division. Codes-BCD Weighted -Excess-Gray -Error Detection Codes. Basic Logic Gates-Boolean laws and theorems-Sum of products -product of sums-Karnaugh map simplification methods-don't care conditions.

Unit-II
Data processing circuits-Multiplexers-Demultiplexers-Decoders-Encoders-Arithmetic Building Blocks: Half and Full Adder: Subtractor, adder -TTL circuits-CMOS circuit. Flip-Flops: RS, Clocked RS, D-Edge-Triggered D, JK, Master/slave flip-flop-clocks and timers-counters, Asynchronous counters, Synchronous counters-MOD3, MOD5, Shift counters.

Unit-III
Central Processing Unit: Introduction –General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulation – Program Control Reduced Instruction Set Computer (RISC).

Unit-IV
Input-Output Organization: Peripheral Devices – Input-Output Interface Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access (DMA) – Input-Output Processor (IOP) –Serial Communication.

Unit-V
Memory Organization: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware. Control Unit:- Control Memory- Address Sequencing, Conditional Branching Mapping of Instruction Subroutines – Design of Control Unit , Micro program Sequencer, Problems.

Text Books:

1. Albert Paul Malvino, Donals P.Leach, Goutam Saha, "Digital Principles and Applications", McGraw Hill, Seventh Edition, 2010. Chapters: 2(1,2), 3(1,2,5,6,8), 5, 6(1,2,9), 4 (1to 6), 6(7,8), 7(1,2,4), 8(1,2,4,5), 10(1,3,7), 13(10).

2. M. Morris Mano, "Computer System Architecture", Prentice-Hall India Third Edition, 2005. Chapters 7(1, 2, 4), 8, 11, 12.

Reference Books:

1. Thomas C. Bartee, "Digital Computer Fundamentals", Tata McGraw Hill, 1996.
2. M. Morris Mano, "Digital Logic and Computer Design" Prentice -Hall of India Year

OBJECT ORIENTED PROGRAMMING IN C++

Course-15UPCSC1C02   **4 Credits**

Course Objective:
- **To understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code**

- **To prepare object-oriented design for small/medium scale problems**

- **To Use the generic programming features of C++ including the STL**

Unit-I
History of C and C++ - Typical C++ Development Environment- First Program in C++: Printing a Line of Text- Another C++ Program: Adding Integers-Memory Concepts - Arithmetic -Equality & Relational Operator-Classes, Objects, Member Function & Data members – Defining a class with member function – Defining a Member Function with a Parameter- Data Members, set Member Functions and get Member Functions-Initializing Object with Constructor.

Unit-II
Algorithm & Pseudo code - Control Structure - If Selection- If else double selection statement-While repetition Statement- Assignment, Increment & Decrement Operator-For repetition Statement- Do while repetition statement-Switch Multiple Selection- Break &Continue- Logical Operator-Program Components in C++- Math Library Function-Function Definition with Multiple Parameter-Function Prototypes &Argument Coercion-C++ Standard Library Header Files-Storage Classes - Scope rules- Inline Function-Default Argument-Function Overloading-Function Template.

Unit-III
Arrays-Declaring Arrays- Examples Using arrays-Range Based for Statement - Multidimensional Array- Introduction to Pointer- Pointer Declaration, Initialization -Pointer Operators-Pass-by-Reference with Pointers-Using Const with Pointer- sizeof Operator-Pointer- Pointer Expression and Pointer Arithmetic-Pointer-Based Strings--Class Scope and Accessing Class Members-Access Functions and Utility Functions-Constructors with Default Arguments Destructors -const Objects and const Member Functions -friend Functions and friend Classes- Using the this Pointer -static Class Member.

Unit-IV
Fundamentals of Operator Overloading- Overloading Binary Operator-Overloading Binary Stream Insertion &Extraction -Overloading Unary operator-Overloading the Unary Prefix and Postfix ++ and -- Operators-Conversion between types-Introduction to Inheritance-Base Class & Derived Class-Relationship between Base and Derived Classes-Constructors &

Destructors in Derived Class- Public, Protected & Private Inheritance-Introduction to Polymorphism- Relationship among Objects in Inheritance hierarchy-Abstract class and Pure Virtual Function

Unit-V

Files & Stream-Creating Sequential file- Reading &Updating Sequential file- Creating Random file-Reading & Writing to random access file-Exception Handling Overview-Handling an attempt to divide by Zero-Rethrowing an exception-When to Use Exception Handling -Introduction to template-Class template-Function Template to Manipulate a Class-Overloading Function template.

Text Book:

> P. J. Deitel and H. M. Deitel **"**C++ How to Program**"**, Ninth edition, 2013. (Chapters 1-12, 14, 17 & 18)

Reference Books:

1. BhushanTrivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.

2. S.BLippman, Josee, JoseeLajoie, Barbara, " C++ Premier" 4th Edition, Pearson , 2012.

3. Ray Lischner, "Exploring C++ : The programmer's introduction to C++", Apress, 2010.

DATA STRUCTURES
(2016 – 17 BATCH ONWARDS)

Course 15UPCSC1C03A   **4 Credits**

Course Objective:

- **To explore the components of data structure like Abstract Data types, Trees, Hashing, Sorting and Graph Algorithms for developing program.**

- **Provides ability to analyze a problem and determine the appropriate data structure for the problem.**

Unit –I

Abstract Data Types - Singly linked lists: Insertion and Deletion Operations – Search. Doubly linked list: Adding new nodes– Deleting Nodes- Circular linked list: Inserting nodes-Stacks and Queues. Stacks: Push and Pop operations –Delimiter Matching algorithm - Vector Implementation of Stack – Linked List Implementation of Stack. Queues: Enqueue and de-queue operations - Array Implementation of Queue – Linked List Implementation of Queue

Unit – II

Trees, Binary Trees, Binary Search Trees – Implementing Binary Trees – Searching a Binary Search Tree – Tree Traversal: Breadth First Traversal – Depth First Traversal – Stackless Depth –first Traversal: Threaded Trees. Insertion – Deletion: Deletion by merging –Balancing a Tree : The DSW Algorithm – AVL Trees. Self-Adjusting Trees: Self-Restructuring Tress – Splaying.

Unit – III

Heaps: Heaps as Priority Queues - Organizing Arrays as Heaps. Polish Notation and Expression Trees: Operations on Expression Trees. Graphs :Graph Representation - Graph Traversals shortest path: All-to-All Shortest Path Problem Spanning Trees – Connectivity: Connectivity in Undirected Graphs - Connectivity in Directed Graphs - Topological Sort - Eulerian and Hamiltonian Graphs.

Unit-IV

Elementary Sorting Algorithms: Insertion Sort - Selection Sort - Bubble Sort - Comb Sort. Decision Trees: Decision trees for insertion and bubble sort applied to the array- .Efficient Sorting Algorithms: Shell Sort - Heap Sort – Quicksort – Mergesort - Radix Sort - Counting Sort. Case Study: Adding Polynomials

Unit-V
Hash Functions : Division – Folding - Mid-Square Function – Extraction - Radix Transformation - Universal Hash Functions. Collision Resolution: Open Addressing – Chaining – Bucket Addressing. Deletion - Hash Functions for Extendible Files: Extendible Hashing - Linear Hashing.

Text Book:

1. Adam Drozdek, "Data Structures and Algorithms in C++", Cengage Learning, 4th Edition, 2013. Chapter 1.1 (Chapter 3: 3.1 (3.1.1, 3.1.2, 3.13), 3.2, 3.3),
    (Chapter 4: 4.1, 4.2, 4.3),
    (Chapter 6: 6.1, 6.2, 6.3, 6.4 (6.4.1, 6.4.2, 6.4.3), 6.5, 6.6 (6.6.1, 6.6.2), 6.7 (6.7.1, 6.7.2), 6.8 (6.8.1, 6.8.2), 6.9 (6.9.1, 6.9.2), 6.12 (6.12.1))
    (Chapter 8: 8.1, 8.2, 8.3 (8.3.1), 8.5, 8.6 (8.6.1, 8.6.2), 8.7, 8.10 (8.10.1, 8.10.2)
    (Chapter 9: 9.1 (9.1.1, 9.1.2, 9.1.3, 9.1.4), 9.2, 9.3 (9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6), 9.6)
    (Chapter 10: 10.1 (10.1.1 – 10.1.6), 10.2 (10.2.1 – 10.2.3), 10.3, 10.6 (10.6.1, 10.6.2))

Reference Books:

1. Ellis Horowitz, SartajSahni, Dinesh Mehta, "Fundamental of Data Structures in C++", Second Edition, University Press, 2008.
2. SratajSahni ," Data Structures, Algorithms and Applications in C++", Second Edition, University Press, 2005.

FRONT END TOOL

Course-15UPCSC1C04   **4 Credits**

Course Objective:
- **To introduce computer programming using the Visual BASIC programming language with object-oriented programming principles.**
- **To emphasis on event-driven programming methods, including creating and manipulating objects, classes, and implementation by using Microsoft Visual Studio 2008 and the Microsoft .NET Framework 3.5.**

Unit–I
Introduction: Visual Studio Environment- Visual Basic Project –Visual Basic Code Statements – Run the Project- Finding and Fixing Errors – Project Debugging- Controls- Working with Multiple Controls- Designing your Applications for User Convenience.

Unit-II
User Interface Design: Data : Variables and Constants –Formatting Data for Displaying – Handling Exceptions – Displaying Messages in Message Boxes- List Boxes and Combo Boxes -Decision and Conditions: If Statements – Boolean Expressions- Nested If Statements – Input Validation – Case Structure- Do-Loops- Sharing an Event Procedure- Calling an Event Procedure – Debugging Visual Basic Projects.

Unit–III
Menus – Common Dialog Boxes – Creating Context Menus – Writing General Procedure – Using Multiple Forms – Variable and constants in Multiple Forms- Arrays: Single Dimensional Arrays- For Each/Next Statements – Structures – Multi Dimensional Array.

Unit–IV
OOPS: Classes – Creating new Objects using a Class – Inheritance- Database Applications: Databases – Using ADO. Net and Visual Basics- Creating a Database Application – Binding Individual Data Fields – Selecting Records from the List – Selecting Records using Web Forms

Unit-V
Web Applications: Visual Basic and Web Programming – Creating a Website – Laying out Web Forms- Navigating a Web Forms – Using the Validating Controls- AJAX – Graphics in Windows and Web- Simple Animation- Timer Component- Playing Sounds – Drag and Drop Programming.

Text Book:
Julia Case Bradley, Anita C. Millspaugh, "PROGRAMMING IN VISUAL BASIC 2008".—7th ed., McGraw-Hill, 2009.

Reference Book:
Tim Patrick, "Programming Visual Basic 2008", 1st ed. O'Reilly Media, 2008.

PROBLEM SOLVING TECHNIQUES USING C

Course-15UPCSC1C05   **4 Credits**

Course Objective:
- **To identify methods appropriate for solving problems**
- **To apply problem solving skills when working with real time projects**

Unit-I
Introduction - The Problem-solving Aspect - Top-down Design-implementation of Algorithms- Program Verification - The Efficiency of Algorithms. Fundamental Algorithms - Exchanging the values of Two Variables - Counting - Summation of a set of Numbers - Factorial Computation-Sine function computation - Generation of the Fibonacci sequence - Reversing the Digits of an Integer - Base Conversion Character to Number Conversion.

Unit-II
Finding the square Root of a number - The Smallest Divisor of an Integer - The Greatest Common Divisor of Two Integers - Generating Prime Numbers - Computing the Prime Factors of an Integer - Generation of Pseudo - random Numbers - Raising a Number to a Large Power - Computing the nth Fibonacci Number.

Unit-III
Array Order Reversal-Array Counting or Histogramming - Finding the Maximum Number in a Set - Removal of Duplicates from an Ordered Array - Partitioning an Array – Finding the kth Smallest Element - Longest Monotone Subsequence.

Unit-IV
Overview of C – Constants, Variables, Data types – Operators – Expressions – The Decision Control Structure – The Loop control Structure – The Case Control Structure – Functions and Pointers – Arrays – Pointers and Arrays – Two Dimensional Arrays – Array of Pointers – Three Dimensional Array – Puppetting on Strings – Structures.

Unit-V
File Input / Output – Data Organization – File Operations – File Modes – String (Line) or Record I/O in Files – Text Files and Binary Files – Database Management - Miscellaneous Features – Enumerated Data Type – Typedef – Typecasting – Bit Fields – Pointers to Functions – Functions Returning Pointers – Union of Structures – C Under Windows – DOS and Windows Programming Model.

Text Books:
1. R.G.Dromey, " How to Solve it by Computer ", Pearson Education, India, 2007.
   (Chapters: 1, 2, 3, and 4)
2. Yashavant P. Kanetkar, "Let Us C", Fifth Edition, Sridhara Publication, India, 2008.
   (Chapters: 1, 2, 3, 4, 5, 8, 9, 10, 12, 15, 16, 19)

Reference Books:

1. SeymourLipschutz, "Essentials Computer Mathematics", Schaums" outlines series, Tata McGrawHill Edition, 2004.
2. Kernigan Brian W., and Dennis M. Ritchie, "The C Programming Language", Second Edition, Prentice Hall, 1988.
3. Balagurusamy E, "Programming in ANSI C", Third Edition, Tata McGraw Hill, 2004.

