

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

Accredited by NAAC, Affiliated to Periyar University,

Recognized under 2(f) & 12(B) of UGC Act, 1956

Kalippatti (Po), Tiruchengode (Tk), Namakkal (Dt) – 637501.



**DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM**

SYLLABUS FOR M.Sc. COMPUTER SCIENCE

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2016 - 2017 ONWARDS**

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI, NAMAKKAL (Dt) – 637501.

REGULATIONS FOR M.Sc. COMPUTER SCIENCE DEGREE COURSE

with Semester System and CBCS Pattern

(Effective from the academic year 2015-2016)

1. OBJECTIVE OF THE COURSE

To develop the Post Graduates in Computer Science with strong knowledge of theoretical computer science subjects who can be employed in research and development units of industries and academic institutions.

2. ELIGIBILITY FOR ADMISSION

A candidate who has passed B.Sc., Computer Science / BCA / B.Sc. Computer Technology / B.Sc. Information Science / B.Sc. Information Technology degree of any University accepted by the College Academic Council as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the **M.Sc. Computer Science** degree examination of after a course of study of two academic years.

3. DURATION OF THE COURSE

The course for the degree of **Master of Science in Computer Science** shall consist of two academic years divided into four semesters. Each semester consist of 90 working days.

4. COURSE OF STUDY

The course of study shall comprise instructions in Core and Elective subjects according to the syllabus and books prescribed from time to time. This syllabus for various subjects shall be clearly demarcated into five viable UNITS in each paper / subject.

5. EXAMINATIONS

The Theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination. The practical examinations for PG course should be conducted at the end of the every semester.

6. a) SUBMISSION OF RECORD NOTE BOOKS FOR PRACTICAL EXAMINATIONS

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

6. REVISION OF REGULATIONS AND CURRICULUM

The college may revise / amend / change the Regulations and Scheme of Examinations, if found necessary.

7. PASSING MINIMUM

a) THEORY

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks out of 100(CIA – 12 marks out of 25 and EA – 38 marks out of 75) in the examination in each theory paper.

a) PRACTICAL

The candidate shall be declared to have passed the examination if the candidate secure not less than 50 marks put together out of 100(CIA – 20 marks out of 40 and EA – 30 marks out of 60) in the examination in each practical paper.

8. EVALUATION PATTERN

Theory: Internal [CIA]: 25 Marks & External [EA]: 75 Marks Max. Marks: 100

Internal Marks Distribution [CIA] (Total Marks: 25)

- Attendance : 5 Marks
- Assignment : 5 Marks
- Seminar : 5 Marks
- Internal Examinations : 10 Marks

External Marks Distribution [EA] (Total Marks: 75)

Practical: Internal [CIA]: 40 Marks & External [EA]: 60 Marks Marks: 100

Internal Marks Distribution Practical / Software Development Lab [CIA] (Total Marks: 40)

- Preparation of Record & Submission : 15 Marks
- Internal Practical Examinations : 25 Marks

The components for continuous internal assessment are:

- Attendance : 5 Marks
- Model Practical Examinations : 20 Marks

External Marks Distribution Practical [EA] (Total Marks: 60)

For each Practical question the marks should be awarded as follows (External):

- | | | |
|--|---|-----|
| (i) Algorithm / Flowchart | - | 20% |
| (ii) Writing the program in the main answer book | - | 30% |
| (iii) Test and debug the programs | - | 30% |
| (iv) Printing the correct output | - | 20% |

(Marks may be proportionately reduced for the errors committed in each of the above)

Software Development Lab Marks Distribution [EA] (Total Marks: 60)

Students should write about their project work briefly. **(20 Marks)**

- i) Aim
- ii) Features
- iii) Description of Modules

Viva-voce: 40 Marks

PROJECT DISSERTATION (Max. 200 Marks)

Internal : 50 Marks
 Evaluation (External) : 50 Marks
 Viva -Voce (Joint) : 100 Marks

9. QUESTION PAPER PATTERN

Theory: Time: 3 Hours Max.Marks: 75

PART-A (5 x 5 = 25)

Answer all the questions (Either or type from each unit)

PART-B (5 x 10 = 50)

Answer all the questions (Either or type from each unit)

Practical: Time: 3 Hours Max.Marks: 60

1. One compulsory question from the given list of objectives : 30 Marks
2. One either / OR type question from the given list of objectives : 30 Marks

10. REGULATIONS OF PROJECT WORK

- Students should do their five months [December to April] Project work in Company / Institutions
- The candidate should submit the filled in format as given in **Annexure – I** to the department for approval during the first week of January in their project semester
- Each internal guide shall have maximum of 4 Students
- Periodically the project should be reviewed minimum three times by the advisory committee
- The students should prepare three copies of the dissertation and submit the same to the college in the month of April for the evaluation by examiners. After evaluation one copy is to be retained in the college library and the student can hold one copy.
- A sample format of the dissertation is enclosed in **Annexure – II**
- Format of the Title page and certificate are enclosed in **Annexure – III**
- The Students should use Power Point Presentation during their Project Viva-voce Examinations.

11. CLASSIFICATION OF SUCCESSFUL CANDIDATES

- FIRST CLASS WITH DISTINCTION – 75% and above at the first appearance
- FIRST CLASS - 60% and above
- SECOND CLASS - 50% to 59%

12. COMMENCEMENT OF REGULATION

These regulations shall take effect from the academic year 2016 – 2017, i.e. for students who are to be admitted to the first year of the course during the academic year 2016 – 17.

ANNEXURE – I

College Name :

Course :

Student Name :

Register Number :

Title of the Project :

Address of Organization / Institution :

Name of the Guide :

Qualification :

Teaching Experience :

Place:

Date:

Signature of Guide

HEAD OF THE DEPARTMENT

ANNEXURE II
COLLEGE BONAFIDE CERTIFICATE
COMPANY ATTENDANCE CERTIFICATE
ACKNOWLEDGEMENT
CONTENTS

Page No.

SYNOPSIS

1. INTRODUCTION

ORGANIZATION PROFILE
SYSTEM SPECIFICATION
HARDWARE CONFIGURATION
SOFTWARE CONFIGURATION

2. SYSTEM STUDY

EXISTING SYSTEM
DRAWBACKS
PROPOSED SYSTEM
FEATURES

3. SYSTEM DESIGN AND DEVELOPMENT

FILE DESIGN
INPUT DESIGN
OUTPUT DESIGN
DATABASE DESIGN
SYSTEM DEVELOPMENT
DESCRIPTION OF MODULES

(Detailed explanation about the project work)

4. TESTING AND IMPLEMENTATION

5. CONCLUSION

BIBLIOGRAPHY
APPENDICES
A. DATA FLOW DIAGRAM
B. TABLE STRUCTURE
C. SAMPLE CODING
D. SAMPLE INPUT
E. SAMPLE OUTPUT

ANNEXURE III

1) Format of the Title page

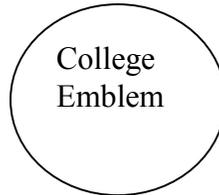
TITLE OF THE DISSERTATION

A Dissertation submitted in partial fulfillment of
the requirements for the degree of
Master of Science in Computer Science

by

STUDENT NAME

Reg.No:



DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI – 637 501.

MONTH – YEAR

2) Format of the Certificate

MAHENDRA ARTS & SCIENCE COLLEGE

(Autonomous)

KALIPPATTI – 637 501.

MONTH – YEAR

PROJECT WORK TITLE OF THE DISSERTATION

Bonafide Work done by

STUDENT NAME

REG. NO

A Dissertation submitted in partial
fulfillment of the requirements for the degree of
Master of Science in Computer Science

INTERNAL GUIDE

HEAD OF THE DEPARTMENT

Submitted for the Viva-Voce Examination held on _____

Internal Examiner

External Examiner

Credits Distribution

M.Sc. Computer Science (2016-2017)

Semester	No. of credits				Total Credits	Max. Marks
	I	II	III	IV		
Major	16	12	16	8	52	1300
Elective	4	4	4	4	16	400
Practical	4	4	4	-	12	600
EDC	-	4	-	-	4	100
Project	-	1	-	4	5	300
Human Rights	-	2	-	-	2	100
Soft Skills	2	-	-	-	2	100
Cumulative Total	26	27	24	16	93	2900

S. No.	Subject	Subject Code	Hrs. / Week	Exam Duration (Hrs)	Maximum Marks			Credit Points
					IA	EE	Total	
Semester I								
1	Core - I Advanced Java Programming	M16PCS01	5	3	25	75	100	4
2	Core - II Advanced Computer Architecture	M16PCS02	4	3	25	75	100	4
3	Core - III .NET Programming	M16PCS03	5	3	25	75	100	4
4	Core - IV Design and Analysis of Algorithms	M16PCS04	4	3	25	75	100	4
5	Elective – I Software Project Management	M16PCSE04	4	3	25	75	100	4
6	Core Practical I: Java	M16PCSP01	3	3	40	60	100	2
7	Core Practical II: .Net Programming	M16PCSP02	3	3	40	60	100	2
8	Soft Skill - Quantitative Aptitude	M16PCSSS01	2	3	100	-	100	2
Total			30		305	495	800	26

Semester II								
1	Core - V Network Management	M16PCS05	5	3	25	75	100	4
2	Core – VI Advanced Data Structures	M16PCS06	5	3	25	75	100	4
3	Core - VII Discrete Mathematics	M16PCS07	5	3	25	75	100	4
4	Elective – II Wireless Application Protocol	M16PCSE05	4	3	25	75	100	4
5	Core Practical III: Networking Lab	M16PCSP03	3	3	40	60	100	2
6	Core Practical IV: Advanced Data Structures	M16PCSP04	3	3	40	60	100	2
7	EDC: Business Communication	M16PCMED1	3	3	25	75	100	4
8	Human Rights	M16PHR01	2	3	25	75	100	2
9	Mini Project	M16PCSPR1	-	3	100	--	100	1
Total			30		330	570	900	27

