डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./विज्ञान/अभ्यासक्रम/७४/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, विज्ञान विद्याशाखेने शिफारस केल्यानुसार बी. एस्सी. / एम. एस्सी. प्रथम व द्वितीय वर्षाच्या सुधारित अभ्यासक्रमास आणि बी. एस्सी. प्रथम वर्षाच्या अभ्यासक्रमात किरकोळ बदल करण्यास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेल्या विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

[1]	**B.Sc. Physics**	**Semester-III & IV,**
[2]	**B.Sc. Chemistry**	**Semester-III & IV,**
[3]	**B.Sc. Botany**	**Semester-III & IV,**
[4]	**B.Sc. Zoology with minor changes**	**Semester-I & II,**
[5]	**B.Sc. Zoology**	**Semester-III & IV,**
[6]	**B.Sc. Fisheries**	**Semester-III & IV,**
[7]	**B.Sc. Electronics (Opt.)**	**Semester-III & IV,**
[8]	**B.A./B.Sc. Mathematics**	**Semester-III & IV,**
[9]	**B.Sc. Computer Science**	**Semester-I & II,**
[10]	**B.Sc. Information Technology**	**Semester-I & II,**
[11]	**B.C.A.**	**Semester-I & II,**
[12]	**B.Sc. Computer Science(Opt.)**	**Semester-I & II,**
[13]	**B.Sc. Information Technology(Opt.)**	**Semester-I & II,**
[14]	**B.Sc. Computer Application(Opt.)**	**Semester-I & II,**
[15]	**B.Sc. Computer Maintenance(Opt.)**	**Semester-I & II,**
[16]	**B.Sc. Biotechnology (Progressively)**	**Semester-I to VI,**
[17]	**B.Sc. Biotechnology (Opt.) (Progressively)**	**Semester-I to IV,**
[18]	**B.Sc. Sericulture Technology**	**Semester-I & II,**
[19]	**B.Sc. Networking Multimedia**	**Semester-III & IV,**
[20]	**B.Sc. Bioinformatics**	**Semester-I & II,**
[21]	**B.Sc. Hardware & Networking**	**Semester-I & II,**
[22]	**B.Sc. Animation**	**Semester-I & II,**
[23]	**B.Sc. Dairy Science & Technology**	**Semester-III & IV,**
[24]	**B.Sc. Biochemistry**	**Semester-III & IV,**
[25]	**B.Sc. Analytical Chemistry**	**Semester-III & IV,**
[26]	**B.Sc. Textile & Int. Decoration with minor changes**	**Semester-I & II,**
[27]	**B.Sc. Textile & Int. Decoration**	**Semester-III & IV,**
[28]	**B.Sc. Home Science with minor changes**	**Semester-I & II,**
[29]	**B.Sc. Home Science**	**Semester-III & IV,**
[30]	**B.Sc. Agro.Chem. & Fertilizers**	**Semester-III & IV,**

..2..

[31]	B.Sc. Geology	Semester-III & IV,
[32]	B.A. Statistics with minor changes	Semester-I & II,
[33]	B.A. Statistics	Semester-III & IV,
[34]	B.Sc. Statistics with minor changes	Semester-I & II,
[35]	B.Sc. Statistics	Semester-III & IV,
[36]	B.Sc. Industrial Chemistry	Semester-III & IV,
[37]	B.Sc. Horticultural	Semester-I & II,
[38]	B.Sc. Dry land Agriculture	Semester-I & II,
[39]	B.Sc. Microbiology	Semester-III & IV,
[40]	M.Sc. Computer Science	Semester-I to IV,
[41]	M.Sc. Information Technology	Semester-I to IV.

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) मा. परिक्षा नियंत्रक, परिक्षा विभाग,
२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,
३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.
४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,
५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,
६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,
७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,
८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

-**-

NAAC 'A' Accredition

Dr.Babasaheb Ambedkar Marathwada University
Aurangabad-431004

REVISED SYLLABUS
of
M.Sc. Computer Science
Two Year Semester Course
Sem. I to IV
(with Effective From : June 2014)

हे ज्ञानिची पवित्रता | ज्ञानीचि आथि ||

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad-431004.
Tel.No. : 0240-2403400/431, Fax:0240-2403113
Website : www.bamu.ac.in, http://bamua.digitaluniversity.ac.in

CIRCULAR NO.ACADI/NP/COMP.SC/30 /2002

It is hereby notified for the information of all concerned that on the recommendations of the Ad-hoc board in computer Science and Academic Council the Management Council at its meeting held on 19-08-2000 has accepted the amendment to the ordinance 625 regarding Admission Eligibility Rules for admission to M.Sc (Computer Science) Course. The amended 0.625 is as follow:

0.625: Admission Eligibility Rules:

A candidate shall be admitted to the First Year for the Master of Science(Computer science) in the Faculty of Science, provided that he/she passes Computer Science as one of the Optional subjects at B.Sc. level B.E./Any Other Bachelor1s Degree in Computer Science of this University Or any Other University recognized as equivalent thereto with minimum of 50% of Marks (45% of Marks for Reserved Category).