OBJECT ORIENTED PROGRAMMING   IN C++ - LAB

Course-15UPCSC1C06 **2 Credits**

Course Objective:
- **To understand the concepts of OOPS**
- **To develop the programming skills in C++**

Develop program to implement the following:

1. Function Overloading

2. Constructors and Destructors

3. Passing arguments to functions by reference

4. Passing arrays to functions

5. Overloading Unary and Binary Operators using friend and member functions

6. Inheritance – All types

7. Exception Handling

8. Virtual functions

9. Processing Sequential and Random Access files

10. Function and Class templates

DATA STRUCTURES - LAB

Course 15UPCSC1C07   **2 Credits**

Implement the following using C ++ and OOP Concepts

1. Array Implementation of Stack

2. Array implementation of Queue

3. Singly Linked List Implementation

4. Circular Linked list Implementation

5. Polynomial Addition Using Singly Linked List.

6. Tree Traversal

7. Quick sort

8. Merge sort

9. Heap sort

10. Doubly Linked List Implementation

OFFICE AUTOMATION – LAB

Course-15UPCSC1C08   **1 Credit**

Course objective:

- **To develop the documentation skill**
- **To understand the basic data base concepts**
- **To improve the presentation skill**

MS-WORD
1. Create a document with tables and apply various properties.
2. Create a multiple page document using mail merge.

MS – EXCEL
3. Create a table and apply the various formatting properties and generate a chart for the table.
4. Create a table and apply the various mathematical functions.

MS – POWER POINT
5. Create a slide with different layout and background with links.
6. Create a slide with custom animation using access button.

MS – ACCESS
7. Create a database with various tables and assign the relationship between them.
8. Create a form with column and table style.

Case studies
9. Design a newspaper document with diagrams and import the tables and chart from the excel sheet.
10. Create an address book using tables in MS-Access and generate the labels using forms.

SEMESTER - II

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Course 15UPCSC1C09 **4 Credits**

Course Objectives:

- **This course enables the students to learn basic functions, principles with the advanced concept of data base management system**

- **To understand the necessity of data base management system**

- **To develop the skill of data base design**

Unit–I

Introduction to Database Systems: Role and Advantages of DBMS – Types of databases – Limitations of File system – Database systems - Data models: Importance of data models – Data model building blocks – Evolution of data models – Data abstraction models – Relational Database model: Table and their characteristics – Keys – Integrity rules – Relational set operators – Relationships – Codd's rules.

Unit–II

ER modeling: ER model – ER diagram – Database design challenges – Normalization of database tables: Need for Normalization – Normalization process: First normal form – Second normal form – Third normal form - Improving the design – Key considerations – BCNF – Fourth normal form –Denormalization..

Unit–III

SQL: DDL – DML – Virtual tables – Joining database tables – Relational set operators – Join Operators – Sub queries and Correlated queries – SQL functions Database design: Information system – Database life cycle – Database design strategies – Centralized vs. Decentralized design

Unit–IV

Transaction management and concurrency control: Transactions – Concurrency control – Locking methods – Time stamping methods – Optimistic methods – Database recovery management – Database performance tuning concepts – Query processing – Query formulation - DBMS performance tuning.

Unit–V

Distributed database management systems: Evolution – Pros and cons – Distributed processing and databases – Characteristics of DDBMS- DDBMS components – Levels of distribution – Transparency features – Distribution transparency – Transaction transparency

– Performance transparency and Query optimization – Distributed database design – Client server vs. DDBMS - Database connectivity and web development: Database connectivity – Internet databases - Database administration – Need and Role of database in organization – DBA function – DBA role – DBA tools – Data administration strategy.

Text Book:

Peter Rob, Carlos Coronel, "Database Systems – Design, Implementation and Management", 7th Edition, Thomson learning, India Edition, 2007.

Unit-I   : (Chapters: 1.1, 1.2, 1.5, 1.6, 2.1, 2.2. 2.3 - 2.5, 3.1-3.4, 3.6, 3.7, 3.9)
Unit-II : (Chapters: 4.1 - 4.3, 5.1 – 5.4, 5.6, 5.8)
Unit-III : (Chapters: 7.1 – 7.8, 8.1 -8.4, 9.1, 9.3 -9.5)
Unit-IV : (Chapters: 10.1-10.6, 11.1, 11.6, 11.7)
Unit-V : (Chapters: 12.1 -12.12, 14.1 -14.2, 15.1 -15.7)

Reference Books:

1. Ritchie Colin, "Principles of Database Systems and Design" First edition, Cengage Learning India editon, 2011.
2. Coronel carlos, "Database Principles: Fundamentals of Design, Implementation and Management" 10th edition, Cengage Learning India editon, 2013.
3. Ramez Elmasri, Shamkant B Navathe, "Fundamentals of Database Systems – Models, Languages, Design and application programming" 6th edition, Pearson Education, 2013.

OPERATING SYSTEMS

Course-15UPCSC1C10   **4 Credits**

Course Objective:
- **To understand the fundamental principles of operating systems, processes and their communication.**

- **To understand the various operating system components like process management,   Memory management and process synchronization.**

- **To know about file management in Operating Systems.**

- **To understand basic and advanced concepts of Linux.**

Unit-I

Introduction : Computer system organization - Computer system Architecture –Operating system Operating .System Structure: Operating-System Services – User and Operating-System Interface – System Calls – Types of System Calls – System Programs – Operating-System Design and Implementation – Operating-System Structure – Operating-System Debugging – Operating-System Generation – System Boot.

Unit-II

Process Management:– Process Concept – Process Scheduling – Operations on Processes – Interprocess Communication – Process Synchronization: Background – The Critical-Section Problem – Peterson's Solution – Synchronization Hardware– Semaphores – Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Unit-III

Memory Management: Background – Swapping – Contiguous Memory Allocation– Paging – Structure of the Page Table– Segmentation – Virtual Memory: Background – Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing – Memory-Mapped Files – Allocating Kernel Memory.

Unit-IV
Getting started- -Unix architecture- Features of Unix -Locating commands- Internal and External commands - Command Structure - General Purpose Utilities - cal,date,echo,printf,bc,Email basics, passwd, who and uname - File System - pwd,cd,mkdir

and rmdir-Creating and Listing File Directory Commands- Handling Ordinary File Commands-Basic File Attributes Operations and Commands.

Unit-V

The Vi Editor Basic Commands- Process Basics (ps)-System Process- Internal and External Commands-Background Running Jobs-Killing process-Job Control -Shell Commands- umask and find commands-Simple Filters- Essential Shell Programming-Essential System Administration-Advanced Shell Programming.

Text Books:

1. Abraham Silberschalz Peter B Galvin, G.Gagne, "Operating Systems Concepts", 8th Edition, Addision Wesley Publishing Co.,2010 – Chapters(1-10 & 13)
2. Das, Sumitabha, "Unix Concepts And Applications" fourth edition, Tata McGraw-Hillpublishing company, 2006 – Chapters 1-6, 8 to 14 and 21)

Reference Books:

1. Andrew S.Tanenbaum, "Modern Operating Systems", Third Edition, PHI Learning Pvt.Ltd., 2008.
2. William Stallings, "Operating Systems: Internals and Design Principles",Seventh Edition, Prentice Hall, 2011.

SOFTWARE ENGINEERING

Course-15UPCSC1C11   **4 Credits**

Course Objective:
- **To learn about steps in software development lifecycle and various models.**

- **To know about the process models and their types.**

- **To learn about the Design engineering concepts, testing strategies and project management.**

Unit-I
Introduction to Software Engineering – The Evolving Role of Software – Software – Legacy Software Myths – The Software Process: –Software Engineering a layered technology – A Process Framework – Process Patterns – Process Assessment – Process Models:– Prescriptive Models – The Waterfall Models- Incremental Process Models, Evolutionary Process Models- Specialized Process Model.

Unit-II
An Agile View of Process – Agile Process Models - Software Engineering Practice – Communication Practices – Planning Practices – Modeling Practices –Building the Analysis Model: – Requirements Analysis – Analysis Modeling Approaches – Data Modeling Concepts – Object Oriented Analysis – Scenario based Modeling – Flow Oriented Modeling – Class Based Modeling.

Unit-III
Design Engineering: – Design Process and Design Quality – Design Concepts – The Design Model – Creating An Architectural Design – Software Architecture – Data Design - Architectural Styles and Patterns – Architectural design – Mapping Data Flow into a Software Architecture – Performing User Interface Design:– The Golden Rules – User Interface Analysis and Design – Interface analysis – Interface Design Steps - Design.

Unit-IV
Testing Strategies:– A Strategic approach to Software Testing – Validation Testing – System Testing –The Art of Debugging –Testing Tactics:– Black-Box and White-Box Testing – White Box Testing: – Basis Path Testing – Control Structure Testing – Black Box Testing : – Object oriented Testing Methods – Testing Method – Applicable at class level – Interclass – Test Case Design.

Unit-V

Project Management:– Management Spectrum – People – Product – Process – Risk Management – Quality   Management: – Quality Concepts – Software Quality Assurance – Software Reviews – Formal Technical Reviews – Statistical Software Quality Assurance – Software Reliability.

Text Book:

Roger S. Pressman, "Software Engineering a Practitioner's Approach", Sixth Edition, McGraw-Hill Higher Education, 2006.

Reference Books:

1. Ian Somerville, "Software Engineering", Seventh Edition, Pearson Education, 2005.
2. Richard Fairly, "Software Engineering Concepts", TMGH, 2004.
3. Rajib Mall, "Fundamentals of Software Engineering", PHI, Second Edition, 2000.
4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mndrioli, "Fundamentals of   Software Engineering", Second   Edition, PHI/Pearson Education Asia, 2000

COMPUTER NETWORKS

Course 15UPCSC1C12   **4 Credits**

Course Objective:
- Understand the fundamental concepts of Computer network
- Enable to understand the modern network architecture, protocols and applications
- Exposed to learn the emerging technologies and their potential impact.

Unit- I
Introduction – Network Hardware – Network Software – Reference models: OSI Reference model – TCP/IP Reference model – Network Standardization Physical Layer: Transmission media –- Wireless transmission – Communication Satellites – PSTN – Mobile telephone network.

Unit- II
Data Link layer: Design issues – Error Detection and Correction – Elementary Protocol – Sliding Window Protocol – MAC sub layer: Channel Allocation problem – Multiple Access Protocols –Wireless LAN – Bluetooth.

Unit- III
Network Layer: Design Issues – Routing algorithms – Congestion control algorithm - Quality of Service – Internetworking – Network Layer in the Internet

Unit-IV
Transport Layer: Transport Service – Elements of Transport Protocol – Congestion control - Internet Transport Protocols: UDP – TCP.

Unit- V
Application Layer: DNS – Electronic mail – WWW – Streaming Audio and Video – Content delivery

Text Book
1. Andrew S Tanenbaum, and David J Wetherall, "Computer Networks", Fifth Edition, Pearson Education, 2011.

Reference Books:
1. B.A. Forouzan, "Data Communication and Networking", Fourth Edition, McGraw Hill, 2007.
2. B.A. Forouzan and Firouz Mosharraf "Computer Networks – A Top – down approach",   McGraw Hill, 2012.

OPERATING SYSTEMS –LAB

Course-15UPCSC1C13   **2 Credits**

Course Objective:
- **To implement different algorithms in operating systems**
- **To develop skill in shell scripts**
- **To implement file management in operating Systems**
- **To implement algorithms using Linux**

Operating System Concepts

1. Implementation of Round Robin Scheduling algorithm

2. Implementation of FCFS scheduling algorithm

3. Implementation of Shared Memory Client/ Server techniques

4. Implementation of Disk Scheduling algorithms

5. Implementation of Semaphore (Producer _Consumer Process)

Shell Script

1. Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.

2. Write an interactive file handling shell program. Let it offer the user the choice of copying, removing, renaming or linking files. Once the use has made a choice, have the program ask the user for necessary information, such as the file name ,new name and so on.

3. Write a shell script that displays a list of all files in the current directory to which the user has read write and execute permissions.

4. Develop an interactive script that asks for a word and file name and then tells how many times that word occurred in the file.

5. Write a shell script to perform the following string operations.
         i) To extract a sub string from a given string
         ii) To find the length of a given string

RDBMS – LAB

Course-15UPCSC1C14 **2 Credits**

1. Design a calculator.

2. Simple program using menu Design.

3. Simple program using Timer Control.

4. Simple programs with classes and objects

5. Preparation of student mark list

6. Railway Reservation system

7. Bank management system.

8. Hospital management system.

9. Handling Events

10. Creation of Active X controls

11. Simple Animations

Oracle

1. Simple Queries using DDL, DML, base Tables.

2. Simple Queries using DDL, DML base Views.

3. Column Reports Creation.

4. PL/SQL Procedures Creation.

5. Database Triggers Creation.

6. Reports Creation.

7. Built-in Functions Creation.

FINANCIAL COMPUTING - LAB

Course-15UPCSC1C15   **1 Credit**

1. Create a Single Ledger using display and alter commends

2. Create a Multiple Ledger using display and alter commends

3. Create Single group using display and alter commends

4. Create a multiple groups using display and alter commends

5. Create a voucher types like contra, credit & debit notes, purchase, sales, receipt and delivery notes.

6. Create a single stock group.

7. Create a multiple stock groups

8. Create balance sheet for various items

9. Create profit and loss account for various aspects

10. Prepare various types of vouchers like accounting, inventory, and import transaction

SEMESTER-III

DISCRETE MATHEMATICS
(Theorems and Proofs are not expected)

Course-15UPCSC1C16   **4 Credits**

Course Objective:
- **To understand the applications of functions and relations**
- **To understand the basic concepts of mathematical logic and predicate calculus**
- **To understand the concept of method of induction**
- **To develop the skills in solving recurrence relations**

Unit-I
Wellformed formulas – truth table of well formed formula – tautology, contradiction and contingency –equivalence of formulas. Algebra of propositions – Functionality complete sets – Normal forms of well formed formulas- Rules of Inference for propositional calculus – well formed formulas of predicate calculus – Rules of Inference for predicate calculus – predicate formulas involving two or more quantifiers.

Unit-II
Set theory – set identities – relations-Binary relations – properties of binary relations in a set – Equivalence relations and partial orderings – Representation of a relation by a matrix representation of a relation by a digraph - Basics of Counting – Integers and Induction-functions.

Unit-III
Formulation as Recurrence Relations-solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. Permutations-Combinations-Permutations with repetitions-Combinations with repetition-permutations of sets with indistinguishable objects.