S. No.	Subject	Subject Code	Hrs. / Week	Exam Duration (Hrs)	Maximum Marks			Credit Points
					IA	EE	Total	
Semester III								
1	Core – VIII Data Mining	M16PCS08	5	3	25	75	100	4
2	Core – IX Cloud Computing	M16PCS09	5	3	25	75	100	4
3	Core – X Theory of Computation	M16PCS10	5	3	25	75	100	4
4	Core – XI Internet Programming	M16PCS11	5	3	25	75	100	4
5	Elective – III Principles of Programming Languages	M16PCSE11	4	3	25	75	100	4
6	Core Practical V: Data Mining using R-Programming	M16PCSP05	3	3	40	60	100	2
7	Core Practical VI: Web Based Software Development	M16PCSP06	3	3	40	60	100	2
Total			30		205	495	700	24

Semester IV								
1	Core - XII Machine Learning	M16PCS12	5	3	25	75	100	4
2	Core – XIII Advanced Mobile Computing	M16PCS13	5	3	25	75	100	4
3	Elective – IV Big Data Analytics	M16PCSE13	5	3	25	75	100	4
4	Project	M15PCSPR2	-	3	50	150	200	4
Total			30		125	375	500	16

ELECTIVE – I		
Students should select any one of the following subjects as Elective in the First Semester		
S. No.	Subject Code	Title of the Paper
1.	M16PCSE01	Object Oriented Analysis and Design
2.	M16PCSE02	Software Engineering
3.	M16PCSE03	Green Computing
4.	M16PCSE04	Software Project Management
ELECTIVE – II		
Students should select any one of the following subjects as Elective in the Second Semester		
S. No.	Subject Code	Title of the Paper
1.	M16PCSE05	Wireless Application Protocol
2.	M16PCSE06	Client-Server Technology
3.	M16PCSE07	Advanced Database Management Systems
4.	M16PCSE08	Advanced Operating Systems
ELECTIVE – III		
Students should select any one of the following subjects as Elective in the Third Semester		
S. No.	Subject Code	Title of the Paper
1.	M16PCSE09	Information Security
2.	M16PCSE10	Professional Practices
3.	M16PCSE11	Principles of Programming Languages
4.	M16PCSE12	Embedded Systems
ELECTIVE – IV		
Students should select any one of the following subjects as Elective in the Fourth Semester		
S. No.	Subject Code	Title of the Paper
1.	M16PCSE13	Big Data Analytics
2.	M16PCSE14	Open Source Technologies
3.	M16PCSE15	Social Computing
4.	M16PCSE16	Digital Image Processing

Core 1	M.Sc. Computer Science	2016-2017
M16PCS01	ADVANCED JAVA PROGRAMMING	
Credit: 4		

UNIT - I

JDBC: The Design of JDBC: JDBC Driver Types – Typical Uses of JDBC. Basic JDBC Programming concepts – Query Execution – Scrollable and Updatable Result Sets - Metadata – Row Sets – Transactions - Stored Procedures.**(Reference Book 1)**

UNIT - II

Applet: AWT Classes : window Fundamentals-working with Frame windows - working with Graphics - working with Color - working with Fonts. JApplet - Button - Combo - Trees - Tables - Panes. **(Text Book 1)**

UNIT - III

(Text Book 1)Servlet: Life Cycle of Servlet – The Servlet API – The javax.servlet Package - Reading Servlet Parameters – The javax.servlet.http Package –Handling HTTP Requests and Responses - Cookies - Session Tracking. **Java Server Pages: Overview – Implicit Objects – Scripting – Standard actions – Directives (Reference Book: 1)**

UNIT - I V

(Text Book 1)Networking: InetAddress - TCP/ IP client sockets - TCP/ IP server sockets - URL - URL Connection – Datagrams. **(Text Book 2)Remote Method Invocation:** Setup for Remote Method Interfaces and Implementations – Parameter Passing in Remote Methods – Server Object Activation – Java IDL and CORBA – Creating RMI Client and Server Classes RMI.

UNIT - V

(Text Book 1)Java Beans: Bean Development Kit - Jar Files - Introspection - Design Pattern for properties, events and methods - Constrained Properties - Persistence – Customizers.

XML: Introduction XML – Parsing an XML Document – Validating XML Documents. **(Ref.Book 1)**

Text Books

1. Patrick Naughton & Herbert Schildt, "The Complete Reference: Java 2", 5th Edition 2007, Tata McGraw Hill.
2. Cay.S.Horstmann, Gary Cornal, "Core Java@-vol II – Advanced Features" 7th Edition, Prentice Hall.

References

1. Deitel & Deitel, "Java How to Program", Prentice Hall, 10th Edition, 2015.
2. Peter Hagggar, "Practical Java: Programming Language Guide", Addison-Wesley Pub Co, 1st Edition, 2000.
3. Bruce Eckel, "Thinking in Java", Pearson Education Asia, 2nd Edition, 2000.

Core 2	M.Sc. Computer Science	2016-2017
M16PCS02	ADVANCED COMPUTER ARCHITECTURE	
Credit: 4		

UNIT I

Parallel Computer Models: The State of Computing-Multiprocessors and Multicomputers: Shared Memory Multiprocessors-Distributed Memory Multicomputers, Multivectors and SIMD Computers, PRAM and VLSI Models.

UNIT II

Program and Network Properties: Conditions of Parallelism-Program Partitioning and Scheduling-Program Flow Mechanisms-System Interconnect Architectures. **Principles of Scalable Performance:** Parallel Processing Applications-Speedup Performance Laws-Scalability Analysis and Approaches.

UNIT III

Processors and Memory Hierarchy: Advanced Processor Technology-Superscalar and Vector Processors-**Bus, Cache, and Shared Memory:** Backplane Bus Systems-Cache Memory Organizations-Shared Memory Organizations-Sequential and Weak Consistency Models.

UNIT IV

Pipelining and Superscalar Techniques: Linear Pipeline Processors-Nonlinear Pipeline Processors- Instruction Pipeline Design-Arithmetic Pipeline Design. Superscalar and Super pipeline Design: Superscalar Pipeline Design-Super pipelined Design. Multiprocessor and Multicomputer: Multiprocessor System Interconnects.

UNIT V

Parallel Program Development and Environments: Parallel Programming Environments-Synchronization and Multiprocessing Modes-Shared Variable Program Structures-Message Passing Program Development-Mapping programs onto Multicomputer.

TEXT BOOK

1. “Advanced Computer Architecture” Kai Hwang 2nd Edition McGraw Hill, Inc 2008.

REFERENCE BOOKS

1. Kai Hwang, Faye A. Briggs, ‘Computer Architecture and Parallel Processing’, 1985, McGraw Hill Publications.
2. Carling A, ‘Parallel processing’, 1992, Galgotia Publications.

Core 3	M.Sc. Computer Science	2016-2017
M16PCS03	.NET Programming	
Credit: 4		

UNIT – I

Visual Basic .NET and the Framework: - Getting to know the runtime – The Common Language Runtime – Understanding Assemblies. **The Visual Basic .NET Development Environment:** Working with the Visual Studio IDE – Creating a Visual Basic .NET Solution. **The Elements of Visual Basic .NET:** Getting Started – Classes the View from the Above – Working with Numbers – Working with Variables and Constants.

UNIT II

Visual Basic .NET Operators – Software Design, Conditional Structures, and Control Flow: Control Structures – Control Flow – Conditional Statements – Loops. **Methods:** What is a Method – Method Data – Method Access Characteristics - Properties – Introduction to Exception Handling

UNIT III

Building Web Pages with ASP.NET: Understanding ASP.NET Web Forms: - Understanding the Web Form Code Model – Web Form Event Handling – Automatic State Management with Web Forms – **Creating Simple Web Pages with the HTML Server Controls:** What are HTML Server Controls – The General Controls – The Table Controls – The Input Controls.

UNIT IV

Creating Interactive Forms with Web Form Server Control: What are Web Server Controls? – The Web Control Class – General Controls – Form Controls – Table Controls. **Designing Advanced Interface with Web Forms List Controls:** Using Simple List Controls – Using Templated List Controls. **Improving Your User Interfaces with Validation Controls:** What are Validation Controls – Properties and Methods Common to All Validation Controls – Simple Validation Controls – Advanced Validation Controls.

UNIT V

Handling Data Access with ADO.NET: Introduction to ADO.NET and Data Binding: The ADO.NET Dichotomy - Data Binding. **Accessing Data with .NET Data Providers:** Working with .NET Data Providers – Connecting to Data Using Connections – Executing SQL with Commands – Fast Data Access with Data Reader – Creating Datasets with Data Adapters. **Working with ADO.NET Data Sets:** Creating a Dataset – Working with Data table – Filtering, Sorting and binding with Data views – Relating Tables with Data relation Object – Fabricating Datasets.

Text Books

1. Jeffrey R.Shapiro, Visual Basic.Net The Complete Reference, Tata McGraw Hill 2002 Edition
2. Michael Amundsen, Paul Litwin, ASP.NET for developers, SAMS Publishing, 2002 Edition.

Reference Books

1. Evangelos Petroustos, Mastering Visual Basic Dot Net, BPB Publications
2. Kathleen Kalata, Introduction to ASP.NET 2.0, Third Edition, Thomson Course Technology.