In case of vacancies not filled due to non-availability of students with above mentioned criteria, the students with *B.Sc. Physics/Electronics/Mathematics* as one of the optional subjects may also be considered for the admission.

This shall be effective from 01-6-2014.

Statement showing the details of Tuition Fees & Other Fees Per Year for M.Sc. (CO

MP. SCIENCE) Degree Course Under the Faculty of Science on "No Grant Basis"

COURSE	Admn. Fees Rs.	Tuition Fees Rs.	Library Fees Rs.	Laboratory Fees Rs.	Medical Exam. Fees Rs.	Gym-khana Fees Rs.	Sports Fees Rs.	Students Welfare Fees Rs.
1	2	3	4	5	6	7	8	9
M.Sc. (COMP.Sci.) SCIENCE) PER YEAR	25/-	7000/-	50/-	10000/-	05/-	25/-	10/-	10/ -

1. The degree of Master of Science (Computer Science) shall be conferred on the candidate who has perused a regular course of study consisting of *Four Semesters* and has appeared and passed the examination prescribed for the Master of Science (Computer Science) degree course in the faculty.
2. The College/Institute must have following faculties and non-teaching staff in the department.
    i. The Head/Coordinator should be full time and qualification should be as per the UGC rule and as per the University guidelines.
    ii. All teachers should be appointed as per the University procedure and the UGC guidelines.
    iii. One Lab Assistance and one Lab Attendant for each laboratory.
    iv. A clerk cum typist to assist the Head for maintenance of the office record/work
3. Scheme of Paper Setting:

Each theory paper is of 50 marks and is divided in 2 sections. Duration of the theory examination will be of *three* hours. The entire syllabus of theory paper is divided in 5 units. There will be one question on each unit with internal or. The question paper should be set as follows:

i. There should be two parts, Part A (10 marks) and Part B (40 marks).
ii. *Part A should have 10 objective type questions/one line answer question/true-false/fill in the blank type question with one mark each.*
iii. *Part B should have five questions with internal choice and should be from each unit of the syllabus. Each question of this part will have 8 marks and divided into two bits (a and b). Each bit carry 4 marks each. The objective of* ***bit a*** *will be to test students regarding theoretical concepts. The questions should not be of general type, like discuss, and explain as far as possible.* ***Bit b*** *questions should be problem oriented. The questions should be designed to test students on applied nature of theoretical concepts.*

iv.

Q.No.	Format	Marks
1.	Multiple Choice/Fill in the blank/Match the pair/ one line answer. 1) 2) : 10)	1 x 10 = 10
2.	a) b)	2 x 4 =8
3.	a) b)	2 x 4 =8
4.	a) b)	2 x 4 =8
5.	a) b)	2 x 4 =8
6.	a) b)	2 x 4 =8
	Total	**50**

4. The duration of the practical examination will be of four hours. There should be at least one external examiner for each practical examination.
5. Students are required to maintain a well documented signed with date journals for each practical. In journals, students must write the dates on which the practical has been performed.
6. The students must keep a diary for projects and seminar. In diary they must record the progress of the project and seminar and be signed by the concerned teacher/guide time to time.
7. Project Report: Two typed and duly bound copies of project report shall be submitted at least 3 weeks before commencement of the Theory/Practical examination which ever commences earlier.
8. The following shall be the Scheme of instruction and examinations of theory papers.

M.Sc. – I Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
1	Object Oriented Programming Using C++	04	50	03
2	Advanced Operating System	04	50	03
3	Web Design and Development using PHP	04	50	03
4	Advanced Database Management System	04	50	03
5	Practical-1 based on theory paper-1 and 2	08	50	04
6	Practical-2 based on theory paper-3 and 4	08	50	04
			300	

M.Sc. – II Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
7	Data Structures, Algorithms & Analysis	04	50	03
8	S/w Engineering & Testing	04	50	03
9	Advanced Computer Networks	04	50	03
10	Numerical Techniques & Discrete Mathematics Structure	04	50	03
11	Practical-3 based on theory paper-7 and -8	08	50	04
12	Practical-4 based on theory paper-9 and 10	08	50	04
			300	

Paper No.: 1 **M.Sc.(C.S.) Semester – I**

Paper title: Object Oriented Programming Using C++

Unit – I

C++ Programming Basics	**Introduction:**An overview of object oriented programming, Drawbacks of procedural programming, Concepts of OOP: Class, Object, Data abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing. **C++ Program Elements**: Basic Program Construction, Output Using cout, Input with cin, Directives, Comments, Constant, Variable Type: Integer Variables, Character Variables, Floating Point Types, Type bool, Manipulator: setw, endl, Type Conversion, Library Functions, Operators: Unary, Binary & Ternary, Arithmetic, Relational, Logical, Assignment, Bitwise, Precedence & Hierarchy. Data types: Primitive, Derived & User defined data types, Type modifiers (long, short, signed, unsigned).
Loops and Decisions	**Loops:** while, do-while, for, Nesting of looping statement **Decisions:** if, if-else statement, nested if-else, else if ladder. **Other Control Statements:** switch-case, break, continue.