Unit-IV
Definition and examples-properties of lattices –lattices as algebraic systems-Sub lattices and lattice Isomorphism-special classes of lattice –distributive lattices and Boolean algebras.

Unit-V
Connected Graphs-Euler Graphs-Hamiltonian circuits and paths – planar graphs – matrix representation of graphs.

Text Book:

N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI Learning Private Limited, New Delhi, 2010.

      Unit-I : (Chapters: 2.1-2.11)
      Unit-II : (Chapters: 1.3-1.7, 4.1-4.2, 5.1-5.5)
      Unit-III : (Chapters: 6.1-6.5, 3.1-3.6)
      Unit-IV : (Chapters: 8.1-8.6)
      Unit-V : (Chapters: 10.1-10.5 and 10.8)

Reference Books:

1. J.P.Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 1997.
2. T. Sengadir, "Discrete Mathematics and Combinatorics", Pearson New Delhi 2009.
3. RakeshDube ,AdeshPandeyRitu Gupta, "Discrete Structures and Automata Theory", Narosa publishing House New Delhi 2007.

JAVA PROGRAMMING

Course-15UPCSC1C17   **4 Credits**

Course Objective:
- **To provide the overview of the object oriented techniques and apply the skills developed in network and database programming using java.**

Unit-I
Java Fundamentals- Data types – Operators – Control Statements- Classes and objects.

Unit-II
Methods and Classes - Inheritance – Packages – Interfaces – Exceptional Handling.

Unit-III
Collections- File and Streams – Networking –Event Handling – AWT: Windows, Controls, Layout Managers and Menus –Swing –JDBC.

Unit-IV
Java Servlets: Design – Life Cycle- cookies – Session tracking- Java Server Pages: Overview –Implicit Objects –Scripting –Standard Actions- Directives.

Unit-V
Remote Method Invocation: Remote Interface – Naming Class – RMI Security Manager Class – RMI Exceptions – Creating RMI Client and Server Classes – IIOP.

Text Books:
1. Herbert Schildt, "The Complete Reference – Java 2", Ninth Edition, 2014.
   Chapters: 1-10, 18, 20, 22, 24-26, 31, 38
2. Deitel&Deitel, "Java How to Program", Pearson Education, Ninth Edition, 2012.
   Chapters: 20,23,27,28

Reference Book:
Cay S. Horstmann, Gary Cornell , Core Java™, Volume I–Fundamentals , Prentice Hall; 9th edition, 2012

WEB TECHNOLOGY

Course-15UPCSC1C18   **4 Credits**

Course Objective:
- **To understand the basic concepts of WWW, Web browsers and Web servers.**
- **To understand how static and dynamic web documents are created using HTML and JavaScript.**
- **To understand Server side programming using PHP.**
- **To understand how web services can be created using XML.**

Unit–I:
A Brief Introduction to the Internet – The World Wide Web – Web Browsers – Web Servers, Uniform Resource Locator – Multipurpose Internet Mail Extension – The Hypertext Transfer Protocol – Origin and Evaluation of HTML & XHTML, Standard XHTML document structure – Basic text markup – Images – Hypertext link – Lists – Tables – Forms – Frames – Syntactic differences between HTML & XHTML.

Unit–II:
Cascading Style Sheet(CSS) – Overview of Java Script – Object Orientation & Java Script – Primitives, Operation and Expressions – Screen Output and Keyboard Input – Control Statements – Object Creation Modifications, Arrays – Function Construction – Pattern matching using Regular expression.

Unit-III:
Java Script Execution Environment – Document Object Model(DOM) – Element Access in Java Script – Events and Events Handling – Handling Events from Body Elements, Button Elements, Textbox and Password Elements – DOM Tree traversal and Modification – Positioning Elements – Moving Elements – Elements Visibility – Changing colors and fonts – Dynamic Content – Stacking Elements – Locating the Mouse Cursor, Reacting to a Mouse Click – Dragging and Dropping Elements.

Unit-IV:
Introduction – XML Document Structure – Document Type Definition – Namespace – XML Schemas – Displaying Raw XML Document – Displaying XML Document with CSS – XSLT Style Sheet - XML Processors– Web services

Unit-V:
Overview of PHP – General Syntactic characteristics – Primitives, Operation and Exception – Output – Control Statement – Arrays –Functions - Pattern Matching – Form Handling –

Files – Cookies, Session Tracking – MySQL database system -Database access with PHP & MySQL. Overview of Ajax – The Basics of Ajax- Rails with Ajax.

Text Book:

Robert W. Sebesta, "Programming with World Wide Web", 4th Edition, Pearson Education, 2008, Chapter 1-7, 11,13.4 - 13.6,16

Reference Books:

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
2. Achyut S Godbole and AtulKahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
4. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
5. Steven Holzner, "The Complete Reference - PHP", Tata McGraw Hill, 2008
6. Mike Mcgrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.
7. A. Puntambekar, "Web Technologies", Technical Publications, 2009.

JAVA PROGRAMMING – LAB

Course-15UPCSC1C19   **2 Credits**

Use JAVA Programming Language to implement the following:

1. Concept of different types of inheritance.

2. Concept of Interface.

3. Concept of Package.

4. To handle mouse event and keyboard events

5. To simulate the functions of simple calculator using grid layout

6. To Create Input output and Random files

7. To develop chat application with datagram sockets and datagram packets.

8. To invoke servlet using a. HTML forms b. Applet c. JSP

9. JDBC to interact with database.

10. To create multiple chat applications using TCP packets.

WEB TECHNOLOGY – LAB

Course-15UPCSC1C20   **2 Credits**

1. Design Online Book Store using List and Frames

2. Design a Time Table using Table and Images

3. Embedding Video and Audio Files in HTML

4. Design Event Web Page using Style Sheet (Font/Text, Color and Border

Properties)

5. Write an XML document to display your bio-data. Write an XSL style sheet and attach
  into the XML document. Validate the document using DTD or XSD.

6. Write an Ajax Program to get the User name suggestions in Registration Form

7. Web page using XML with Java Script

8. Design Image Map using Java Script

9. Registration Form Validation using Java Script

10. Event handling in Java Script

11. To implement the Control Structures in PHP

12. String Functions in PHP

13. Accessing the Student Exam Result Database (MySQL) using PHP

14. Develop a web application for Airline Reservation System using PHP and

AJAX.

15. Online Shopping cart with Table operations (Insert, Select, Delete, Update) using
  PHP.

PYTHON PROGRAMMING – LAB

Course-15UPCSC1C21   **1 Credit**

Implement the following in Python:

1. Programs using elementary data items, lists, dictionaries and tuples

2. Programs using conditional branches, loops.

3. Programs using functions

4. Programs using exception handling

5. Programs using classes and objects

6. Programs using inheritance

7. Programs using polymorphism

8. Programs to implement file operations.

9. Programs using modules.

10. Programs for creating dynamic and interactive web pages using forms.

SOFT SKILL DEVEOPMENT-Lab

Course-15UPCSC1C22   **1 Credit**

Unit-I

Know your self - Environment understanding and adoption - Self esteem - Emotional Intelligence - Behavioral skills: Mind set - attitude - Uniqueness - Characteristics

Unit- II

Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

Unit- III

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

Unit- IV

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation) - Common Errors.

Unit-V

Structuring the resume / report - Letter writing / Email Communication - Samples.

TEXT BOOKS
1. E. Suresh Kumar, P. Sreehari, J. Savithri, Communication Skills and Soft Skills- An Integrated Approach, Pearson Education, Sixth Edition 2015.
2. S. P. Dhanavel, English and Soft Skills, Orient Black Swan 2010.

REFERENCES
1. Sanjay Kumar, Communication Skills, Oxford University Press
2. Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
3. Prakash, P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd. Second Edition, New Delhi,2004.
4. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.
5. Evans, D, Decision maker, Cambridge University Press, 1997.
6. Thorpe, E, and Thorpe, S, Objective English, Pearson Education, Second Edition, New Delhi, 2007.
7. Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addision Wesley Longman Ltd.,Indian reprint 1998.
8. Eric Garner, The A to Z of Presentations, Bookboon.com
9. David beckett, 33 Steps to Great Presentations, Bookboon.com

SEMESTER-IV

DATA MINING TECHNIQUES

Course-15UPCSC1C23   **4 Credits**

Course Objective:
- **To understand the fundamental processes, concepts and techniques of datamining.**
- **Investigate different applications, algorithms and trends of data mining.**

Unit-I
INTRODUCTION TO DATA MINING: Data miners-The Need for Human Direction of Data Mining-The Cross-Industry Standard Process for Data Mining: CRISP-DM- CRISP-DM: The Six Phases -Fallacies of Data Mining –Data Preprocessing :Data Cleaning-Handling Missing Data-Identifying Misclassification-Data Cleaning - Handling Missing Data- Identifying Misclassifications-Graphical Methods for Identifying Outliers -Measures of Center and Spread - Data Transformation-Min–Max Normalization- Z-Score Standardization - Decimal Scaling- Transformations to Achieve Normality-Numerical Methods for Identifying Outliers - Flag Variables - Transforming Categorical Variables into Numerical Variables- Binning Numerical Variables- Reclassifying Categorical Variables-Adding an Index Field - Removing Variables that are not Useful - Variables that Should Probably not be Removed- Removal of Duplicate Records.

Unit-II
DIMENSION –REDUCTION METHODS: Need for Dimension-Reduction in Data Mining-Principal Components Analysis-Applying PCA to the Houses Data Set- The Eigenvalue Criterion - The Proportion of Variance Explained Criterion- The Minimum Communality Criterion- The Scree Plot Criterion-Profiling the Principal Components- Communalities-Minimum Communality Criterion- Validation of the Principal Components-Factor Analysis-Applying Factor Analysis to the Adult Data Set- Factor Rotation- User-Defined Composite.

Unit-III
K-NEAREST NEIGHBOR ALGORITHM: Classification Task- k-Nearest Neighbor Algorithm-Distance Function - Combination Function-Simple Unweighted Voting-Weighted Voting-Quantifying Attribute Relevance: Stretching the Axes-Database Considerations-k-Nearest Neighbor Algorithm for Estimation and Prediction- Choosing k - Application of k-Nearest Neighbor Algorithm Using IBM/SPSS Modeler-Decision Tree: Requirements for Using Decision Trees- Classification and Regression Trees- C4.5 Algorithm- Decision Rules-Comparison of the C5.0 and CART Algorithms Applied to Real Data.

Unit-IV

CLUSTERING: The Clustering Task - Hierarchical Clustering Methods-Single-Linkage Clustering- Complete-Linkage Clustering - k-Means Clustering- Example of k-Means Clustering at Work-Behavior of MSB, MSE, and Pseudo-F as the k-Means Algorithm Proceeds-Application of k-Means Clustering Using SAS Enterprise Miner-Using Cluster Membership to Predict Churn-MEASURING CLUSTER GOODNESS: Rationale for Measuring Cluster Goodness-The Silhouette Method - Silhouette Example - Silhouette Analysis of the IRIS Data Set-The Pseudo-F Statistic-Example of the Pseudo-F Statistic - Pseudo-F Statistic Applied to the IRIS Data Set - Cluster Validation- Cluster Validation Applied to the Loans Data Set.

Unit-V

ASSOCIATION RULES-Affinity Analysis and Market Basket Analysis-Data Representation for Market Basket Analysis-Support, Confidence, Frequent Itemsets, and the a Priori Property-Generating Frequent Itemsets- Generating Association Rules-Extension from Flag Data to General Categorical Data- Information-Theoretic Approach: Generalized Rule Induction Method-J-Measure-Association Rules are Easy to do Badly-- Local Patterns Versus Global Models- Case Study: Business understanding, Data Preparation and EDA

Text Book:

> Daniel T. Larose , Chantal D. Larose, Data mining and Predictive analytics, Second Ed., Wiley Publication, 2015. (Chapters: 1, 2, 4, 10, 11, 19, 22, 23, 29)

Reference Books:

1. David L. Olson DursunDelen , Advanced Data Mining Techniques, Springer-Verlag Berlin Heidelberg, 2008
2. Jiwei Han, MichelienKamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers an Imprint of Elsevier, 2006.
3. John Wang, Encyclopedia of Data warehousing and Mining, Idea Group Publishing, 2005.

DOT NET PROGRAMMING

Course-15UPCSC1C24   **4 Credits**

Course Objective:
- **To understand the basics of .Net application development platform with ASP.Net and ADO.Net**

Unit-I
Introduction to .NET-VB and VB.NET differences –Data types-Variables-Operators-Arrays-Conditional Logic

Unit-II
Procedures-Dialog Boxes-File IO and System Objects-Error Handling-Namespace-Classes and Objects

Unit-III
Introduction to Data Access in .NET-ADO.NET-Data Access in Visual Studio.NET-Windows Forms: Controls-Specific Controls

Unit-IV
Introduction to Web Development-ASP.NET-Page Framework-HTML Server controls-Web controls

Unit-V
Validation controls-User controls-Events-Cascading Style Sheets-State Management-Asp.Net Applications-Tracing-Security

Text Book:
1. Bill Evjen Janson Beres et al., "Visual Basic .Net Programming Bible", 2014.
   (Chapters : 1, 2, 5, 6, 7, 8, 9, 10, 12, 13, 14, 21, 22, 23, 25, 26, 27, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43)

Reference Books:
1. Jason N.Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter, "Professional ASP.NET 4.5 in C# and VB"- 2013.
2. Bill Evjen, Scott Hanselman, Devin Rader, "Professional ASP.NET 3.5 SPI Edition: in C# and VB- 2009.
3. Thearon willis, Jonathan Crossland Blair ,"Beginning VB .NET 2003",Wiley Dreamtech Publishers, 2004.