EBook -Website Link

1. <https://www.ebooksworld.in/pages/464>
2. <http://www.024yeya.com/book/search.php?req=ASP.NET%20Developer>

Core 4	M.Sc. Computer Science	2016-2017
M16PCS04	DESIGN AND ANALYSIS OF ALGORITHMS	
Credit: 4		

UNIT – I

Introduction: Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis Framework – Asymptotic Notations and Basic Efficiency Classes – Mathematical analysis for Non-recursive and Recursive algorithms.

UNIT – II

Brute Force: Closest-Pair and Convex-Hull Problems – **Exhaustive Search:** Travelling Salesman Problem – Knapsack Problem – Assignment Problem. **Divide and conquer methods:** Merge Sort – Quick Sort – Binary Search – Multiplication of Large Integers and Strassen’s Matrix Multiplication – Closest-Pair and Convex-Hull Problems.

UNIT – III

Dynamic Programming: Computing a Binomial Coefficient – Warshall’s and Floyd’s algorithm – Optimal Binary Search Trees – The Knapsack Problem and Memory functions. **Greedy Technique:** Prim’s algorithm – Kruskal’s Algorithm – Dijkstra’s Algorithm – Huffman Trees.

UNIT – IV

Iterative Improvement: The Simplex Method – The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs – The Stable Marriage Problem.

UNIT – V

Limitations of Algorithm Power: Lower-Bound Arguments – Decision Trees – P , NP and NP -complete Problems – **Coping with the Limitations of Algorithm Power:** Backtracking n-Queens Problems – Hamiltonian Circuit Problem – Subset-Sum Problem – **Branch and Bound:** Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP -hard Problems.

Books for Study

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, 2nd Edition, Pearson Education, 2012.

Core: Practical 1	M.Sc. Computer Science	2016-2017
M16PCSP01	PRACTICAL I - JAVA LAB	
Credit: 2		

1. Use JDBC connectivity and create Table, insert and update data.
2. Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface.
3. Create a Japplet using swing control, which will create the layout shown below and handle necessary events.

Format

Enter your Name:

Enter your Age:

Select your s/w: * Oracle *Visual Basic *Java

Select your city : *Delhi *Mumbai *Chennai

OK Cancel

4. Write a program in Java to implement a Client/Server application using RMI.
5. Write a program in Java to create a Cookie and set the expiry time of the same.
6. Write a program in Java to create Servlet to count the number of visitors to a web page.
7. Write a program in Java to create a form and validate a password using Servlet.
8. Develop a Java Bean to demonstrate the use of the same.
9. Write a program in Java to convert an image in RGB to a Grayscale image.
10. Develop Chat Server using Java.

Core: Practical 2	M.Sc. Computer Science	2016-2017
M16PCSP02	Practical II - .NET Programming Lab	
Credit: 2		

1. Create a simple application using controls in VB.Net.
2. Write a VB.Net program to accept a string and convert the case of the characters.
3. Develop a VB.Net Application for simple calculator.
4. Develop a VB.Net Application to display Student information using Data Grid.
5. Create a Web page with basic controls using ASP.NET.
6. Develop a web page using all validation controls.
7. Develop a web page for a software company.
8. Create ASP.Net Web Page with Applications and Session States.
9. Develop Book Store applications using ADO.Net.
10. Develop a Database Application using ASP.Net and ADO.Net to perform Online Quiz.

Core: V	M.Sc. Computer Science	2016-2017
M16PCS05	NETWORK MANAGEMENT	
Credit: 4		

Unit I

Categories of Network: Local Area Network (LAN) –Metropolitan Area Network (MAN) - Wide Area Network (WAN) – Comparison between LAN, WAN and MAN – Global Area Network – Building Backbone - **Networks:** Types of connections – **Network topologies:** Bus, Star, Ring, Mesh and Hybrid Topology – Comparison between Bus and Ring topology – OSI Model: Layered Network architecture - Layers in OSI Models

Unit II

Internetworking (Connecting LANs): Connecting devices – Hubs (Passive, Active and Intelligent Hub) – repeaters – Bridges(Bridge architecture – functions of bridge – Fixed routing bridges – Transparent bridges or spanning tree bridges-source routing bridges – remote bridges) – Switches (layer 2, 3,4 switch) – Routers – Gateways – Network interface card (NIC) – Difference between repeater, bridge, router and gateway

Network Layer: Functions of network layer – Ipv4 Addresses (Classful addressing – Special addressing – Classless addressing – Header format – IP fragmentation – options – sub netting a network – Network Address Translation(NAT) – Classless Inter domain Routing (CIDR)) – Ipv6 Addresses(Address types – packet format – Extension headers) – Transition from IPv4 to IPv6 – Address mapping.

Unit III

TCP / IP Protocol Suit: Addressing (Physical Addresses, Logical Addresses, Port addresses and Special addresses) – Transport Services – Elements of Transport protocols (Addressing- connection termination- Flo0w control and buffering –Multiplexing) Simple Transport Protocol (STP) – User Datagram Protocol – (UDP) – **Transmission Control Protocol (TCP):** TCP Services – TCP Header – TCP connection establishment Protocol / Three way hand shake – Connection termination – TCP timeout and retransmission – TCP Data flow – TCP congestion – TCP finite state machine.

Unit IV

Network Security: Understanding the need for security: understanding the problem – recognizing the problem – **The risk analysis process:** Accessing security risks- Identifying and minimizing explore. **Implementing user access security:** Managing user accounts – Managing passwords – Managing access security and user rights. **Configuring Network security:** Identifying network attacks-Adding firewalls-Adding Encryption- Implementing wireless security – using auditing and Logs. **Configuring Computer security:** Understanding Malicious software-Protecting Networked computers.

Unit V

Network Management: Recognizing network management requirements: Identifying management requirements – Justifying Network administration – Considering network management strategies. **Managing reliability:** Managing Backups – Managing Redundancy project. **Controlling configuration management:** Understanding user management – Understanding Software management. – **Monitoring your network:** Establishing a baseline – Analyzing network performance – Monitoring network computers. **Using management systems:** Managing TCP/IP networks – Remotely monitoring a network – Using common management information protocol – Implementing Network management systems. **Managing individual servers:** Understanding local management – Understanding remote management.

Text Books

1. Computer Networks, Vilas.S. Bagad and Iresh .A. Dhotre , Technical Publications 2011.
2. Networking Basics Patric Ciccarelli, Christina Faulkner, Jerry FitzGerald, Alan Dennis, David Groth and Toby Skandier with Frank Miller.

<https://books.google.co.in/books?id=KpOb37EHETcC&printsec=frontcover#v=onepage&q&f=false>

Core: 6	M.Sc. Computer Science	2016-2017
M16PCS06	ADVANCED DATA STRUCTURES	
Credit: 4		

Unit I: Algorithm Analysis

Introduction: Mathematical Background-Model-What to analyze? - Running time calculations.

Lists, Stacks and Queues: Abstract Data Types (ADTs)-The List ADT-The Stack ADT-The Queue ADT.

Unit II: Trees

Preliminaries-Binary trees-The Search Tree ADT-Binary Search Trees-AVL Trees-Splay Trees-Tree traversal (Revisited) – B-Trees.

Unit III: Hashing & Sorting

Hashing: Hash Function- Separate Chaining- Hash Tables without Linked Lists - Rehashing-Linear Probing- Rehashing-Universal Hashing-Extendible Hashing.

Sorting: Sorting – Insertion Sort- A Lower Bound for simple Sorting Algorithms-Shell sort- Heap sort- Merge sort- Quick sort- External Sorting.

Unit IV: Graph Algorithms and Design Techniques

Graph algorithms: Definitions-Topological Sort-Shortest Path Algorithms-Network flow Problems-Minimum Spanning Tree-Applications of Depth - First search.

Algorithm Design Techniques: Dynamic Programming-Randomized Algorithms-Backtracking Algorithms.

Unit V: Advanced Data Structures and Implementation

Top-Down Splay Trees-Red-Black Trees, Treaps-Suffix Arrays and Suffix Trees- -d Trees-Pairing heaps.

Reference Books

1. Mark Allen Weiss-Data structures and Algorithm Analysis in C++, Pearson Education, 4th Edition,2014.
2. Horowitz Sahni, Rajasekaran, —Computer Algorithms, Galgotia, 2000.

Core Practical 3	M.Sc. Computer Science	2016-2017
M16PCSP03	PRACTICAL III – NETWORKING LAB	
Credit: 4		

List of Practical's

1. a. Making of Ethernet cable
 b. Icons for networking devices
 c. Types of cables used to connect devices and simulators
2. a. Assigning and finding the ip address & MAC address
 b. Identifying the classes of ip addresses
3. Capturing Hub functions
4. Capturing Switch functions
5. Routing configuration method using 3 routers, 3 switches & PC's
6. Static & default routing configuration
7. Configuring switch to switch devices
8. Configuration of router with multiple switch
9. HCP configuration
10. Telnet configuration

Core Practical 4	M.Sc. Computer Science	2016-2017
M16PCSP04	PRACTICAL IV – ADVANCED DATA STRUCTURES LAB	
Credit: 4		

List of Practical's

1. Write a C++ program to implement **Circular Queue** ADT using an Array.
2. Write a C++ program to perform the following operations into a **Binary Search Tree**
 - a) Insert an element b) Delete an element c) Search for a key element
3. Write a C++ program to implement **Quick sort**.
4. Write a C++ program to implement **Heap sort**.
5. Write a C++ program for **Shortest Path Problem using Digikstra's algorithm**.
6. Write a C++ program to implement **Depth First Search (DFS)** algorithm.
7. Write a C++ program to find a **Minimum Spanning tree**.
8. Write a C++ program to perform the following operations into a **Tree Traversal**

(Revisited) a) Preorder b) In order c) Post order.
9. Write a C++ programs to implement **Backtracking algorithm**.
10. Write a C++ program to implement **Splay tree**.

Core 8	M.Sc. Computer Science	2016-2017
M16PCS08	DATA MINING	
Credit: 4		

Unit I

Data Mining

What is Data Mining - Data Mining - On What kind of Data: Relational Databases-Data Warehouses-Transactional Databases-Advanced data and Information systems and Advanced Applications - **Data Mining Functionalities-What kinds of patterns can be mined:** Concept\Class description: Characterization and Discrimination –Mining frequent patterns, Associations and Correlations-Classification and Prediction-Cluster Analysis – Outlier Analysis - Evolution Analysis. **Classification of data mining systems – Data mining task primitives.**

Data Preprocessing

Why preprocess the data - Data cleaning: Missing values-Noisy data-Data cleaning as a process-**Data integration and Transformation:** Data integration—Data transformation-**Data reduction:** Data cube aggregation-Attribute subset selection-Dimensionality reduction – Numerosity reduction.

Unit II

Data warehouse

What is data warehouse: Difference between operational database systems and data warehouses - **Data warehouse architecture:** Steps for the design and construction of data ware houses-3-tier data ware house architecture-data warehouse back-end tools and utilities- Metadata repository – Types of OLAP servers: ROLAP vs MOLAP vs HOLAP- **Data warehouse implementation** – Efficient computation of data cubes – Indexing OLAP data – Efficient processing of OLAP queries – **From data warehousing to data mining :** Data warehouse usage – From on-line analytical processing to on-line analytical mining.

Unit III

Association Rule Mining

Efficient and Scalable Frequent Item set Mining Methods: Apriori algorithm - Generating Association rules from frequent item sets-Improving the efficiency of Apriori- Mining frequent item sets without candidate generation – Mining frequent item sets using vertical data format

Classification

Introduction - Issues regarding classification and prediction – Preparing the data for classification and prediction – Comparing classification and prediction methods **Classification by Decision tree induction** – Decision tree induction. **Bayesian classification-** Bayes’ Theorem – Naïve Bayesian classification – Bayesian belief networks

Classification by BackPropagation- A multilayer feed-forward neural network – Defining a network topology – Backpropagation

Unit IV

Prediction: Linear regression – Nonlinear regression. **Accuracy and error measures:** Classifier accuracy measure- Predictor error measures

Cluster Analysis

Introduction -**Types of Data in cluster analysis** – Interval scaled variables – Binary variables-Categorical, Ordinal and ratio-scaled variables- variables of mixed types-vector objects.

Unit V

Data Mining Applications: Data mining for financial analysis – Data mining for the retail industry-Data mining for telecommunication industry-Data mining for Biological data analysis- Data mining in other scientific applications.

Additional Themes on Data Mining: Theoretical Foundations of Data Mining – Statistical Data Mining – Visual and Audio data mining – Data mining and collaborative filtering.

Text Book

Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

Unit I: Chapter 1: 1.1, 1.2, 1.3, 1.4, 1.6, 1.7 **Chapter 2:** 2.1, 2.3, 2.4, 2.5

Unit II: Chapter 3: 3.1.1, 3.3, 3.4, 3.5 **Chapter 2:** 2.1, 2.3, 2.4, 2.5

Unit III: Chapter 5: 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5

Chapter 6: 6.1, 6.2, 6.3.1, 6.4.1, 6.4.2, 6.4.3, 6.6.1, 6.6.2, 6.6.3

Unit IV: Chapter 6: 6.11.1, 6.11.2, 6.12, 7.1, 7.2

Unit V: Chapter 11: 11.1.1, 11.1.2, 11.1.3, 11.1.4, 11.1.5, 11.3

Core 9	M.Sc. Computer Science	2016-2017
M16PCS09	CLOUD COMPUTING	
Credit: 4		

UNIT I

UNDERSTANDING CLOUD COMPUTING Cloud Computing –History of Cloud Computing –Cloud Architecture –Cloud Storage –Why Cloud Computing Matters –Advantages of Cloud Computing –Disadvantages of Cloud Computing –Companies in the Cloud Today –Cloud Services.

UNIT II

DEVELOPING CLOUD SERVICES Web-Based Application –Pros and Cons of Cloud Service Development –Types of Cloud Service Development –Software as a Service –Platform as Service–Web Services –On-Demand Computing –Discovering Cloud Services Development Services and Tools –Amazon Ec2 –Google App Engine –IBM Clouds.

UNIT III

CLOUD COMPUTING FOR EVERYONE Centralizing Email Communications –Collaborating on Schedules –Collaborating on To-Do Lists –Collaborating Contact Lists –Cloud Computing for the Community –Collaborating on Group Projects and Events –Cloud Computing for the Corporation.

UNIT IV

USING CLOUD SERVICES Collaborating on Calendars, Schedules and Task Management –Exploring Online Scheduling Applications –Exploring Online Planning and Task Management –Collaborating on Event Management –Collaborating on Contact Management –Collaborating on Project Management –Collaborating on Word Processing –Collaborating on Databases –Storing and Sharing Files.

UNIT V

OTHER WAYS TO COLLABORATE ONLINE Collaborating via Web-Based Communication Tools –Evaluating Web Mail Services –Evaluating Web Conference Tools –Collaborating via Social Networks and Groupware –Collaborating via Blogs.

TEXT BOOK

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

REFERENCE BOOK

Kumar Saurabh, “Cloud Computing –Insights into New Era Infrastructure”, Wiley Indian Edition, 2011.3.

E BOOK LINK

https://books.google.co.in/books?id=mzM53Yp9cpUC&printsec=frontcover&dq=michael+miller+cloud+computing:+web+based+applications+that+change+the+way+you+work+and+collaborate+online%2Bpdf&hl=en&sa=X&ved=0ahUKEwi7kJ_GhcXMAhVDy2MKHQCWCLwQ6AEIMzAA#v=onepage&q=michael%20miller%20cloud%20computing%3A%20web%20based%20applications%20that%20change%20the%20way%20you%20work%20and%20collaborate%20online%2Bpdf&f=false

Core 10	M.Sc. Computer Science	2016-2017
M16PCS10	THEORY OF COMPUTATION	
Credit: 4		

UNIT - I

Automata: Why Study Automata Theory? - The Methods and the Madness – Introduction to Formal Proof. **Finite Automata:** An Informal Picture of Finite Automata – **Deterministic Finite Automata** – **Nondeterministic Finite Automata** – **An Application:** Text Search – Finite Automata with Epsilon-Transitions.

UNIT - II

Regular Expressions and Languages: Regular Expressions – **Finite Automata and Regular Expressions** – Applications of Regular Expressions – Algebraic Laws for Regular Expressions – **Properties of Regular Languages:** Closure Properties of Regular Languages – Equivalence And Minimization of Automata.

UNIT - III

Context-Free Grammars And Languages: Context-Free Grammars – **Pars Trees** – **Pushdown Automata:** Definition of the Pushdown Automaton – **The Languages of a PDA** – **Equivalence of PDA’s and CFG’s** – **Deterministic Pushdown Automata.**

UNIT - IV

Introduction to Turing Machines: The Turing Machine – Programming Techniques for Turing Machines – Extensions to the Basic Turing Machine – Restricted Turing Machines – **Turing Machines and Computers.**

UNIT - V

Intractable Problems: **The Classes P and NP** – An **NP Complete Problem** – **Additional Classes of Problems:** Complements of Languages in NP – Problems Solvable in Polynomial Space.

TEXT BOOK

1. John E. Hopcroft and Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Addison Wesley, Third Edition 2007.

REFERENCE BOOK(S)

1. Michael Sipser, "Introduction to the Theory of Computations", Brooks/Cole, Thomson Learning, 1997.
2. John c. Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw-Hill, 2003.

Core: 11	M.Sc. Computer Science	2016-2017
M16PCS11	INTERNET PROGRAMMING	
Credit: 4		

Unit –I

HTML: Introduction to HTML and HTML5 - Formatting and Fonts –Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms. **Cascading Style Sheet (CSS):** Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – Manipulating text - Margins and Padding - Positioning using CSS.

Unit- II

Introduction to Java Script: Introduction - Functions - Arrays - String, Date and Math related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form handling and validations. **Advanced Java Script:** Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes.

Unit -III

PHP: Introduction - How web works - Setting up the environment (LAMP server) - Programming basics - Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions.

Unit -IV

Reading Data in Web Pages: Setting up web pages to communication with PHP- Handling Text Fields-Checkbox-Radio buttons-Password Controls- List boxes- Buttons – Hidden Control – File Upload. Php Browser Handling Power: PHPs Server Variables – HTTP Header – Getting the User’s Browser Type – Redirecting Browsers with HTTP Headers – Performing Data Validation – Client –side Data Validation.

Unit-V

Working with Databases: Creating a MYSQL Database-Creating a New Table-Putting Data into the New Database-Accessing the Databases in PHP-Updating Databases-Inserting New Data Items into a Database- Deleting Records-Creating New Tables-Creating a New Database-Sorting your Data – Setting a Cookie – Reading a Cookie – Deleting Cookies.

REFERENCE BOOKS

1. Achyut S Godbole and Atul Kahate, “Web Technologies”, Second Edition, Tata McGraw Hill, 2012.
2. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013.
3. David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O'Reilly Media, 2011
4. Steven Holzner, “The Complete Reference - PHP”, Tata McGraw Hill, 2008
5. Mike Mcgrath, “PHP & MySQL in easy Steps”, Tata McGraw Hill, 2012.
6. Leon Atkinson, ”Core PHP programming”, Pearson Education, 2004.