NETWORK MANAGEMENT

Course-15UPCSC1C25   **4 Credits**

Course Objective:
- **To be Learn for NMS domain knowledge and obtain strong knowledge on Network Management Concepts and Principles.**

Unit-I
Analogy of Telephone Network Management – Data (Computer) and Telecommunication Network – Distributed Computing Environment – TCP/IP–Based Networks: Internet and Intranet – Communication Protocols and Standards – Communication Architectures – Protocol Layers and Services – Networks, Systems, and Services – Broadband Networks, Systems, and Services – Wide Area Networks – Broadband Access Networks – Home/CPE Networks – Quality of Service in Broadband Systems – Security and Privacy in Broadband Systems – Network Management: Goals, Organization and Functions.

Unit-II
Basic Foundations: Standards, Models, and Language – Network Management Standards – Network Management Models – Organization Model – Information Model – Abstract Syntax Notation One: ASN.1 – SNMPv1 Network Management: Organization and Information Models – SNMPv1 Network Management: Communication and Functional Models – SNMPv2 – SNMPv2 Structure of Management – SNMPv2 Protocol – SNMPv3 – SNMPv3 Applications.

Unit-III
Security Threats – Security Model – Message Format – SNMPv3 User-Based Security Model – Access Control: Elements of the Model – VACM Process – VACM MIB – SNMP Management: RMON – Introduction to Remote Monitoring – RMON SMI and MIB – RMON1: RMON1 Textual Conventions – RMON1 Groups and Functions – Relationship between Control and Data Tables – RMON1 Common and Ethernet Groups – RMON Token-Ring Extension Groups – RMON2 – ATM Remote Monitoring.

Unit-IV
Basic Tools – SNMP Tools – Protocol Analyzer – Network Statistics Measurement Systems – MIB Engineering: General Principles and Limitations of SMI – Counters vs. Rates – Object-Oriented Approach to MIB Engineering – SMI Tables – SMI Transactions – NMS Design: Functional Requirements – Architecture of the NMS Server – Key Design Decisions – Discovery Module – Performance Manager – Fault Manager – Distributed Management Approaches – Server Platforms – NMS Client Design – Network Management Systems: Network Management – System and Application Management – Enterprise Management – Telecommunications Management Systems.

Unit-V

Configuration Management: Network Provisioning – Inventory Management – Network Topology – Fault Management – Performance Management: Performance Metrics – Data Monitoring – Data Monitoring – Problem Isolation – Performance Statistics – Event Correlation Techniques: Rule-Based Reasoning – Model-Based Reasoning – Case-Based Reasoning – Casebook Correlation Model – State Transition Graph Model – Finite State Machine Model – Security Management: Policies and Procedures – Resources to Prevent Security Breaches – Firewalls – Cryptography – Authentication and Authorization – Client-Server Authentication Systems – Message Transfer Security – Network Protection from Virus Attacks – Accounting Management – Report Management – Policy Management – Policy-Based Management – Service Level Management.

Text Book:

    1. Mani Subramaniam, "Network Management: Principles and Practice", Pearson Education
        India", Second Edition, 2010. (Chapters: 1, 3, 4, 5, 6, 7, 8, 9, 11)

Reference Books:

    1. D.E. Comer, "Internetworking with TCP/IP Vol- III", (BSD Sockets Version), Second Edition, Pearson Education, 200 (Unit-III)
    2. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2",Third Edition, Addison Wesley, 1999.

DOT NET - LAB

Course-15UPCSC1C26   **2 Credits**

A. Implement the following using VB.NET

1. Creating and using Variables, Arrays and Structure

2. Creating and using Procedures

3. Using Decision Structures

   i. Checking User Input
   ii. Confirming Application Close

4. Implementing Structured Exception Handling

5. Creating Menus , Status Bars and Toolbars

6. Create and open a connection to a database using ADO.NET

7. Create, read, update, and delete records in a database using ADO.NET

B. Implement the following using ASP.NET

1. Create a master page to serve as a template for the Web site's pages.

2. Create an admin page with an editable master-detail view for browsing, inserting, updating, and deleting records.

3. Create a simple web site

4. Create and open a connection to a database using ADO.NET

5. Create, read, update, and delete records in a database using ADO.NET

6. Use SqlDataSource to populate a DropDownList and GridView

7. Use ObjectDataSource to Populate a GridView

8. Create a feedback form.

DATA MINING – LAB

Course-15UPCSC1C27   **2 Credits**

Develop R Program for the following:

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND).

2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames.

3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept.

4. To perform statistical operations (Mean, Median, Mode and Standard deviation).

5. To perform data pre-processing operations:
   i)   Handling Missing data   ii) Min-Max normalization

6. To perform dimensionality reduction operation using PCA.

7. To perform Simple Linear Regression.

8. To perform K-Means clustering operation and visualize it.

9. Write R script to diagnose any disease using KNN classification and plot the results.

10. To perform market basket analysis using Apriori algorithm.

MOBILE APPLICATION PROGRAMMING - LAB

Course – 15UPCSC1C28   **1 Credit**

ANDROID PROGRAMMING LAB

1. Create an Application to display Bio Data using different Text Views.

2. Create an Application to compute different Arithmetic Operations using Buttons.

3. Create an Application to Open Multiple Activities using Buttons.

4. Create an Application to display status of Toggle Button.

5. Create an Application to Pickup order of different items using Checkbox.

6. Create an Application to make a CALL.

7. Create an Application to make a SMS.

8. Create an Application to make a MAIL.

9. Create an Application to display List View by Populating Data from Array Adapter.

10. Create an Application to collect input and store in Database.

SOFT SKILL DEVEOPMENT-Lab II

Course-15UPCSC1C29   **1 Credit**

Unit -I

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

Unit -II

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

Unit-III

Why is GD part of selection process - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD –Video samples

Unit- IV

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews - Video samples.

Unit-V

Sign - Symbols - Paragraphs - Tables - Charts - Figures - Audio - Video

TEXT BOOKS

1. E. Suresh Kumar, P.Sreehari, J.Savithri, Communication Skills and Soft Skills- An Integrated Approach, Pearson Education, Sixth Edition 2015.
2. S.P. Dhanavel, English and Soft Skills, Orient Black Swan 2010.

REFERENCES:

1. S.R.Bhatia, A. K.Jain Praveen, Professional Communication Skills, S. Chand and Company, Sixth Edition.
2. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press.
3. Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
4. Prakash, P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd. Second Edition, New Delhi,2004.
5. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.
6. Evans, D, Decision maker, Cambridge University Press, 1997.
7. Thorpe, E, and Thorpe, S, Objective English, Pearson Education, Second Edition, New Delhi, 2007.
8. Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addision Wesley Longman Ltd.,Indian reprint 1998.
9. Eric Garner, The A to Z of Presentations, Bookboon.com
10. David beckett, 33 Steps to Great Presentations, Bookboon.com
11. Melissa Conteras, Interpersonal Skills for Entrepreneurs, Bookboon.com

INDUSTRIAL TRAINING

Course-15UPCSC1C30   **2 Credits**

      The students are expected to take training from reputed a industry during vacation for about 15 days. It is necessary to develop a module accordingly and a report should be submitted. The evaluation will be done in the first week of July.

BIG DATA ANALYTICS

Course-15UPCSC1C31   **4 Credits**

Course Objective:
- **To understand the basic concepts of big data**
- **To learn Hadoop, MapReduce, Hive, HBase and Pig**

Unit – I Fundamentals of Big Data
Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle

Unit – II Fundamentals of Hadoop
Core components of Hadoop- Apache Hadoop – HDFS Daemons – MapReduce Daemons – HDFS High Availability Daemons – Benefits and Challenges of HDFS – File Sizes, Block Sizes and Block Abstraction in HDFS – Data Replication – How does HDFS Store, Read, and Write Files? – Data Serialization Options – File System Shell Commands for HDFS – Choosing Key and Value Types for MapReduce Jobs – The Relationship of Input Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce Job Configuration and Submission

Unit – III HDFS and MapReduce
Hadoop Distributed File System – MapReduce Framework – Setting the Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework - Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming

Unit – IV Hive and HBase
Apache Hive: Setting the Environment – Configuring Hadoop, Hive – Starting HDFS, Hive Server, CLI – Creating and Using a Database– Creating a Managed Table – Loading data into a Table – Creating a Table using LIKE – Adding Data into a Table from Queries – Adding Data using INSERT INTO TABLE - Adding Data using INSERT OVERWRITE – Creating a table using CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table– Creating an External Table – Apache HBase: Setting the Environment - Configuring Hadoop, Hive and HBase – Starting the HBase and HBase Shell – Creating HBase Table – Adding Data to a Table – Listing all Tables – Getting a Row of Data – Scanning a Table – Counting the Number of Rows in a Table – Altering a Table – Deleting a Table Row, Column – Disabling and Enabling a Table – Truncating and Dropping a Table – Determining If Table Exists – Creating a Hive External Table stored by HBase

Unit – V Pig
Introduction – Installing and Running Pig – Grunt – Pig's Data Model – Introduction to Pig Latin – Advanced Pig Latin – Developing and Testing Pig Latin Scripts – Making Pig Fly – Writing Evaluation and Filter Functions – Writing and Loading Store Function

Text Books

1. Alan Gates, "Programming Pig", Oreilly Publication, 2011.
    Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11
2. Deepak Vohra, "Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools", Apress, 2016.
    Chapters: 1, 2, 3, 4
3. Thomas Erl, WajidKhattak, Paul Buhler, "Big Data Fundamentals Concepts, Drivers & Techniques", Service Tech Press, 2015.
    Chapters: 1, 2, 3

CLOUD COMPUTING

Course-15UPCSC1C32   **4 Credits**

Course Objective:
- Enable the students to learn and understand the fundamental concepts of Cloud and its services.

Unit I
Introduction – Definition of Cloud – Cloud types – Characteristics of Cloud – Cloud standards – Measuring cloud's value – Early adopters and new applications - Laws of cloudonomics – Cloud obstacles – Cloud adoption – Cloud computing costs – Service level agreements – Licensing model - Cloud architecture: Cloud computing stack – Composability – Infrastructure – Platforms – Virtual appliances – Communication protocol – Applications – Connecting to cloud.

Unit II
Cloud Services: IaaS – PaaS – SaaS – IdaaS – CaaS - Abstraction and Virtualization: Virtualization technologies – Load balancing – Hypervisors – Machine imaging – Porting applications – Capacity planning: Baseline and Metrics – Measurements – System metrics – Load testing – Resource ceilings – Servers and Instance types – Network Capacity – Scaling

Unit III
Exploring Platform as a Service (PaaS) : Service model – Development – Sites and tools – Application features - Exploring Cloud Infrastructures: Administrating the clouds – Management responsibilities – Life cycle management - Cloud management products – Cloud management standards – Cloud Security: Securing the Cloud – Securing the Data – Establishing identity and presence

Unit IV
Service oriented architecture – Introduction – SOA communications – Managing and Monitoring SOA – Relating SOA and Cloud - Applications to the cloud : Functionality mapping – Applications attributes – Cloud service attributes – System abstraction – Cloud bursting – Applications and Cloud APIs – Cloud Storage: Measuring digital universe – Provisioning cloud storage – Cloud backup solutions – Cloud storage interoperability –

Unit – V
Exploring cloud mail service – Syndicate services – Instant messaging – Collaboration technologies using social networking – Audio and Video streaming – VoIP applications – Mobile market – Smart phones with the cloud - Mobile Web service : Service types – Service discovery – SMS – Protocols – Synchronization

Text Book
1. Barrie Sosinsky, Cloud Computing Bible, Wiley Publications, 2011
   (Unit I to V)

Reference Books

1. Rountree, Castrillo, The Basics of Cloud Computing - Understanding the Fundamentals of Cloud Computing in Theory and Practice, First Edition, Syngress Publication, 2013

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

3. Srinivasan, S, Cloud Computing Basics, Springer, 2013

BIG DATA ANALYTICS - LAB

Course-15UPCSC1C33   **2 Credits**

1. Installing and Configuring Hadoop, Pig, Hive and HBase
2. Implement the following files and directories handling commands in HDFS
   a. Making a Directory
   b. Listing Files and Directories
   c. Changing Group Associations for Files and Directories
   d. Displaying File and Directory Sizes
   e. Removing Files and Directories
   f. Changing Owner of Files and Directories
   g. Counting File and Directories
3. Implement the following file Manipulating commands in HDFS
   a. Putting Files in the HDFS
   b. Creating a File
   c. Changing Permission of Files
   d. Copying Files to the local file system
   e. Appending to a File
   f. Copying HDFS files to STDOUT
   g. Testing a File
   h. Copying Files in HDFS
   i. Moving Files within HDFS
   j. Outputting a File in Text Format
4. Write a Mapreduce program using single reduce function for finding Maximum and Minimum Number
5. Write a Mapreduce program using multiple reduce function for Word Count in an given Text Document
6. Write a Mapreduce program using multiple reduce function for Matrix Multiplication
7. Implement the following using Pig Latin
   a. Input and Output Operations
   b. Relational Operations
8. Implement the following using Pig Latin
   a. User Defined Functions
   b. Advanced Relational Operations
9. Implement the following using Hive commands
   a. Starting Hive server, Hive CLI
   b. Handling the Database
   c. Creating and Manipulating Table
10. Implement the following using Hbase commands
    a. Starting HBase, HBase Shell
    b. Creating and Manipulating Table

CLOUD COMPUTING - LAB

Course-15UPCSC1C34   **2 Credits**

Implement the following using Open Nebula or Equivalent

1. Find procedure to run the virtual machines can be utilized to run the virtual machine of different configuration. Check how many at particular time.

2. Find procedure to attach the virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine

3. Install a C Compiler in the virtual machine and execute a sample Program

4. Show the virtual machine migration based on the certain condition from one node to the other.

5. Find the procedure to install storage controller and interact with it.

6. Find the procedure to set up the one node Hadoop cluster

7. Write a program to use the API's of Hadooop to interact with it.

8. Find the procedure to implement the Identity Management (Open Stack)

9. Write a program for Web Feed using PHP and HTML

10. Find the procedure to implement Single Sign On (SSO)

ELECTIVE I - LIST

MICROPROCESSORS

Course-15UPCSC1E01   **3 Credits**

Course Objective:
- **To understand the basic concepts of microprocessor and its different interface units.**

Unit-I
MICROPROCESOR-BASED SYSTEMS: HARDWARE AND INTERFACING: Microprocessors, Microcomputers and Assembly Language-Introduction to 8085 Assembly Language Programming-Microprocessor Architecture and Microcomputer Systems-8085 Microprocessor Architecture and Memory Interfacing-Interfacing I/O Devices.