Core Practical 4	M.Sc. Computer Science	2016-2017
M16PCSP04	PRACTICAL IV – DATA MINING LAB USING R-PROGRAMMING	
Credit: 3		

To Develop R programming 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.

Core: 12	M.Sc. Computer Science	2016-17
M16PCS12	MACHINE LEARNING	
Credits: 4		

UNIT I

SIMPLE LINEAR REGRESSION : Introduction to Simple Linear Regression-The Least Squares Estimates-Dangers of Extrapolation-The Co-efficient of Determination, r -Standard Error of the Estimate s - Correlation Coefficient r -ANOVA Table for Simple Linear Regression-Outliers, High Average 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 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.

UNIT II

MULTIPLE REGRESSION AND MODEL BUILDING: Introduction to Multiple Regressions-The Population Multiple Regression Equation-Inference in Multiple Regression-Regression with Categorical Predictors, Using Indicator Variables-Adjusting R^2 : Penalizing Models for Including Predictors that are not useful-Sequential sums of squares-Multicollinearity-Variable Selection Methods-An application of Variable Selection Methods.

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 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

TEXT BOOK

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

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.

Core 13	M.Sc. Computer Science	2016-17
M16PCS13	ADVANCED MOBILE COMPUTING	
Credit: 4		

Unit I

Fundamentals of wireless communication technology – The Electromagnetic spectrum – Radio propagation mechanisms – **Characteristics of the wireless channel:** Path Loss-Fading-Interference – Doppler Shift-Transmission Rate constraints - **Modulation techniques:** Analog Modulation – **Multiple access techniques:** Frequency Division Multiple Access- Time Division Multiple Access-Code Division Multiple Access-Space Division Multiple Access – **Error control:** Parity check-Hamming code-Cyclic redundancy check-Convolutional coding-Turbo codes – **IEEE802 Networking standard:** Physical layer-Data Link layer-IEEE802.3 Standard-IEEE802.11 Standard.

Unit II

Principles of wireless network operation

Network planning: Introduction – Wireless network topologies – Cellular topology – Cell fundamentals - Network planning for CDMA systems.

Wireless Network operation: Introduction – Mobility management – Radio resources and power management – Security in wireless networks.

Unit III

Wireless Internet

Introduction-What is wireless internet: Address mobility-Inefficiency of transport Layer protocols– **Mobile IP** – Simultaneous bindings – Route optimization – Handoffs- IPv6 Advancements- IP for Wireless Domains- Security in mobile IP-**TCP in wireless domain** - Traditional TCP-TCP over wireless –Indirect TCP-Mobile TCP-Explicit Loss notification – Impact of Mobility-**WAP:** The WAP Model-WAP protocol socket-

Ad Hoc Wireless networks: Introduction – Issues in Ad hoc wireless networks –Ad Hoc wireless internet

Unit IV

MAC Protocols for Ad Hoc Wireless Networks

Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks-Design Goals of a MAC protocol for Ad Hoc Wireless Networks-Classifications of MAC protocols

Routing Protocols for Ad Hoc Wireless Networks

Issues in designing a Routing protocol for Ad Hoc Wireless Networks-Classifications of Routing Protocols –Table-Driven routing Protocols: Destination Sequenced Distance-Vector routing protocol

Unit V

Wireless Sensor Networks

Introduction: Applications of sensor networks – Comparison with Ad Hoc Wireless networks-Issues and challenges in designing a sensor network – Sensor Network Architecture: Layered architecture-Clustered architecture.

Recent Advances in wireless networks

Ultra-Wide-Band radio communication -Wireless Fidelity systems: The service provider models for Wi-Fi systems-Issues in Wi-Fi systems-Interoperability of Wi-Fi systems and WWANs-Pricing-Billing issues in Wi-Fi systems -Optical wireless networks.

Text Books

1. Ad Hoc Wireless Networks Architectures and Protocols by C. Siva Ram Murthy and B.S. Manoj, Prentice Hall Communications Engineering and Emerging Technologies Series, 2004.
2. Principles of Wireless Networks by Keveh Pahlavan Prashant Krishnamurthy, Prentice Hall Communications Engineering and Emerging Technologies Series, 2002.

Unit I

Book1: Chapter1 - 1.1, 1.2, 1.3, 1.4, 1.5 (1.5.1), 1.6, 1.8, 1.12

Unit II

Book 2: Chapter 5 – 5.1, 5.2, 5.3, 5.4, 5.7 **Chapters 6** – 6.1, 6.2, 6.3, 6.4

Unit III

Book1: Chapter 4 – 4.1, 4.2(4.2.1, 4.2.2), 4.3(4.3.1, 4.3.2, 4.3.3, 4.3.5, 4.3.6, 4.3.7, 4.3.8), 4.4(4.4.1, 4.4.2, 4.4.5, 4.4.6, 4.4.7, 4.4.11), 4.5(4.5.1, 4.5.2) **Chapter 5** – **5.1, 5.2, 5.3**

Unit IV

Book1: Chapter 6 – **6.2, 6.3, 6.4 Chapter 7** – 7.2, 7.3, 7.4(7.4.1)

Unit V

Book1: Chapter 12 – 12.1, 12.2 **Chapter 14**-14.2, 14.3(14.3.1, 14.3.2, 14.3.3, 14.3.4)
Chapter 14.4

Elective - I	M.Sc. Computer Science	2016-2017
M16PCSE01	OBJECT ORIENTED ANALYSIS AND DESIGN	
Credit: 4		

UNIT – I

Introduction - Use case Modelling.

UNIT - II

Static Modelling Using Class diagrams – Interaction Diagrams.

UNIT - III

Dynamic Modelling Using State and Activity diagram – The unified process of Software Development – Architectural Modelling.

UNIT – IV

Design Patterns: Creational – Structural – Behavioral Patterns. Pragmatics: Management an Planning – Staffing – Release Management – Reuse – Quality Assurance and Metrics – Documentation – Tools – The benefits and Risks of Object – Oriented Development.

UNIT – V

Object Oriented Programming Languages - Case Studies: Weather Monitoring Station - Inventory Tracking – Traffic Management.

TEXT BOOK

1. Mahesh P. Matha, Object – Oriented Analysis and Design Using UML, PHI.

REFERENCE BOOKS

1. Grady Booch, Object Oriented Analysis and Design, Pearson Edition.
2. Martin Fowler, Kendall Scott, UML Distilled, A Brief Guide to the Standard Object Modeling Languages, 2nd Edition, Pearson Education.
3. James Rumbaugh etal, Object Oriented Modeling and Design, Pearson Education.

Elective - I	M.Sc. Computer Science	2016-2017
M16PCSE02	SOFTWARE ENGINEERING	
Credit: 4		

UNIT – I

Socio-technical systems: Emergent system properties- Systems Engineering – Organizations, People and Computer Systems – Legacy Systems. Software Processes: Software process models – Process iteration – Process activities – The Rational Unified 28 Process – Computer-Aided Software Engineering. Project Management: Management activities – Project planning – Project scheduling – Risk management.

UNIT – II

Software Requirements: Functional and non-functional requirements – User requirements – System requirements – Interface specification – The software requirements document. Requirements Engineering Process: Feasibility studies – Requirements elicitation and analysis – Requirements validation – Requirements management. System Models: Context Models – Behavioral Models – Data Models – Object Models – Structured Methods.

UNIT – III

Design: Architectural Design decisions - System organization – Modular decomposition styles – Control styles- Reference Architectures. Distributed Systems Architectures: Multiprocessor architectures – Client-Server Architectures – Distributed object architectures – Inter-Organizational distributed computing. Application Architectures: Data processing systems – Transaction processing systems – Event processing systems – Language processing systems. User Interface Design: Design issues- The UI design process – User Analysis – User Interface prototyping – Interface evaluation.

UNIT – IV

Rapid Software Development: Agile methods- Extreme programming – Rapid application development - Software prototyping. Component-based Software Engineering: Components and Component Models – The CBSE process – Component composition. Software Evolution: Program evolution dynamics – Software maintenance – Evolution processes – Legacy system evolution.

UNIT – V

Verification and Validation: Planning verification and validation – Software inspections – Automated static analysis – Verification and formal methods. Software Testing: System Testing – Component Testing – Test case design – Test automation. Software Cost Estimation: Software productivity – Estimation techniques – Algorithmic cost modeling – Project duration and staffing. Configuration Management: System building – CASE tools for configuration management.

TEXT BOOK

1. Ian Sommerville, Software Engineering , Seventh Edition, Pearson Education, 2005

REFERENCE BOOKS

1. Richard Fairley, Software Engineering Concepts, TMGH, 1997
2. Roger S. Pressman, Software Engineering a Practioner's Approach, Fifth Edition, Mc Graw-Hill Higher Education.
3. Rajib Mall, Fundamentals of Software Engineering, PHI, Second Edition
4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, Second Edition, PHI/ Pearson Education Asia.

Elective - I	M.Sc. Computer Science	2016-2017
M16PCSE03	GREEN COMPUTING	
Credit: 4		

UNIT I

FUNDAMENTALS - Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II

GREEN ASSETS AND MODELING - Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III

GRID FRAMEWORK -Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV

GREEN COMPLIANCE - Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V

CASE STUDIES - The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS

1. BhuvanUnhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

REFERENCE BOOKS

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008.
4. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.

Elective - I	M.Sc. Computer Science	2016-2017
M16PCSE04	SOFTWARE PROJECT MANAGEMENT	
Credit: 4		

UNIT-I

SPM: Introduction – Project planning – Project evaluation – Selection of an appropriate project approach.

UNIT-II

Software effort estimation – Activity planning – Risk Management – Resource allocation.

UNIT-III

Monitoring and control – Managing people and organizing teams – Small projects.

UNIT-IV

Software Quality: Introduction – Establishment – Software Quality Assurance Planning – Overview – Purpose and Scope – SQA management – Documentation – Standards, Practices, Conventions and Metrics.

UNIT-V

Reviews and Audits – Tests – Tools – Techniques and Methodologies – Training – Risk Management.

TEXT BOOKS

1. BOB Huges Mike Cotterell, Software Project Management, 2nd edn, McGraw Hill. (Units I to IV).
2. Mordechai Ben, Menachem Garry S. Marliss, Software Quality, Vikas, 1997. (Unit V)

REFERENCE BOOKS

1. Futrell, Quality software Project management, Pearson Education India.
2. Royce, Software Project management, Pearson Education India.
3. Basics of Software Project Management , NIIT, Prentice-Hall of India
4. Drew Bire and Mike Harwood, Software Project Management from concept to Deployment , Wiley Dreamtech.
5. Darrel Ince, An Introduction to Software Quality Assurance and its implementation

Elective - II	M.Sc. Computer Science	2016-2017
M16PCSE05	WIRELESS APPLICATION PROTOCOL	
Credit: 4		

UNIT-I

Introduction – Market Convergence – Enabling Convergence – Key Services for the Mobile Internet –The Origins of WAP – WAP Architecture – Components of the WAP Standard –Network Infrastructure services Supporting WAP Clients – WAP Architecture Design Principles

UNIT-II

The Wireless Markup Language: Overview – The WML Document Model – WML Authoring – URLs Identify Content – Markup Basics – WML Basics – Basic Content – Events, Tasks and Bindings – Variables – Controls – Miscellaneous Markup – Sending Information – Application Security – Document Type Declaration

UNIT – III

Web Site Design: Computer Terminals versus Mobile Terminals – Designing a usable WAP Site – Structured Usability Methods – User Interface Design Guidelines – Design Guidelines for Selected WML Elements.

UNIT-IV

Tailoring Content to the Client– Push Messaging: Overview of WAP Push – Push Access Protocol – WAP Push Addressing –Push Message – MIME media types for Push Messages – Push Proxy Gateway – Push Over – the – Air Protocol – Push Initiator Authentication and Trusted Content.

UNIT-V

Wireless Telephony Applications: Overview of the WTA Architecture – The WTA Client Framework – The WTA Server and Security – Design Considerations – Application Creation Tool Box – Future WTA Enhancements – Mapping the Deployment Chain to the Business value Chain – Security Domains – Linking WAP and the Internet – WAP Service Design – The Mobile Internet Future.

TEXT BOOK

- 1.Sandeep Singhal, Thomas Bridgman, Lalitha Suryanarayana and Others, The Wireless Application Protocol, Pearson Education, 2001.

REFERENCE BOOK

- 1.Charles Arehare, Nirmal Chidambaram, and others, Professional WAP, Wrox press Ltd., Shroff publ. And Dist – Pvt. Ltd., 2001.

Elective - II	M.Sc. Computer Science	2016-17
M16PCSE06	CLIENT/ SERVER TECHNOLOGY	
Credit: 4		

UNIT-I

Client Server computing – What is Client / Server – File Servers, Database servers, Transaction servers, Group war servers, Object servers, Web servers – FAT servers or client/Server/Server Building blocks.

UNIT-II

Client/Server and operating systems-the Anatomy of a server program- Needs of Client/Server from an OS – Server scalability – Client Anatomy – Client server hybrids. NOS: Creating the single system image – peer-to-peer communications-remote procedure calls(RPC) – messaging and Queuing :The MOM Middleware – MOM vs RPC

UNIT-III

SQL Database Servers- Fundamentals of SQL and Relational Databases- What does a database server do- Stored procedures, Triggers and rules. Data warehouses – OTP(Online Transaction Processing) Decision Support systems(DSS)-Executive Information System(EIS) – The Data warehouse – EIS/DSS: From Queries, to OLAP(On Line Analytical processing),Data mining.

UNIT-IV

Client/Server Transaction Processing – the ACID properties – transaction Models – TP Monitors – Transaction Management standards. Client /server groupware –importance of groupware – What is groupware- The components of groupware. Distributed objects and components – what distributed objects promise – From distributed objects to component-3-tier Client/Server, Object style – Distributed objects, CORBA style Object Management Architecture-CORBA 2.0 CORBA object services – CORBA common facilities – CORBA Business objects –Compound documents.

UNIT-V

Client/Server Distributed system management-Components-Management application-The Internet Management Protocols-OSI Management Framework-The Desktop Management Interface-X/Open Management Standards-Client/Server application development tools-Client/Server Application Design.

REFERENCE BOOK

1. Robert Orfali, Dan Harkev, Jeru Edwards, "The Essential Client/Server Survival Guide", Galgotia Publications Pvt. Ltd. – 1997.

Elective - II	M.Sc. Computer Science	2016-2017
M16PCSE07	ADVANCED DATABASE MANAGEMENT SYSTEMS	
Credit: 4		

UNIT I

Advanced Data Modeling – Advanced SQL – Database Design

UNIT II

Advanced database concepts: Transaction management and concurrency control- Database performance tuning and query optimization, distributed database management systems.

UNIT III

Object oriented databases – Introduction – Evolution of object oriented concepts – Object Oriented Concepts – Characteristics of an Object Oriented date models – OODM and previous models – OODBMS – How object orientation affects Database Design – Advantages and Disadvantages of OODBMS. Data base in Electronic Commerce.

UNIT IV

Web databases: Internet technologies and data databases – Uses of internet databases- Web to database Middleware – Server side Extensions – The web browser – Internet database systems: Special considerations – Database Administration.

UNIT V

Mobile Database – Geographic Information systems – Genome Data Management – Multimedia database – Spatial databases.

Text Books

1. Peter Rob and Carlos Coronel, Database Systems – Design Implementation and Management, Cengage Learning, 7th Edition – 2007 (Unit I, Ch 6,8, 9 Unit II, Ch 10,11,12)
2. Peter Rob and Carlos Coronel, Database Systems – Design Implementation and Management, Thompson Learning, Course Technology, 5th Edition, 2003 (Unit III, Ch 11,14, Unit IV, Ch 15.1, 15.2, 15.3, 15.4,15.6,16)
3. Ramez Elmasri, Shamkant B.Navathe, Fundamentals of Database Systems 5-E, Pearson Education (Unit V, Ch 24,30)

Reference Books

1. Thomas M.Connolly, Carolyn E.begg, Database Systems – A practical Approach to design, Implementation and Management, Third Edition, Pearson Education 2003.
2. Gary W. Hansen and James V. Hansen, Database management and design, Prentice Hall of India Pvt Ltd, 1999.
3. C.S.R Pabhu, Object Oriented Database Systems, PHI 2003.
4. M.Tamer Ozsü, Patrick Ualduriel, Principles of Distributed Database Systems, Second Edition, Pearson Education, 2003.

Elective - II	M.Sc. Computer Science	2016-2017
M16PCSE08	ADVANCED OPERATING SYSTEMS	
Credit: 4		

UNIT I

Definition of OS-Mainframe System-Desktop Systems-Multi processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure-System Components-Services-System Calls-System Programs-System Design and Implementation

UNIT II

Concepts-Process Scheduling-Operations on Processes -Co-operating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts-Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.

UNIT III

Critical Section-Synchronization Hardware-Semaphores-Problems of Synchronization-Critical Regions-Monitors-Deadlocks-Characterization-Handling Deadlocks-Deadlock Prevention-Avoidance-Detection-Deadlock Recovery.

UNIT IV

Storage Hierarchy-Storage Management Strategies-Contiguous-Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition-Swapping-Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging-Segmentation-Page Replacement Methods-Locality-Working Sets I/O and File systems.

UNIT V

Disk Scheduling-File Concepts-File System Structure -Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management-Case Study: Linux System

TEXT BOOK

1. Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2004

REFERENCE BOOKS

1. Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 1992
2. P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall Of India, 2004
3. H.M.Deitel, An Introduction to Operating Systems,2nd Edition, Pearson Education, 2002

Elective - III	M.Sc. Computer Science	2016-2017
M16PCSE09	INFORMATION SECURITY	
Credit: 4		

UNIT - I

Information Security Overview: Importance of information protection - The Evaluation of information security - Justifying security investment - Security methodology - How to build a security program. **Risk Analysis:** Threat analysis - Types of attacks. **Compliance with standards, regulations, and laws:** information security standards – Laws affecting information security professionals.

UNIT – II

Secure design principles: The CIA triad and other models – Defense models – Zones of trust – Best practices for network defense. **Security organization:** Roles and responsibilities – Managed security services – Security Council, steering committee, or board of directors – Interaction with human resources. **Authentication and Authorization:** Authentication-Authorization - Compliance with standards.

UNIT - III

Data security: Securing unstructured data: Structured data Vs unstructured data - Approaches to securing unstructured data – Newer approaches to securing unstructured data. **Data Encryption:** A Brief history of Encryption – **Symmetric-Key Cryptography** – **Public key Cryptography** – **Public Key Infrastructure**. **Network Security: Firewalls - Overview of firewalls – Core firewall functions – Additional firewall capabilities** – Firewall design.