Unit-II
PROGRAMMING THE 8085: Introduction to 8085 Instructions-Programming Techniques with Additional Instructions-counters and time delays-stack and subroutines- code conversion, BCD arithmetic,and 16-Bit Data Operations-Software Development Systems and Assemblers.

Unit-III
INTERFACING PERIPHERALS (I/0s) AND APPLICATIONS: Interrupts- Interfacing Data Converters- Programmable Interface Devices: 8155 I/O and Timer; 8279 Keyboard/Display Interface-General-Purpose Programmable Peripheral Devices- Serial I/O and Data Communication- Microprocessor Applications- Extending 8-Bit Microprocessor Concepts to Higher-Level Processors and Microcontrollers

Unit-IV
The 8086 Processor – Software aspects Evolution of Microprocessors – 8086 architecture – Addressing modes. Instruction set and assembler directives – Assembly language programming – Interrupts and interrupt service routines.

Unit-V
The Pentium and Pentium Pro Microprocessors : Introduction – Introduction to the Pentium Microprocessor – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Introduction to the Pentium Pro Microprocessor – Special Pentium Pro Features.

Text Books:

1. Gaonkar, "Microprocessor architecture, programming and applications", Wiley Eastern Ltd, 2006. (Chapter 3-5, 6-10, 13-15, 17)
2. Barry B.Brey, "The Intel Microprocessors, 8086/8088, 80186/80188. 80286,80386, 80486, Pentium, Pentium Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing", Sixth Edition, Pearson Education,2006.(Chapters 2, 3, 8, 17)

Reference Books:

1. Kenneth L short, "Microprocessor and programming logic", PHI, 1988.
2. Ajith pal, "microprocessors, principles and applications", Tata McGraw Hill, 2006.
3. A.K. Ray & K.M. Bhurcandi, "Advanced Microprocessors and peripherals-Architectures, Programming and Interfacing", Tata McGraw Hill, 2002 reprint.
4. Yu-Cheng, Glenn A. Gibson, "Microcomputer systems: The 8086/8088 Family architecture, Programming and Design", PHI 2003.
5. Peter Abel, "IBM PC Assembly language and programming", Prentice Hall of India Pvt, Ltd.
6. Barry B. Brey & C.R. Sarma , "The Intel Microprocessors – Architecture, Programming, and Interfacing", Pearson Education Pte. Ltd., 2005.
7. U.S. Shah, "Microprocessor and Microcontrollers", Tech-Max Publications, 2005
8. Gaonkar, "Microprocessor architecture, programming and applications", Wiley Eastern Ltd, 1987.

PARALLEL PROCESSING

Course-15UPCSC1E02   **3 Credits**

Course Objective:

- **To understand the basic concepts of parallel processing and different types of pipelining processing.**

Unit-I

Introduction to parallel processing: Evolution – Uni processor – Parallel computer structures – Classification schemes – Applications – Memory I/O Subsystem : Hierarchical memory structures – Virtual memory system – Memory allocation and management – cache-I/O sub system.

Unit-II

Principles of pipelining and vector processing: pipelining – Instruction and arithmetic pipelines – principles of designing pipelined processors – vector processing requirement – pipeline computers and vectorization method.

Unit – III

Structures and algorithms for array processors – SIMD array processors – SIMD interconnection networks – parallel algorithms for array processor – associative array processing.

Unit – IV

SIMD computers and performance enhancement – The space of SIMD Computers – The massively parallel processor – performance enhancement methods.

Unit – V

Multiprocessor Architecture and Programming – Functional Structures – Interconnection Networks – Parallel memory Organization.

Text Book:

        Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing", TMGH 2011.

SYSTEM SOFTWARE

Course-15UPCSC1E03   **3 Credits**

Course Objective:
- **To understand the structure and operations of system components**

Unit-I
System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

Unit-II
Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers .

Unit-III
Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders

Unit-IV
Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels –Conditional Macro Expansion – keyword
Macro Parameters - Macro within Macro.

Unit-V
Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

Text Book:
> Leland L. Beck, "System Software – An Introduction to Systems Programming", Pearson Education Asia, 2005.

Reference Books:
1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition,TataMcGraw-Hill,1999.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

THEORY OF COMPUTATION

Course-15UPCSC1E04   **3 Credits**

Course Objective:
- **Enable the students to learn the concepts behind the computational process of a system**

Unit – I
Basic Terminology – String –Set theory- relation on set-graph and tree-Automata theory and computation- history of automata- grammar-Chomsky hierarchy-use of automata-characteristics of   automata-finite automata-graphical and tabular representation-transactional system-DFA and NFA –conversion of NFA to DFA-Equivalence of DFA and NFA-Dead state-Finite automata with output-conversion of one machine to another-minimization of finite automata-Myhill--Nerode Theorem-Two way finite automata-applications-limitations.

Unit – II
Finite state machine-state equivalence and minimization of machine - incompletely specified machine-merger graph- merger table-finite memory and definite memory-information lossless machine-inverse machine-minimal inverse machine-regular expression-operations on regular expression-identities of regular expression-arden's theorem-construction of finite automata from regular expression-NFA with € move and conversion to DFA by € -closure method.

Unit – III
Equivalence of two finite automata- Equivalence of two regular expression- construction of regular grammar from an RE-constructing FA from regular grammar-Pumping lemma for regular expression-closure properties of regular set-decision problems of regular expression-'Grep' and regular expression-applications-context free grammar-derivation and parse tree-Ambiguity in context free grammar-left recursion and left factoring-simplification of context free grammar-linear grammar-normal form-closure properties –pumping lemma for CFL-Ogden's lemma for CFL-Decision problems for CFG-CFG and regular language-Applications.

Unit- IV
Push down automata-acceptance PDA-DPDA and NPDA-Construction of PDA from CFG-construction of CFG equivalent to PDA-Graphical notation for PDA-Turing Machine-transactional representation of turing machine –non deterministic turing –conversion of regular expression to turing machine.

Unit- V

Variations of turing machine-turing machine as an integer function-Universal turing machine-linear bounded automata-TM languages-unrestricted grammar-modified Chomsky hierarchy-Properties of recursive and recursively enumerable languages.

Text book:

Shyamlendu Kandar, "Introduction to automata theory, formal languages and Computation" First Edition, Pearson Education, 2013.

Unit-I : (Chapters: 1.1-1.4,1.7-1.8,2.1-2.2,3.1-3.18)
Unit-II : (Chapters: 4.3-4.12,5.1-5.6)
Unit-III : (Chapters: 5.7-5.15,6.1-6.13)
Unit-IV : (Chapters: 7.1-7.6,8.1-8.4)
Unit-V : (Chapters: 9.1-9.4,10.1-10.4)

Reference Books:

1. John E Hopcraft, "Introduction to Automata theory, Languages and Computation", 3rd edition, Pearson Education, 2008.
2. Rajesh Shukla, E V Prasad, "Formal Languages and Automata theory", 1st edition, Cengage learning India edition, 2012.

ELECTIVE-II-LIST

OBJECT ORIENTED ANALYSIS AND DESIGN

Course-15UPCSC1E05   **3 Credits**

Course Objective:
- **To understand the object oriented methodologies and workflows.**
- **To describe the object oriented software development process and apply the concepts of abstraction, encapsulation, inheritance and polymorphism.**

Unit-I

The Object: The evolution of the Object model-Elements of the Object model-Applying object model. Classes and Objects: The nature of Object-Relationships among objects.

Unit-II

Classes and Objects: The nature of the class-Relationship among classes-The Interplay of Classes and Objects-On building quality classes and objects. Classification: The importance of proper classification-Identifying proper classes and objects-Key abstraction mechanism.

Unit-III

Introduction to UML-Development Process-The Class Diagram: Essential and Advanced Concepts-Sequence Diagrams-Object Diagrams-Package Diagrams.

Unit-IV

Deployment   Diagrams-Use   Cases-State   Machine   Diagram-Activity   Diagram Communication Diagram-Component Diagram-Collaboration-Interaction Diagram-Timing Diagram.

Unit-V

Process-Pragmatics- Applications: System Architecture: Based Navigation-Control System: Traffic Management-Data Acquisition: Weather Monitoring.

Text Book:

Grady Booch,Robert A.Maksimchuk,Michael W.Engle,Bobbi J.Young,Ph.D, Jim Conallen,Kelli A.Houston,"Object Oriented Analysis and Design with Applications", Third Edition-sixth impression-2012 (Chapters- 1, 2,3,4,5,6,7,8,9,11).

Reference Books:
1. Bernd Bruegge, Allen H.Dutoit "Object Oriented Software Engineering using UML,Patterns,and Java"- 2010.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Pattern Elements of Reusable Object Oriented Software"- 2009.
3. Grady Booch, Robert A.Maksimchuk, Michael W.Engle, Bobbi J.Young,Ph.D, Jim Conallen, Kelli A.Houston ,"Object Oriented Analysis and Design with Applications",Third Edition- 2007.

DESIGN AND ANALYSIS OF ALGORITHMS

Course-15UPCSC1E06   **3 Credits**

Course Objective:
- **Apply the algorithms and design techniques to solve problems**
- **Analyze the complexities of various problems in different domains.**
- **Analyze the performance of various algorithms.**

Unit-I

Introduction – Notion of Algorithm - Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm efficiency – analysis frame work – Asymptotic Notations and Basic Efficiency Classes-   Mathematical analysis of non-recursive Algorithms – Non-recursive solution to the Matrix Multiplication - Mathematical analysis of recursive algorithms – Recursive solution to the Tower of Hanoi Puzzle.

Unit-II

Divide and conquer Technique – Multiplication of large integers – Strassen's matrix multiplication – Closest pair and Convex Hull Problems - Greedy method – Prim's algorithm – Kruskal's algorithm –   Dijkstra's algorithm.

Unit-III

Dynamic Programming - Computing a binomial coefficient – Warshall's and Floyd' Algorithm – Application of Warshall's Algorithm to the digraph – Flyd's Algorithm for the all pairs shortest paths Problem - The Knapsack problem and Memory function.

Unit-IV

Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem – Branch and bound – Assignment problem – Knapsack problem –   Traveling salesman problem.

Unit-V

P, NP and NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem – Knapsack problem.

Text Book:

AnanyLevitin "Introduction to the Design and Analysis of Algorithms" Pearson Education 2009. (Chapters 1.1-1.3, 2.1, 2.2, 2.3, 2.4, 4.5, 4.6, 8.2, 8.4, 9.1-9.3, 11.3, 12.1,12.2, 12.3)

Reference Books:

1.Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, "Introduction to algorithms", Prentice Hall 1990.
2. S.K. Basu, "Design methods and Analysis of Algorithms", Prentice Hall, 2005.

EMBEDDED COMPUTING

Course-15UPCSC1E07   **3 Credits**

Course Objective:
- **To understand the basics of embedded computing and its environment.**
- **To know the architecture of embedded systems and the different applications.**

Unit-I

An Introduction to Embedded Processing: Embedded Computing, Distinguishing Between Embedded and General - Purpose Computing – Characterizing Embedded Computing – Embedded Market Structure.

An Overview of VLIW and ILP: Semantics and Parallelism – Design Philosophies – Role of the Compiler – VLIW in the Embedded and DSP Domains – Historical Perspective and Further Reading.

Unit-II

An Overview of ISA Design: Overview – Basic VLIW Design Principles – Designing a VLIW ISA for Embedded Systems – Instruction-set Encoding – VLIW Encoding – Encoding and Instruction-set Extensions.

Architectural Structures in ISA Design: The Datapath - Registers and Clusters – Memory Architecture – Branch Architecture – Speculation and Predication – System Operations.

Unit-III

Microarchitecture Design: Register File Design – Pipeline Design – CLIW Fetch, Sequencing, and Decoding – The Datapath – Memory Architecture – The Control Unit – Control Registers – Power Considerations.

System Design and Simulation: System-on-a-Chip (SoC) – Processor Cores and SoC – Overview of Simulation - Simulating a VLIW Architecture – System Simulation – Validation and Verification.

Unit-IV

Embedded Compiling and Tool chains: Introduction – Embedded Cross-Development Toolchains – Structure of an ILP Compiler – Code Layout – Embedded-Specific Tradeoffs for Compilers – DSP-Specific Compiler Optimizations.

Compiling for VLIWs and ILP: Profiling – Scheduling – Register Allocation – Speculation and Predication – Instruction Selection.

Unit-V

The Run-time System: Exceptions, Interrupts, and Traps – Application Binary Interface Considerations – Code Compression – Embedded Operating Systems – Multiprocessing and Multithreading.

Application Areas: Digital Printing and Imaging – Telecom Applications – Other Application Areas: Digital Video – Automotive – Hard Disk Drives – Networking and Network Processors.

TEXT BOOK

1. Joseph A. Fisher, Paolo Faraboschi, Cliff Young, Embedded Computing: AVLIW Approach to Architecture, Compilers, and Tools, Morgan Kaugmann Publishers An imprint of Elsevier, Elsevier Inc., 2008.
   (Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11)

REFERENCE BOOKS

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997

DISTRIBUTED COMPUTING

Course-15UPCSC1E08   **3 Credits**

Course Objective:
- **To understand the various concepts of distributed computing and its environment.**

Unit-I
Introduction- Vertex colouring – Tree algorithm – Leader election – Distributed sorting-Shared memory – objects – Maximal Independent set

Unit-II
Wireless Protocol – Stabilization – Labelling schemes – Fault tolerance & Paxos

Unit–III
Byzantime agreement – Authenticated agreement – Quorum systems – Eventual consistency and Bitcoin – Distributed storage

Unit–IV
Game theory – Peer – to – Peer computing – All to all communication – Dynamic networks Consensus

Unit–V
Multicore computing – Domination set – Routing – Routing strikes Back.