UNIT - IV

Caseing Establishment: Foot printing - What is foot printing? – Internet foot printing. **Scanning:** Determining which services are running or listening. **System hacking:** Hacking Windows - Unauthenticated Attacks – Authenticated Attacks – Windows security features – **Hacking UNIX: Remote Access** – **Local Access** – After hacking root. **Infrastructure hacking:** Remote connectivity and VoIP hacking – preparing to Dial-up – War-dialing – Brute-Force Scripting – The homegrown way.

UNIT – V

Wireless hacking: Wireless foot printing – Wireless scanning and Enumeration. **Web hacking:** Web server hacking – Web application hacking. **Hacking the internet User:** Internet client vulnerability - A brief history of internet client hacking – Cookies –

SSL Attacks - **E-Mail Hacking** – Instant Messaging. **Network Security secrets and solutions:** Socio-Technical Attacks - Phishing and identity theft – Phishing Techniques. Annoying deceptive software: Spyware, Adware, and Spam: Blocking. Detecting, and Cleaning Annoying and deceptive software.

TEXT BOOKS

1. [Mark Rhodes-Ousley](#) “Information Security “The complete reference, Tata McGraw-Hill, 2009.New Delhi, 2nd Edition.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2009.

WEB LINK

1. <http://www.mvatecybernet.com/IT%20EBOOKS/IT%20PDF%20Books/IT%20BOOKS/NETWORKING/INFORMATION%20SECURITY%20THE%20COMPLETE%20REFERENCE%202ND%20EDITION.pdf>
2. https://books.google.co.in/books?id=RTNyXFy4MgsC&printsec=frontcover&dq=hacking+exposed+6&hl=ta&sa=X&redir_esc=y#v=onepage&q=hacking%20exposed%206&f=false

REFERENCE BOOKS

1. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2012.
2. . Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

WEB LINK:

1. <https://books.google.co.in/books?id=KUbaY0MMEvcC&printsec=frontcover&dq=Handbook+of+Information+Security+Management&hl=en&sa=X&ved=0ahUKEwit1buz4vNAhUjF6YKHWNsAjoQ6AEINDAA#v=onepage&q=Handbook%20of%20Information%20Security%20Management&f=false>
2. https://books.google.co.in/books?id=pfdBiJNfWdMC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Elective - III	M.Sc. Computer Science	2016-2017
M16PCSE10	PROFESSIONAL PRACTICES	
Credit: 4		

UNIT I

Computer Ethics: An Overview – Identifying ethical issues – Ethics and law – Ethical theories – Professional codes of conduct – An ethical dilemma – A framework for ethical decision making. **Computer Hacking:** Introduction – Definition of hacking – Destructive programs – Hacker ethics – Legal constraints – Professional constraints – To hack or not to hack.

UNIT II

Aspects of Computer crime: Introduction – What is computer crime? – Computer security measures – The computer misuse act – Professional duties and obligations. **Intellectual property rights:** Introduction – The nature of intellectual property - Intellectual property legislation – The extent and nature of software piracy – Ethical and Professional issues – Free software and Open source code. **Regulating Internet content:** Introduction – In defence of freedom of expression – Censorship – Laws upholding free speech – Free speech and the internet – Ethical and professional issues.

UNIT III

Personal privacy and computer technologies: Introduction – Valuing privacy – Internet technologies and privacy – Privacy legislation – The data protection Act. **Computer Technologies:** Introduction – Principle of equal access – Obstacles to access for individuals – Legislation – Enabling the disabled – Professional responsibility. **Empowering computers in the workplace:** Introduction – Computers and employment – Computers and the quality of work – Computerized monitoring in the workplace – Telecommuting.

UNIT IV

The use of artificial intelligence and Expert systems: Introduction – Origins of AI and Expert systems – The debate on computer intelligence – Applying intelligence – Implications on agent-based decision making – Social, legal and professional issues. **The failure of IT projects:** Introduction – The problems of producing successful IT projects

– How the profession is addressing the problem of IT failure – The relationship between professional codes of conduct and IT projects – An overview of national legislation.

UNIT V

Codes of Conduct: Introduction – Professional bodies and the British Computer society – The role of codes of conduct – Key aspects of the BCS code of conduct.

Towards the future: Introduction – The database society – Restricting choice: Digital rights management – Review of the ethical dilemmas.

TEXT BOOK

1. “Ethical, Legal and Professional Issues in Computing”, By Penny Duquenoy, Simon Jones, Barry G. Blundell, 2008.

WEB LINK

<https://books.google.co.in/books?id=G0WcDX1DwP4C&printsec=frontcover&dq=ethical+legal+and+professional+issues+in+computing+penny&hl=en&sa=X#v=onepage&q=ethical%20legal%20and%20professional%20issues%20in%20computing%20penny&f=false>

REFERENCE BOOKS

1. “Ethics in Information Technology” By George Reynolds, Strayer University, Fifth edition.2015

WEB LINK

https://books.google.co.in/books?id=sOPKAgAAQBAJ&printsec=frontcover&dq=1.%09%E2%80%9CEthics+in+Information+Technology%E2%80%9D+By+George+Reynolds&hl=ta&sa=X&redir_esc=y#v=onepage&q=1.%09%E2%80%9CEthics%20in%20Information%20Technology%E2%80%9D%20By%20George%20Reynolds&f=false

2. Caroline Whitback,” Ethics in Engineering Practice and Research “, Cambridge University Press,2011

WEB LINK

https://books.google.co.in/books?id=jonM_OftXAIC&printsec=frontcover&dq=Ethics+in+Engineering+Practice+and+Research&hl=en&sa=X&ved=0ahUKEwiA99W_x4vNAhXBKJQKHxDbkQ6AEIJDA#v=onepage&q=Ethics+in+Engineering+Practice+and+Research&f=false

Elective - III	M.Sc. Computer Science	2016-2017
M16PCSE11	PRINCIPLES OF PROGRAMMING LANGUAGES	
Credit: 4		

UNIT I

Preliminary Concepts: Reasons for studying **Concepts of Programming Languages** - Programming domains - Language Evaluation Criteria - Influences on Language design - Language categories. **Syntax and Semantics:** Introduction – The General Problem of describing Syntax - Formal methods of describing syntax – Attribute Grammars – Describing the meanings of Programs: Dynamic Semantics.

UNIT II

Lexical and Syntax analysis: Introduction – Lexical analysis – The Parsing Problem - Recursive-Descent parsing – Bottom-Up parsing. **Names, Bindings and Scope:** Introduction - Names – Variable - Concept of binding – Scope – Scope and Lifetime – referencing environments – Named constants. **Data types:** Introduction - primitive, character, **user defined**, array, associative, record, **list**, union, pointer and reference types. – Type checking - strong typing- Type Equivalence

UNIT III

Expressions and Assignment Statements: Introduction – **Arithmetic expressions**, Overloaded operators – Type conversions – **Relational and Boolean expressions** - Short circuit evaluation - **Assignment Statements** - Mixed mode assignment. **Statement Level Control structures:** Introduction - Selection, Iterative, Unconditional branching Statements. **Subprograms:** Fundamentals of sub-programs - Design issues of subprograms - Local referencing environments - **Parameter passing methods** - Parameters that are sub-programs – Calling subprograms indirectly – **Co routines**.

UNIT IV

Implementing subprograms: The general semantics of Calls & Returns – Implementing Simple subprograms – Nested subprograms – Blocks. **Support for Object-Oriented Programming:** Support for Object-Oriented Programming in C++,

Java, C#, Ada 95. Concurrency: Introduction to Subprogram level concurrency – Semaphores – Monitors - Message passing - Java threads - C# threads.

UNIT V

Exception handling and Event handling: Introduction to Exceptions handling - Exception handling in Ada, C++ and Java. Event handling: Introduction to Event handling - Event handling in Java, C#. **Logic Programming Language:** Introduction to Predicate Calculus - Predicate Calculus and Proving theorems - An overview of logic programming – Origins of Prolog - Basic elements of prolog – Deficiencies of Prolog - Application of logic programming.

TEXT BOOK

1. Concepts of Programming Languages Robert .W. Sebesta 8/e, Pearson Education, 2012, 10th Edition.

REFERENCE BOOKS

1. Programming Languages, 2nd Edition, A. B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Loudon, 2nd Edition, Thomson, 2003.
3. LISP Patric Henry Winston and Paul Horn Pearson Education.
4. Programming in Prolog, W. F. Clocksin & C. S. Mellish, 5th Edition, Springer.
5. Programming Python, M. Lutz, 3rd Edition, O'reilly, SPD, rp-2007.
6. Core Python Programming, Chun, II Edition, Pearson Education, 2007.
7. Guide to Programming with Python, Michel Dawson, Thomson, 2008

Elective - III	M.Sc. Computer Science	2016-2017
M16PCSE12	EMBEDDED SYSTEMS	
Credit: 4		

UNIT I

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.

UNIT III

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modeling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V

Case Study of Washing Machine- Automotive Application- Smart card System Application.

TEXT BOOKS

1. Rajkamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. Peckol, “Embedded system Design”, John Wiley & Sons, 2010
3. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013

REFERENCE BOOKS

1. Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill, 2009.
2. Elicia White," Making Embedded Systems", O' Reilly Series, SPD, 2011.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning,2009.
5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007.

Elective – IV	M.Sc. Computer Science	2016-2017
M16PCSE13	BIG DATA ANALYTICS	
Credit: 4		

UNIT-I

INTRODUCTION TO BUSINESS INTELLIGENCE

Changing Business Environments and Computerized-Decision Support-A Framework for Business Intelligence-Intelligence Creation and Use and BI Governance-Transaction Processing Versus Analytic Processing-Successful BI Implementation-Analytics Overview- Brief introduction to Big data Analytics.

UNIT- II

DATAMINING, TEXT AND WEB ANALYTICS

DATA MINING: Concepts – Applications- Process-Methods-Software tools.
TEXT AND WEB ANALYTICS: Overview-Natural Language Processing-Text Mining Applications-Process-Sentiment Analysis-Web mining overview-Search Engines-Web Usage Mining (Web Analytics) -Social analytics.

UNIT-III

BIG DATA ANALYTICS AND TECHNOLOGY

BIG DATA ANALYTICS: Definition of Big data- Fundamentals of Big Data Analytics-Big data Technologies –Big data and Data Warehousing – Big Data Vendors – Big data and Stream Analytics – Application of Stream Analytics.

BIG DATA TECHNOLOGY: Data Discovery: Work the Way people’s Minds work-Open Source Technology for Big Data Analytics-The Cloud and Big Data-Predictive Analytics Moves into the Lime light-Software as a Service BI-Mobile Business Intelligence is going Mainstream-Crowd sourcing Analytics-Inter and Trans-Firewall Analytics.

UNIT -IV**HADOOP AND ENVIRONMENT**

BIG DATA: FROM THE TECHNOLOGY PERSPECTIVE: The history of Hadoop-Components of Hadoop-Application Development in Hadoop-Getting your data into Hadoop-Other Hadoop Components.

APACHE HADOOP: The Core Hadoop: Map Reduce-Hadoop's Lower Levels: HDFS and Map Reduce-Improving Programmability: Pig and Hive-Improving Data Access: Hbase, Sqoop and Flume Getting data in and out.

BIG DATA MARKET SURVEY: Integrated Hadoop System-Analytical Databases with Hadoop Connectivity-Hadoop-Centered Companies.

UNIT -V**APPLICATIONS OF BIGDATA**

BIG DATA IN THE CLOUD: IaaS and Private Clouds-Platform Solutions-Big Data Cloud platforms compared.

DATA MARKETPLACES: What Do Marketplaces Do?-Info chumps-Factual- Windows Azure Data Market place-Data market-Data Markets Compared-Other data Suppliers.

WHY VISUALIZATION MATTERS?-A picture Is Worth 1000 rows-Types of Visualization-Explaining and exploring-Your Customers Make Decisions, Too-Do yourself a Favor and Hire a Designer.

FUTURE OF BIG DATA: More powerful and Expressive Tools for analysis-Stream data processing-Rise of Data market places-Development of data Science Workflows and Tools-Increased Understanding of and Demand for Visualization.

TEXT BOOKS

1. Business Intelligence: A Managerial Approach, Efraim Turban, Ramesh Sharda, Dursun Delen, David Kind, Pearson II Edition, 2012.

<http://www.gbv.de/dms/zbw/75695505X.pdf>

2. Understanding Big Data, Analytics for Enterprise Class Hadoop and Streaming Data, Chris Eaton, Dirk Deroos, Tom Deutsch, George Lapis, Paul Zikopoulos, Tata Mc Graw Hill, 2012 Edition. (EBook).

https://www.ibm.com/developerworks/vn/library/contest/dw-freebooks/Tim_Hieu_Big_Data/Understanding_BigData.PDF

3. Planning for Big Data, O'Reilly Radar Team, 2012(eBook).

<http://eecs.wsu.edu/~yinghui/mat/courses/fall%202015/resources/planning-for-big-data.pdf>

REFERENCE BOOK

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj “Big Data Big Analytics “, Wiley Publications, Indian Reprint 2014.

<http://www.abcd.lk/sliit/Big%20Data,%20Big%20Analytics%20Emerging%20Business%20Intelligence%20and%20Analytic%20Trends%20for%20Today's%20Businesses%20%28Wiley%20CIO%29.pdf>

Elective - IV	M.Sc. Computer Science	2016-2017
M16PCSE14	OPEN SOURCE TECHNOLOGIES	
Credit: 4		

UNIT I: OPEN SOURCE

Introduction to open source development- A brief history about open source development- The evolution of the open source movement- FLOSS - Free, libre, open source software- Advantages and disadvantages of open source- Open source trends and perspectives- Career path.

UNIT II: LINUX

Linux Distributions- Download and Install- Decisions- Linux Partition Sizes- Accounts- Security-Basic Unix- Shell- Owner, Groups, Permissions, Ownership- Processes- PATH and Environment- Commands- Basic File system Essentials-Useful programs.

UNIT II: APACHE

Introduction - Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public_html Web sites- Remove server-status and server-info- - Create the Web Site- Downloading the Examples- Apache Log Files -Apache control with .htaccess.

UNIT III: PERL

Introduction- Perl Documentation- Perl Syntax Rules- A First Perl Program—hello, world- Declaring Variables with use strict- Variables- Operators- Flow-Control Constructs- Regular Expressions- Functions- File I/O- Additional Perl Constructs- Making Operating System Calls- A Quick Introduction To Object-Oriented Programming

UNIT IV: MySQL

Introduction to MY SQL - The Show Databases and Table - The USE command - Create table, and show table Commands - Describe Commands – Create, Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT V: PHP

Introduction- Embedding PHP Into HTML - Configuration - A Couple of Quick Examples - Language Syntax- Variables - Data Types - Web Variables - Operators - Flow-Control Constructs - Writing PHP Functions- Built-In PHP Functions - PHP and MySQL - PHP project.

Text Book

1." Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", James Lee and Brent Ware, Dorling Kindersley (India) ", James Lee and Brent Ware, Dorling Kindersley(India) Pvt. Ltd, 2008

Reference book

1. "Getting started with open source development ideal for applications developers and administrators", Rachana Kapur & Marria Briggs, DB2 on campus Book series, First edition 2010.

Elective - IV	M.Sc. Computer Science	2016-2017
M16PCSE15	SOCIAL COMPUTING	
Credit: 4		

UNIT – I

Social Computing: History of Social Computing – Social Computing Concepts – Social Computing for the Enterprise - **Building Effective Collaboration Sites :** What is a Collaborative Site? –What Makes an Effective Site? – Preplanning Stage – Site Structure – Governance – End User Support and Training - User Adoption Curve

UNIT – II

Content Tagging: What is Content Tagging? - Why Should Organization Embrace Content Tagging? –Organizational Challenges to Content Tagging – Tagging Content in Share point – **Wikis:** Success Factors for Wikis in Organizations– Enterprise and Community Contributions – **Blogs:** What is Blog? – History – Reasons for Corporate Blogging – Share point Blogs

UNIT – III

Social Networking: The History of Social Computing – The Business Value Proposition Social Networking in SharePoint– **Podcasting: History** – Determine Your Audience – Podcasting in sharePoint- **Mashups:** Mashups in SharePoint– Presence and OCS/Live

UNIT – IV

Presence and OCS/Live : Office Communication Server and Presence - **Interactive Experience, Video, and Communication :** Interactive Media – Discussion Forms – Embedded Chart – Photo Stitching – Videos – Social Communication

UNIT – V

Search: What is Social Search? – Search Fundamentals – Social Search Weaknesses – SharePoint Search Fundamentals – SharePoint and Social Search – Enterprise and Community Contributions.

TEXT BOOK

“Social Computing with Microsoft SharePoint 2007”, Brendon Schwartz, Ranlett, Stacy Draper, Wiley Publishing, Inc, 2009

Web Link : infocat.ucpel.tche.br/disc/cs/docs/scwmsp.pdf

Elective - IV	M.Sc. Computer Science	2016-2017
M16PCSE16	DIGITAL IMAGE PROCESSING	
Credit: 4		

UNIT - I

Introduction: What is Digital Image Processing? – Examples of Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image processing System – **Digital Image Fundamentals:** Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image sensing and Acquisition – Image Sampling and Quantization – Some Basic Relationships between Pixels.

UNIT - II

Image Enhancements in the Spatial Domain : Basic Gray Level Transformations – Histogram Processing - Enhancement Using Arithmetic/ Logical Operations – Basics of Spatial Filtering – Smoothing Spatial Filters – Sharpening Spatial Filters – Combining Spatial Enhancement Methods.

UNIT - III

Image Restoration : A model of the image Degradation/Restoration Process – Noise Models – Restoration in the Presence of Noise Only- Spatial Filtering – Periodic Noise Reduction by Frequency Domain Filtering – Linear, Position – Invariant Degradations – Estimating the Degradation Function - **Color Image Processing :** Color Fundamentals – Color Models – Pseudo color Image Processing – Basics of Full Color Image Processing – Color Transformations – Smoothing and Sharpening – Color Segmentation – Noise in Color Images – Color Image Compression.

UNIT – IV

Wavelets and Multi resolution Processing: Background – Multi resolution Expansions – Wavelet Transforms in One Dimension – The Fast Wavelet Transform – Wavelet Transforms in Two Dimensions – Wavelet Packets - **Image Compression :** Fundamentals - Image Compression Models – Elements of Information Theory- Error Free Compression – Lossy Compression – Image Compression Standards.

UNIT – V

Morphological Image Processing : Preliminaries – Dilation and Erosion – Opening and Closing – The Hit-or-Miss Transformation – Some basic Morphological Algorithms – **Image Segmentation** : Detection of Discontinuities – Edge linking and Boundary Detection – Thresholding – Region Based Segmentation – Segmentation by Morphological Watersheds.

TEXT BOOK

1. Rafael C. Gonzalez, Richard E.Woods, Digital Image Processing, Prentice Hall, Third Edition, 2008

REFERENCE BOOKS

1. Sonka, Hlavac, Boyle, Digital Image Processing and Computer Vision, Cengage Learning, Fourth Edition, 2014
2. Anil.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 2005