Text Book:

1. Roger Wattenhofer, Principles of Distributed Computing", Springer 2015
   Chapters (1-7, 12-15, 17-30)

Reference Books:

1. Ajay D. Akshemkalyani, Mukesh Singhal, "Distributed Computing: Principles, Applications and Systems", Cambridge University, 2011

2. Vijay K. Garg, "Elements of Distributed Computing", Wilesy Publications 2002.

3. Carlos A Verala, "Programming Distributed Computing Systems: A Foundational approach" MIT Press, 2013

ELECTIVE-III-LIST

NUMERICAL METHODS
(Theorems and Proofs are not expected)

Course-15UPCSC1E09   **3 Credits**

Course Objective:
- **To explain the fundamental concepts of Empirical laws and curve fitting.**
- **To develop solutions for linear algebraic equations via different methods.**

Unit–I
Empirical laws and curve fitting :Introduction-Laws reducible the linear law – method of group averages – Laws containing three constants – principle of least squares – Fitting of a straight line – Fitting of a parabola – Fitting an exponential curve – method of moments.

Unit–II
Transcendental Equation and Algebraic Equations : Introduction - Bisection Method, Newton – Rapson Method – Method of False Position – Horner's Method.

Unit–III
Solutions of Linear algebraic Euqations :Direct Methods: Gauss elimination Method- Gauss Jordan Method-Crout's Method. Iterative Methods: Gauss Jacobi's Method-Gauss Seidal method-Relaxation Method.

Unit–IV
Finite Differences: Newton's forward interpolation formula-Newton's backward interpolation formula. Central Differences – Gauss's Forward Formula – Gauss's Backward Formula Sirling's Formula-Bessel's Formula.

Unit-V
Interpolation with unequal Intervals: Divided Differences – Inverse Interpolation – Numerical Differentiation – Numerical integration.

Text Book:
>   A. Singaravelu, Numerical Methods, Meenakshi Publications, Chennai, 1999.

Reference books:
1. S.S.Sastry, "Introductory methods of numerical analysis", PHI, New Delhi1982.
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain "Numerical methods for science and Engineering computation", Wiley Eastern Limited – 2nd edition –1995.

E-COMMERCE

Course-15UPCSC1E10   **3 Credits**

Course Objective:

- **To understand the basic concepts of E-Commerce and its different types.**
- **To know the different security issues in E-Commerce environment.**

Unit-I

Introduction: E-Commerce and E-Business – Categories of E-Commerce – Business Models –Revenue Models and Business Processes – Advantages and Disadvantages of E-Commerce – Economic Forces and E-Commerce – Identifying Electronic Commerce Opportunities – International Nature of Electronic Commerce . Technology Infrastructure : The Internet and the WWW – Packet-Switched Networks – Internet Protocols – Markup Languages and the Web – Intranets and Extranets – Internet Connection Options – Internet2 and the Semantic Web .

Unit-II

Business Strategies for Electronic Commerce: Selling on the Web – Revenue Models and Building a Web Presence – Revenue Models – Revenue Models in Transition – Revenue Strategy Issues – Creating an Effective Web Presence – Web Site Usability – Connecting with Customers. Marketing on the Web: Web Marketing Strategies – Communicating with Different Market Segments – Beyond Market Segmentation – Advertising on the Web – E-Mail Marketing – Creating and Maintaining Brands on the Web – Search Engine Positioning and Domain Names.

Unit-III

Business – to Business Activities: Improving Efficiency and Reducing Costs–Purchasing, Logistics and Support Activities–Electronic Data Interchange–Supply Chain Management Using Internet Technologies–Electronic Market Places and Portals. Social Networking, Mobile Commerce and Online Auctions: Virtual Communities to Social Networks–Mobile Commerce–Online Auctions.

Unit-IV

The Environment of Electronic Commerce: The Legal Environment of E-Commerce–Use and Protection of Intellectual Property in Online Business–Online Crime, Terrorism and Warfare–Ethical Issues– Taxation and Electronic commerce. Technologies for Electronic Commerce: Web Server Basics–Software for Web Servers–Electronic Mail (E-Mail) –Web Site Utility Programs–Web Server Hardware.

Unit-V

Electronic Commerce Security: Online Security Issues Overview–Security for Client Computers–Communication Channel Security–Security for Servers Computers. Payment System for Electronic Commerce: Online Payment Basics–Payment Cards–Electronic Cash–Electronic Wallets–Stored-Value Cards–Internet Technologies and the Banking Industry–Criminal Activity and Payment Systems. Integration: Planning for E-Commerce – Identifying Benefits and Estimating Costs of E-Commerce –Managing E-Commerce Implementations.

Text book:

> Gary P. Schneider, "Electronic Commerce", Gary Schneider, Cengage Learning Eleventh Edition, 2014.

Reference books:

1. Richard .T Watson, Pierre Berthon, Leyland F. Pitt, George M.Zinkhan, "Electronic Commerce: The Strategic Perspective", 2008.
2. S. Jaiswal, "Doing Business on the Internet E-Commerce", Galgotia, 2002.

INFORMATION SECURITY

Course-15UPCSC1E11   **3 Credits**

Course Objective:
- **To know the legal, ethical and professional issues and technological aspects of information security.**

Unit–I

Foundations: Information Security Overview: The importance of information Protection-The evolution of Information Security –Justifying Security Investment –Security Methodology –Build a Security Program-The Impossible Job- the Weakest Link-Strategy and Tactics-Business Process vs. Technical Controls –Risk Analysis: Threat Definition – Types of Attacks- Information Security Standards –Regulations Affecting Information Security Professionals-Laws Affecting Information Security Professionals-Secure Design Principles-Authentication and Authorization.

Unit-II

Introduction to cyber security science: The scientific method-cyber security theory and practice-Human factors-The role of Metrics-Conducting cyber security experiments: Asking Good questions and Formulating Hypotheses-Designing a Fair Test-Analyzing Your Results-Putting Results to work-A checklist for conducting Experimentation –Cyber security Experimentation and Test Environments: Modeling and simulation-Open Datasets for Testing-Desktop Testing –Cloud Computing –Cyber security Test beds-A checklist for selecting an Experimentation and Test Environment.

Unit-III

Software Assurance: An example scientific Experiment in Software Assurance –Fuzzing for Software Assurance –The scientific Method and the software Development Life Cycle-Adversarial Models -How to find More Information-Intrusion Detection and Incident Response: An example Scientific Experiment in Intrusion Detection –False Positives and False Negatives- Performance, Scalability , and Stress Testing –Situational Awareness and Data Analytics: An example Scientific Experiment in Situational Awareness -Experimental Results to Assist Human Network Defenders- Machine Learning and Data mining for Network Monitoring.

Unit–IV

Cryptography: An Example Scientific Experiment in Cryptography –Experimental Evaluation of Cryptographic Designs and Implementation- Provably Secure Cryptography and security Assumptions-Cryptographic Security and the Internet of the Things-Digital Forensics: An Example Scientific Experiment in Digital Forensics–Scientific Reproducibility and Repeatability– Malware Analysis:An Example Scientific Experiment in

Malware Analysis-Scientific Data Collection for simulators and Sandboxes-Game Theory for Malware Analysis.

Unit-V

System security Engineering: An Example Scientific Experiment in System security Engineering –Regression Analysis –Moving Target Defense –Human-Computer Interaction and Usable Security: An Example Scientific Experiment in Usable Security –Double –Blind Experimentation-Usability Measures: Effectiveness, Efficiency, and Satisfaction – Methods for Gathering Usability Data-Visualization :An Example Scientific Experiment in Cyber security Visualization –Graphical representations of Cyber security Data – Experimental Evaluation of security Visualization.

Text Books:
1. Mark Rhodes Ousley, The Information security the complete Reference ,2013 Second Edition (Chapters:1-4,6,7).
2. Josiah Dykstra ,Essential Cyber Security Science, 2016 First Edition (Chapters:1-12)

BIOINFORMATICS

Course-15UPCSC1E12   **3 Credits**

Course Objective:
- **To understand the basic concepts of molecular biology and genetics and correlate the concepts of computer science to problems in biological sciences.**
- **Model the protein prediction problem and gene regulation.**

Unit–I
Bioinformatics: An Introduction – Introduction to Biological Databases –Databases - Types of Databases – Biological Databases Considerations – Information Search and Data Retrieval – Electronic Libraries – Tools for Web Search – Data Retrieval Tools – Data Mining of Biological Databases.

Unit–II
Genome Analysis and Gene Mapping – The Sequence Assembly Problem – Genetic Mapping and Linkage Analysis – Physical Maps – Cloning the Entire Genome – Genome Sequencing – Applications of Genetic Maps – Sequence Assembly Tools – Identification of Genes in Contigs – The Human Genome Project.

Unit–III
Introduction to Phylogenetics – Taxonomic Relationships from Molecular Properties – Terminology – Tree Toplogies – Gene Trees – Tools for Tree Visualization – Methods of Phylogenetric Analysis – Distance-based Methods – Character-based Method – Tree Evaluation – Problems in Phylogenetic Analysis – Automated Tools for Phylogenetic Analysis.

Unit-IV
Gene Identification and Prediction – Basis of Gene Prediction – Pattern Recognition – Gene Prediction Methods – Other Gene Prediction Tools – Gene Expression and Microarrays – Working with DNA Microarrays – Clustering GENE Expression Profiles – Data Sources and Tools for Microarray Analysis - Applications of Microarray Technology.

Unit-V
Protein Classification and Structure Visualization – Overview of the Protein Structure - Protein Structure Visualization – Structure-based Protein Classification - Protein Structure Databases – Protein Structure Visualization Databases and Tools - Protein Structure Alignment – Domain Architecture Databases – Tools for Plotting Protein-ligand Interaction – Protein Classification Approaches – Protein Structure Prediction – Protein Identification and Characterization – Primary Structure Analysis and Prediction – Secondary Structure Analysis and Prediction – Motifs, Profiles, Patterns and Fingerprints Search – Methods of Sequence-based Protein Prediction – *Ab Initio* Approach for Protein Prediction – Methods

of 2-D Structure Prediction – Protein Function Prediction – Protein Prediction from a DNA Sequence.

Text Book:

S. C. Rastogi, N. Mendiratta and P. Rastogi, "Bioinformatics Methods and Applications", Fourth Edition, PHI Learning Private Ltd., 2013.

Unit-I   : (Chapters: 1, 2, 3)
Unit-II : (Chapter: 4)
Unit-III : (Chapters: 7, 8)
Unit-IV : (Chapters: 11, 13)
Unit-V : (Chapters: 14, 15)

ELECTIVE IV - LIST

INTERNET OF THINGS

Course-15UPCSC1E13   **3 Credits**

Course Objective:
- **To understand the technology behind Internet of Things**
- **To get familiar with the design principles of connected devices and**
- **To know about various business models and ethics in Internet of Things**

UNIT – I
The Internet of Things: An Overview –The Internet of Things – The Technology of the Internet of Things - Enhanced objects. **Design Principles for Connected Devices**: Calm and Ambient Technology – metaphor – Privacy – Web thinking for connected Devices.

UNIT – II
 Internet Principles: Internet Communications overview – IP – TCP – TCP/IP – UDP. IP Addresses: DNS – Static and Dynamic IP Address Assignment – MAC Addresses – TCP and UDP Ports – Application Layer Protocols. **Thinking about Prototyping:** Sketching – Familiarity – Prototypes and Production – Open Source versus Closed Source.

UNIT – III
Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. **Prototyping the Physical Design:** Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

UNIT – IV
Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. **Techniques for Writing Embedded Code:** Memory Management - Performance and Battery Life – Libraries - Debugging.

UNIT – V
Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. **Moving to Manufacture:** Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. **Ethics:** Privacy – Control – Environment – Solutions.

Text Book:
1. Adrian McEwen and Hakim Cassimally, **"Designing the Internet of Things"** , Wiley, 2014. (Chapters : 1, 2, 3, 4, 5, 6, 7, 9, 10, 11)

Reference Books:
1. OvidiuVermesan and Peter Friess, "Internet of Things – From Research and Innovation to Market Deployement" , River Publishers, 2014.
2. Peter Waher, "Learning Internet of Things" ,Packt Publishing, 2015.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black",McGraw Hill, 2015.

SOFTWARE PROJECT MANAGEMENT

Course-15UPCSC1E14   **3 Credits**

Course Objective:
- To outline the basic concepts of Software Project Management
- To highlight techniques for software cost estimation and activity planning.

UNIT I

Introduction to Software project management: Importance of Software Project Management-Software projects vs other projects –Activities - Plans, methods and Methodologies – Categorization of Software Projects – Stakeholders - Setting objectives – Management Principles – Management Control – Project portfolio Management- Evaluation individual projects – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II

Choosing methodologies and technologies- Software process and Process Models – Choice of Process models – incremental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II A Parametric Productivity Model – Staffing Pattern.

UNIT III

Activity planning: Objectives of Activity planning – Project schedules – project and Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method –Activity float- short the project duration – identifying critical activities – activity on –arrow networks Risk identification – Assessment –Planning - Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

UNIT IV

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control Software Configuration Management – Managing contracts.

UNIT V

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams –Coordination dependencies – Communications genres – Communication plans.

TEXTBOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Chapters:(1.1,1.2,1.3,1.4,1.6,1.7,1.8,1.9,1.10,1.13,1.14,2.3,2.4,2.5,2.6,2.9,3,4.3,4.4,4
.5,4.11,4.13,4.14,4.15,4.16,4.17,5.4,5.5,5.12,5.13,5.14,5.15,6.2,6.3,6.4,6.5,6.6,6.7,6.
10,6.11,6.12,6.13,6.14,6.15,6.16,7.5,7.6,7.7,7.10,7.11,8.1,8.5,8.9,9.2,9.3,9.6,9.7,9.8,
9.10,9.11,9.12,10,11.1,11.2,11.3,11.4,11.5,11.6,11.10,12)

REFERENCES:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 7th Edition 2014.
2. Walker Royce: ―Software Project Management‖- Addison-Wesley, 5th Edition, 2013.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

NETWORK PROGRAMMING

Course 15UPCSC1E15   **3 Credits**

Course Objective:
- Learning the Unix operating system and its programming environment.
- Understanding the user/kernel interface, fundamental concepts of Unix, user authentication, basic and advanced I/O, fileystems, signals, process relationships, and interprocess communication.
- Fundamental concepts of software development and maintenance on Unix systems.

Unit-I
Introduction :UNIX Architecture - Logging In – Files and Directories – Input and Output – Programs and Processes – Error handling – User Identification – Signals – Time values – System Calls and Library functions – Standards and Implementation : UNIX Standardization – Implementations – Limits –Process Environment: main() – Process termination – Command line arguments – Environment list and variables. Process Control: Identifiers –fork () ,vfork(), exit(), wait().
Chapters: 1, 2.2, 2.3, 2.5, 7.2 to 7.5, 7.9, 8.2 to 8.8

Unit-II
exec functions – Changing User IDs and Group IDs – System function – Process accounting – User identification – Process times. Process relationships: Terminal logins – Network logins – Process groups – Sessions – Controlling terminals – tcgetpgrp ( ), tcsetpgrp() – Job control – Shell execution of programs – Orphaned process groups. Daemon Processes: Characteristics –Coding rules.
Chapters: 8.10, 8.11, 8.13 to 8.16, 9.2 to 9.10, 13.2, 13.3

Unit-III
Socket Introduction: Socket address structure – Byte ordering and manipulation functions – Address conversions functions. Elementary TCP sockets: Introduction – socket, connect, bind, listen, accept, close functions – Concurrent server – Server host crashes, rebooting and shut down. I/O multiplexing: I/O models – select () – shutdown () – poll ().
Chapters: 3.1 to 3.8, 4.1 to 4.6, 4.8, 5.14 to 5.16, 6.2, 6.3, 6.6, 6.10

Unit-IV
Socket options: getsocket () and setsocket () – Generic socket options – IP socket options (IPv4 and IPv6) – ICMP socket options – TCP socket options. Elementary UDP sockets: recvfrom and sendto functions – Lost datagrams – Verifying received response – Server not Running – connect () with UDP – Lack of flow control – Determining out going interface – TCP and UDP echo server using select() – DNS – gethostbyname() – gethostbyaddr () – getservbyname() and getservbyport ().
Chapters: 7.1 to 7.2, 7.2, 7.5 to 7.9, 8.2, 8.7 to 8.9, 8.111, 8.13 to 8.15, 11.2 to 11.5

Unit-V
IPv4 and IPv6 interoperability – Routing sockets – Key management sockets : Reading and Writing – SADB – SA – Maintaining SAs – Broadcasting : Address – Unicast Vs Broadcast – Multicasting : Multicast Vs Broadcast – Multicasting on LAN – Multicasting on WAN –

Threads: Creation and Termination – Raw sockets : Creation – Input – Output – ping program – trace route program.
Chapters: 12, 18, 19.2 to 19.5, 20.2, 20.3, 21.2 to 21.4, 26.2, 28.2 to 28.6

Text Books:
1. W. Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX Environment", Second Edition, Pearson Education, New Delhi, 2007.
   (Units I and II)
2. W.R.Stevens, B.Fenner, A.M.Rudoof, "UNIX Network Programming" Volume I, Third Edition, PHI Private Ltd, New Delhi, 2005.
   (Units III to V)

Reference Books:
1. Sumitabha Das, "Your UNIX the ultimate Guide", Tata McGraw Hill, 2002.
2. Ashok Arora, S. Bansal, "UNIX and C Programming" First edition, Firewall media, 2005.

NETWORK SECURITY AND CRYPTOGRAPHY

Course 15UPCSC1E16   **3 Credits**

Course Objective:
- **To be Learn for different Security Techniques and Algorithms on Network Concepts and Principles.**

Unit-I
Overview: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms –A Model for Network Security – Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography.

Unit-II
Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure –The Data Encryption Standard – The DES Example – The Strength of DES – Block Cipher Design Principles –Basic Concepts in Number Theory and Finite Fields: Divisibility and the Division Algorithm – The Euclidean Algorithm – Modular Arithmetic – Groups, Rings, and Fields – Finite Fields of the Form GF(p) – Polynomial Arithmetic.

Unit-III
Advanced Encryption Standard: Finite Field Arithmetic – AES Structure – AES Transformation Functions – AES Key Expansion –Block Cipher Operation: Multiple Encryption and Triple DES – Stream Ciphers – RC4 – Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems – The RSA Algorithm –Diffe-Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation Based on an Asymmetric Cipher.

Unit-IV
Cryptographic Hash Functions: Applications of Cryptographic Hash Functions – Two Simple Hash Functions – Requirements and Security – Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm(SHA) – SHA-3 – Message Authentication Codes: Requirements – Functions – Security of MACs – MACs Based on Hash Functions: HMAC – MACs based on Block Ciphers: DAA and CMAC – Authenticated Encryption: CCM and GCM – Key Wrapping.

Unit-V
Digital Signatures – Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature Algorithm – Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption – Symmetric Key Distribution Using Asymmetric Encryption – Distribution of Public Keys – X.509 Certificates – Public-Key Infrastructure.

Text Book:

1. William Stallings, "Cryptography and Network Security – Principles and Practices" Pearson Education / PHI, 6th Edition, 2014. (Chapters: 1.1 – 1.6, 2.1 – 2.5 (UNIT-I), 3.1 – 3.5, 4.1 – 4.6 (UNIT-II), 5.1 - 5.4, 6.1, 7.4, 7.5, 9.1, 9.2, 10.1-10.5 (UNIT-III), 11.1-11.6, 12.1, 12.2, 12.4 – 12.8 (UNIT-IV), 13.1-13.6, 14.1-14.5 (UNIT-V)

Reference Books:
1. Bernard Menezes, "Network Security and Cryptography", Cengage,1stEdition, 2010.
2. William Stallings, "Cryptography and Network Security", Pearson Education India, Sixth Edition, 2016.
3. V.K. Jain, "Cryptography and Network Security", Khanna Book Publishing- New Delhi, 2016.
4. C.K. Shyamala, N. Harini, Dr. T. R. Padmanabhan, "Cryptography and Security", Wiley India Pvt. Ltd., 2011.

ELECTIVE V - LIST

ENTERPRISE RESOURCE PLANNING

Course15UPCSC1E17   **3 Credits**

Unit-I
Introduction: Definition – Functional modules – Evolution of ERP systems – Characteristics – Process Integration – Benefits of ERP application – Technology in ERP systems – Implementation costs – Implementation challenges – Facts about Implementations – ERP Implementation in India – ERP Market and Vendors : ERP Market – Vendors – Service oriented on Architecture – ERP Package feature – ERP Packages.

Unit- II
Extended ERP Services : Definition – SCM and ERP – ERP and BI – ERP and E-Commerce – Business Process – Re-engineering and ERP : Definition of ERP – Enterprise Redesign Principles - BPR Vs Total Quality – BPR and change management – Implementation approaches – Implementation methodology – Role of IT in BPR – BPR and ERP systems – BPR Success / Failure factors – BPR Implementation cases.

Unit-III
Planning for ERP: Planning for Implementation – Organizational Requirements –Economic and strategic justification – Analyzing Project scope and Broad implementation approach – Determining resources – Top management commitment – Realizing the commitment – Matching with right ERP systems – Creating a budget – Selecting the right ERP package – Organization preparation – Implementation of ERP: Design – Approaches –Lifecycle – Examples.

Unit- IV
Managing ERP Projects: Risk/Failure factors – Examples of ERP failure – Implementation risks – Management and Complexity of ERP Projects – Training users –Evaluating ERP projects. Going Live and Post implementation: Preparing to GO Live – Strategies for migration to new ERP systems – GO Live performance surprises – Managing after GO Live – Maintenance of ERP systems.

Unit-V
        Expanding ERP boundaries: Service oriented architecture – Enterprise Application Integration – Application service provider model. Case studies: Manufacturing Industries – Service Industries – Governmental Organizations

Text Book
   1. Ashim Raj Singla, "Enterprise Resource Planning", Cengage Learning India Pvt Ltd, New Delhi 2008.
      Chapters: 1 to 9.

Reference Book
   1. Leon Alexis, "Enterprise Resource Planning", Tata McGraw Hill, New Delhi, 1999.

MOBILE COMPUTING

Course 15UPCSC1E18   **3 Credits**

Course Objective:
- To introduce the concepts of wireless devices with signal, Antenna, Radio Frequencies, Signal Propagation.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, Wireless LAN, GSM, CDMA.
- To introduce the WAP Architecture, MANET and Routing

Unit-I

Introduction – Applications – History of wireless communication – A Simplified reference model - Wireless transmission – Frequencies for radio transmission – Regulations – Signals –Antennas - Signal propagation: Path loss of radio signals - Additional signal propagation effects - Multi-path propagation – Multiplexing - Modulation

Chapters: 1, 2.1 to 2.6

Unit-II
Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems. Medium access control: Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access – Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access.
Chapters: 3.1 to 3.3, 3.4.1 to 3.4.4, 3.4.7 to 3.4.9, 3.5.1

Unit-III
GSM - Mobile services – System architecture – Radio interface – Protocols – Localization and calling – Handover – Security – New Data services. UMTS and IMT-2000 - Satellite Systems: Applications – Basics – Routing – Localization – Handover.
 Chapters: 3.6, 4.1.1 to 4.1.8, 4.4, 5.2 to 5.6

Unit-IV
Wireless LAN: Infra red vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture – Protocol architecture – Physics layer – Medium access control layer – MAC management – Blue tooth. Mobile network layer: Mobile IP: Goals, assumptions and requirements – entities and terminology – packet delivery – Agent discovery – Registration – Tunneling and encapsulation Recent technologies
Chapters: 7.1 to 7.3.5, 7.5, 8.1.1 to 8.1.6

Unit-V
WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Mobile ad-hoc networks – MANET Characteristics – Classification of MANETs, Routing of MANETs, Proactive Routing Protocol - DSDV, Reactive Routing Protocols – DSR, AODV.
Chapter10.3.1 to 10.3.6 (Text Book 2- 6.1, 6.2, 6.4, 6.5, 6.6)

Text Book:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2009.
2. KumKumGarg, "Mobile Computing Theory and Practice", Pearson Education, 2014.

Reference Books:

1. Rifaat A. Dayen "Mobile Data & Wireless LAN Technologies", Prentice Hall, 1997.
2. Steve Mann and Scoot Schibli, "The Wireless Application Protocol", John Wiley &inc., 2000.

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Course15UPCSC1E19   **3 Credits**

Course Objective:
- To get familiar with Artificial Intelligence Problems and techniques and the basics of Heuristic Search Techniques
- To Investigate the predicate logic and statistical reasoning concepts in the course
- To understand Game playing, Natural Language Processing Techniques and Parallel and distributed Artificial Intelligence models

UNIT – I
Artificial Intelligence: AI Problems – AI Techniques – Level of the model. **Problems, Problem Spaces and Search:** Defining the Problem – Production Systems – Problem Characteristics – Production System Characteristics – Issues. **Heuristic Search Techniques:** Hill Climbing – Best First Search.

 UNIT – II
Predicate Logic: Representing Simple Facts in logic – Instance and ISA relationships – Computable functions and Predicates – Resolution – Natural Detection. **Representing knowledge using Rules:** Procedural versus Declarative knowledge - Logic Programming – Forward and Backward Reasoning – Matching.**Symbolic reasoning under uncertainty:** Introduction to Nonmonotonic reasoning - Logics for Nonmonotonic reasoning – Implementation of Depth first and Breadth first search.

UNIT – III
Statistical Reasoning: Probability and Bayes Theorem – Certainty factors and rule based systems – Bayesian networks – Fuzzy logic. **Weak slot and Filler structures:** Semantic nets – Frames. **Strong slot and Filler structures:** Conceptual Dependency – Scripts – CYC.

UNIT – IV
Game Playing: Overview – The Minimax search procedure – Adding alpha beta cutoffs – Additional refinements – Iterative Deepening. **Planning:** Overview – Components of planning system – Goal stack planning – Nonlinear planning – Hierarchical planning – Reactive systems – other planning techniques. **Natural language processing:** Introduction – Syntactic Processing – Semantic analysis – Discourse and Pragmatic Processing – Spell Checking.

UNIT – V
Parallel and Distributed AI: Psychological modeling – Parallelism in reasoning system – Distributed reasoning systems. **Learning:** Rote learning – Explanation based learning – Discovery – Analogy – Formal Learning Theory. **Connectionist Models:** Hopfield networks – learning in neural networks – Applications of neural networks – Recurrent

networks. **Expert Systems:** Representing and using domain knowledge – Expert system shells – Explanation – Knowledge Acquisition.

Text Book:
1. Elaine Rich, Kevin Knight and Shivashankar B Nair, "Artificial Intelligence" , Tata McGraw-Hill, 2009, Third Edition.

   (Chapters : 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 18, 20)

Reference Books:
1. C.S. Krishnamoorthy; S. Rajeev, "Artificial Intelligence and Expert Systems for Engineers", CRC Press, 1996.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", Addison – Wesley, 2005, Second Edition.

WAP and XML

Course: 15UPCSC1E20   **3 Credits**

Unit I

Overview of WAP:WAP and the wireless World – WAP Application Architecture – WAP Internal Structure – WAP Versus the Web – Setting up WAP: Available Software products – WAP resources – The Development Tool Kits.

Unit II

WAP gateways: Definition – Functionality of a WAP gateway – The Web model Versus the WAP Model – Positioning of a WAP gateway in the Network – Selecting a WAP Gateway – BASIC WML : eXentsible Markup Language – WML structure – A Basic WML Card – Text formatting – Navigation – Advanced Display Features.

Unit III

Interacting with the user : Making a selection – Events Variables – Input parameter passing – WML script – Need for WML script – lexical structure – Variable & literals – Operators – Automatic data type conversion – Control Constructs – Functions – Using the standard Libraries – Programs – Dealing with errors.

Unit IV

XML: Introduction XML : An Eagle's Eye view of XML – XML Definition – Life of an XML Document – Related Technologies – An Introduction to XML Applications – XML Applications – XML for XML – First XML Documents Structuring Data : Examining the Data XMLizing the Data – The advantages of the XML format – Preparing a style sheet for Document Display.

Unit V

Attributes, Empty Tags and XSL: Attributes – Attributes Versus Elements – Empty Tags – XSL – Well formed XML Documents – Foreign Languages and Non- Roman Text : - Non Roman Scripts on the Web – Scripts, Character sets, Fonts and Glyphs – Legacy Character sets – The Unicode Character set – Procedure to Write XML in Unicode.

Text Books

1. Charles Arehart and Others, 2000, Professional WAP with WML, WML, WML script, ASP, JSP, XML, XSLT, WTA, Push and Voice XML, Shroff Publishers and Distributors Pvt. Ltd. For Unit – I, II & III.
2. Elliotte Rusty Harold, 2000, XML TM Bible, IDG Boobs India (P) Ltd. For Unit – IV & V

e-References

1. http://www.roseindia.net/wap/index.shtml

ELECTIVE VI - LIST

SOFT COMPUTING

Course 15UPCSC1E21 **3 Credits**

Course Objective:
- To understand the basic Concept of neural network, various models of Neural networks and supervised and unsupervised learning techniques
- To get familiar with the basis of Fuzzy logic , fuzzy relations, fuzzy inference system and defuzzification techniques

UNIT – I
Introduction: Neural Networks – Application scope of Neural Networks – Fuzzy Logic. **Artificial Neural Networks:** Fundamental Concept – Evaluation Neural Networks – **Basic Models of Artificial Neural Networks:** Learning - Terminologies of ANNs - McCulloch-Pitts Neuron - Linear Separability - Hebb Network.
(Chapters: 1, 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.3.2, 2.4, 2.5, 2.6, 2.7)

UNIT – II
Supervised Learning Network: Perceptron Networks – Adaptive Linear Neuron - Multiple Adaptive Linear Neurons – Back-Propagation Networks. **Associative Memory Networks:** Introduction – Training Algorithm for Pattern Association – **Hopfield Networks:** Discrete Hopfield Networks.
(Chapters: 3.1, 3.2, 3.3, 3.4, 3.5, 4, 4.1, 4.2, 4.6, 4.6.1)

UNIT – III
Unsupervised Learning Network: Introduction – Maxnet – Maxican Hat Net – Hamming Network - Kohonen Self-Organizing Feature Maps - Learning Vector Quantization-Adaptive Resonance theory Network.
(Chapters: 5.1, 5.2, 5.3, 5.4, 5.6)

UNIT – IV
Fuzzy logic: Introduction – Classical Sets – Fuzzy Sets. **Fuzzy Relations:** Cardinality of Fuzzy Relation – Operations and properties of Fuzzy Relations – Fuzzy Composition – Noninteractive fuzzy sets. **Membership Functions:** Introduction – Features of Membership functions – Fuzzification.
(Chapters: 7.1, 7.2, 7.3, 8.4, 8.6, 9.1, 9.2, 9.3)

UNIT – V
Defuzzification: Introduction – Lambda cut for Fuzzy Sets and Relations – Defuzzification Methods. **Fuzzy Arithmetic and Fuzzy Measures:** Introduction – Fuzzy Arithmetic – Fuzzy Measures.
(Chapters: 10.1 - 10.4, 11.1, 11.2, 11.4)

Text Book:

1. Dr. S. N. Sivanandam and Dr. S. N. Deepa, **"Principles of Soft Computing",** Wiley, Second Edition, 2007.

Reference Books:

1. Bart Kosko, "A dynamical system approach to Machine Intelligence, PHI,1992.
2. George J.Klirl Bo Yuen, "Fuzzy set s and Fuzzy Logic Theory and Application", PHI, 1995.
3. NareshH.sinha, Madan M. Gupta, " Soft Computing & Intelligent System – Theory & Application" - Academic press serving in Engineering, 1999.

DIGITAL IMAGE PROCESSING

Course 15UPCSC1E22   **3 Credits**

Course Objective:
- To introduce different Mathematical tools.
- To implement different morphological image processing techniques.

Unit-I
Digital Image Processing
Introduction – Origins - Examples of fields - Fundamental steps - Components of a image processing system - Elements of visual perception - Light and the electromagnetic spectrum -Image sensing and acquisition - Image sampling and quantization - Basic relationships between pixels - Mathematical tools.

Unit-II
Intensity Transformations
Background – Basic intensity transformation functions – Histogram processing – Fundamentals of spatial filtering – Smoothening spatial filters – Sharpening spatial filters – Spatial enhancement methods – Basics of filtering in the frequency domain – Image smoothening using frequency domain filters – Selective filtering – Implementation.

Unit-III
Image Compression and Segmentation
Fundamentals – Basic compression methods – Digital image watermarking – Morphological image processing – Erosion and dilation – Opening and closing – Hit-or-miss transformation – Basic morphological algorithms – Gray scale morphology – Image segmentation – Fundamentals – Point, Line and edge detection – Thresholding – Region based segmentation – Segmentation using morphological watersheds – Use of motion in segmentation.

Unit-IV
Representation and Description
Representation – Boundary descriptors – Regional descriptors – Use of principal components for description – Relational descriptors.

Unit-V
Object Recognition
Patterns and pattern classes – Recognition based on decision – Theoretic methods – Structural methods.

TEXT BOOKS:
1. Gonzalez.R.C& Woods. R.E., Digital Image Processing, 3rd Edition, Pearson Education, 2012.(Chapters: 1,2,3,4,8,9,10,11,12).
2. Anil K. Jain, Fundamentals of Digital image processing, Prentice Hall of India, 2009.(Chapters: 5,7,8,11).

REFERENCE BOOKS:
1. Chanda and Majumdar, Digital image processing and analysis, Prentice Hall, 9th Edition, 2007.
2. Rafeal C. Gonzalez Richard E. Woods, Digital image processing, 3rd Edition, Pearson Education, 2009.
3. Madhuri a. Joshi, Digital image processing an algorithmic approach, Prentice Hall of India, 2006.
4. Sonka, Hlavac, Boyle, Digital image processing and computer vision, Cengage Learning, 6th Edition, 2011.
5. S. Jayaraman, S.Esakkirajan, T.Veerakumar, Digital image processing, Tata McGraw Hill, 2011.
6. AbhishakYadev, PoonamYadev, Digital image processing, University Science Press, 2011.
7. Rafeal C. Gonzalez Richard E. Woods, Digital image processing using MATLAB, 2rd Edition, Tata McGraw Hill, 2011.

MACHINE LEARNING TECHNIQUES

Course15UPCSC1E23   **3 Credits**

Course Objective:
- To make the students understand different regression models.
- To understand the concepts of neural networks.
- To implement the WEKA tool for validating logical regressions.

Unit I
SIMPLE LINEAR REGRESSION: Introduction to Simple Linear Regression-The Least-Squares Estimates- Dangers of Extrapolation- The Coefficient of Determination, r-Standard Error of the Estimate s- Correlation Coefficient r-ANOVA Table for Simple Linear Regression- Outliers, High Leverage Points, and Influential Observations-Population Regression Equation- Verifying the Regression Assumptions- Inference in Regression-t-Test for the Relationship Between x and y -Confidence Interval for the Slope of the Regression Line - Confidence Interval for the Correlation Coefficient ρ - Confidence Interval for the Mean Value of y Given x - Prediction Interval for a Randomly Chosen Value of y Given x - Transformations to Achieve Linearity-Box–Cox Transformations.

Unit II
MULTIPLE REGRESSION AND MODEL BUILDING: Introduction to Multiple Regression-The Population Multiple Regression Equation-Inference in Multiple Regression-Regression with Categorical Predictors, Using Indicator Variables-Adjusting R2: Penalizing Models for Including Predictors that are not Useful- Sequential Sums of Squares-Multicollinearity- Variable Selection Methods- An Application of Variable Selection Methods- Using the Principal Components as Predictors in Multiple Regression.

Unit III
NEURAL NETWORKS: Input and Output Encoding- Neural Networks for Estimation and Prediction- Simple Example of a Neural Network-Sigmoid Activation Function-Back-Propagation-Gradient-Descent Method - Back-Propagation Rules- Example of Back-Propagation-Termination Criteria -Learning Rate- Momentum Term- Sensitivity Analysis Application of Neural Network Modeling.

Unit IV
LOGISTIC REGRESSION: Simple Example of Logistic Regression- Maximum Likelihood Estimation- Interpreting Logistic Regression Output-Odds Ratio and Relative Risk-Interpreting Logistic Regression for a Dichotomous Predictor-Interpreting Logistic Regression for a Polychotomous Predictor-Interpreting Logistic Regression for a Continuous Predictor- Assumption of Linearity-Zero-Cell Problem- Multiple Logistic

Regression- Introducing Higher Order Terms to Handle Nonlinearity - Validating the Logistic Regression Model-WEKA: Hands-On Analysis Using Logistic Regression.

Unit V
GENETIC ALGORITHMS:Introduction To Genetic Algorithms-Basic Framework of a Genetic Algorithm- Simple Example of a Genetic Algorithm at Work - Modifications and Enhancements: Selection-Modifications and Enhancements: Crossover- Genetic Algorithms for Real-Valued Variables- Using Genetic Algorithms to Train a Neural Network - WEKA: Hands-On Analysis Using Genetic Algorithms- Case Study: Clustering and Principal Components Analysis

Text Book
Daniel T. Larose , Chantal D. Larose, Data mining and Predictive analytics, Second Ed., Wiley Publication, 2015.
Chapters: 8,9,12,13,27,30

Reference Books
1. Bertt Lantz , Machine Learning with R,   Packt Publishing, 2013
2. Jason Bell, Machine Learning:Hands-On for Developers and Technical Professionals, Wiley Publication, 2015.

FUNCTIONAL PROGRAMMING IN JAVA

Course 15UPCSC1E24   **3 Credits**

Unit – I
Introduction to Functional Programming
Introducing Functional Programming - Identifying a paradigm - Subdividing the procedural paradigm - A classic example of functional programming - Exploratory Data Analysis - Introducing Some Functional Features: First-class functions - Immutable data - Strict and non-strict evaluation - Recursion instead of a explicit loop state - Functional type systems - Familiar territory - Saving some advanced concepts- Functions, Iterators, and Generators: Writing pure functions - Functions as first-class objects - Using strings - Using tuples and named tuples - Cleaning raw data with generator functions - Using lists, dicts, and sets

Unit – II
Functional Programming Concepts in Python
Working with Collections: An overview of function varieties - Working with iterables - Using zip(), reversed(), enumerate(), max() and min() functions- Using Python lambda forms - Lambdas and the lambda calculus - Using the map(), filter(), iter() and sorted() functions – Writing Higher order functions, mappings and filters, Generator Functions - Building higher-order functions with Callables – Design Patterns – Recursions and Reductions: Simple numerical recursions - Group-by reductions – from many to fewer

Unit – III
Advanced Functional Programming Concepts in Python
Additional Tuple Techniques - Using an immutable namedtuple as a record - Building namedtuples with functional constructors - Avoiding stateful classes by using families of tuples - Polymorphism and Pythonic pattern matching - The Itertools Module: Working with the infinite iterators - Using the finite iterators - Cloning iterators with tee() - The itertools recipes - More Itertools Techniques: Enumerating the Cartesian product - Reducing a product - Permuting a collection of values - Generating all combinations - The Functools Module: Function tools -Memoizing previous results with lru_cache- Defining classes with total ordering - Applying partial arguments with partial() - Reducing sets of data with reduce()

Unit – IV
Functional Programming Concepts in Java
Using Collections:Lists – Finding Elements - Reusing Lambda Expressions - Using Lexical Scoping and Closures - Picking an Element - Reducing a Collection to a Single Value - Joining Elements - Strings, Comparators, and Filters: Iterating a String - Implementing the Comparator Interface - Multiple and Fluent Comparisons - Using the collect Method and the Collectors Class - Prepared exclusively for Ji-Young Kim Listing All Files in a Directory - Listing Select Files in a Directory - Listing Immediate Subdirectories using flatMap –

Watching a File Change - Designing with Lambda Expressions: Separating Concerns Using Lambda Expressions - Delegating Using Lambda Expressions - Decorating Using Lambda Expressions - A Peek into the default Methods - Creating Fluent Interfaces Using Lambda Expressions - Dealing with Exceptions-Working with Resources: Cleaning Up Resources - Using Lambda Expressions to Clean Up Resources - Managing Locks - Creating Concise Exception Tests

Unit – V
Advanced Functional Programming Concepts in Java

Being Lazy: Delayed Initialization - Lazy Evaluations - Leveraging the Laziness of Streams - Creating Infinite, Lazy Collections – Optimizing Recursions: Using Tail-Call Optimization - Speeding Up with Memoization – Composing with Lamda Expressions: Using Function Composition - Using MapReduce -Taking a Leap to Parallelize – Bringing all together: Essential Practices to Succeed with the Functional Style - Performance Concerns - Adopting the Functional Style

Text Books

1. VenkatSubramaniam, "Functional Programming in Java Harnessing the Power of Java 8 Lambda Expressions", The Pragmatic Programmers, 2014. (Chapters – 2-9)
2. Steven Lott, "Functional Python Programming", Packt Publishing, 2015. (Chapters – 1-10)