Unit – II

Functions	**Function declaration and definition:** Simple Functions, Passing Arguments to Functions, Returning Values from Functions, Reference Arguments, Overloaded Functions, Recursion, Inline Functions, Default Arguments, Returning by Reference.
Arrays, Strings & Structures	**Array:** Array Fundamentals: Introductions, defining and initializing arrays, accessing array elements, Single and multidimensional arrays. **String:** The Standard C++ string Class, Character array, string variables, reading multiple lines, arrays of strings. **Structures:** Specifying the structure, accessing structure members, array of structures, nested structures, enumerated data types

Unit – III

Objects and Classes	**Class**: A Simple Class, C++ Objects as Physical Objects, C++ Objects as Data Types, Constructors and Destructors, Objects as Function Arguments, The Default Copy Constructor, Returning Objects from Functions, Arrays as Class Member Data, Arrays of Objects, Structures and Classes, Classes, Objects, and Memory, Static Class Data, const and Classes.
Operator Overloading	**Overloading** Unary Operators, Overloading Binary Operators, Data Conversion, Pitfalls of Operator Overloading and Conversion, Keywords explicit and mutable

Unit – IV

Inheritance	**Inheritance:** Derived Class and Base Class, specifying the derived class, accessing base class members, the protected access specifier, derived class constructors, overriding member functions, class hierarchies, “abstract” base class, constructors and member functions, multilevel, multiple inheritances, member functions in multiple inheritances, ambiguity and multiple inheritances. Function overriding, Virtual base class, Virtual functions & dynamic binding.

Streams and Files	Stream Classes, Stream Errors, Disk File I/O with Streams , File Pointers, Error Handling in File I/O, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, Memory as a Stream Object, Command-Line Arguments, Printer Output
Unit – V	
Microsoft Visual C++	Screen Elements, Single-File Programs, Multi-file Programs, Building Console Graphics Lite Programs, Debugging, Running the Example Programs in C++Builder, Cleaning Up the Screen, Creating a New Project, Naming and Saving a Project, Starting with Existing Files, Compiling, Linking, and Executing, Adding a Header File to Your Project, Projects with Multiple Source Files.

Reference Book:

1. **Object Oriented Programming In C + +** Robert Lafore ,SAMS Publication , 4th Edition.
2. **The C++ Programming Language,** Bjarne Strousstrup. 4th Edition.
3. **C + + Printer Plus**, Stephen Parata, Galgotia
4. **Object Oriented Programming With C++** , Balagurusamy , Mc-Graw Hill, 4th Edition.

Paper No.: 2 **M.Sc.(C.S.) Semester – I**

Paper title: Advanced Operating System

Unit – I

Basics Concepts of Operating System

INTRODUCTION: What is an operating system? Operating system layered structure, Types of an operating system (Mainframe, Server operating, Personal computer system, Handheld operating system, Embedded, Sensor node, Real time, Smart card), Operating system as resources manager(Memory,Processor,Device, Information Management)
CONCEPT OF OPERATING SYSTEM: Review of Hardware, Processors, Memory, Disks, Tapes, I / O devices, Buses, Booting process, GUI, System calls.

Unit – II

Processor Management

PROCESSOR MANAGEMENT: Introduction ,Definition of process, Process states, Process state transition, The process control block, Operations on process, Evolution of multiprogramming, Context switching, Process scheduling, Types of schedulers: (Short term, Medium term and long term schedulers, Preemptive and Non preemptive), Scheduling algorithms: FCFS, SJF, Priority & RR scheduling problems based on these algorithms ,scheduling criteria

Deadlock

DEAD LOCKS: Introduction, Graphical representation of a deadlock, Deadlock prerequisites, Mutual exclusion condition, Wait for condition, No preemption condition, Circular wait condition, Deadlock strategies(Ignore a deadlock, Detect a deadlock, Recover from Deadlock, Prevent a deadlock, Avoid a deadlock,)Bankers algorithm for deadlock avoidance (safe and unsafe state),Problems based on Bankers algorithm.

Unit – III

Storage / Memory Management

BASICS OF STORAGE/MEMORY MANAGEMENT : Memory or storage Organisation, Storage management, Storage hierarchy, Storage management strategies memory allocation strategies(best fit, first fit , worst fit), Contiguous v/s non -contiguous storage allocation, Single user contiguous storage, Fixed partition multiprogramming, Variable partition multiprogramming, Multiprogramming with storage swapping,

Virtual Memory

VIRTUAL MEMORY: Basic concept, Multilevel storage organisation, Block mapping ,Paging: Basic concept, Paging address translation by direct mapping, Paging address translation by associating mapping, Paging Types(Demand, Anticipatory), Page fault, Page replacement algorithms FIFO, LRU, Optional page, problems based on these algorithms, thrashing, working set model.

Unit – IV

Device Management

Device Management: Dedicated devices, Shared devices, Virtual devices, I/O Devices, Storage devices, types of storage devices(Serial Access, Completely Direct Access, Direct Access), Sharable &Non sharable devices and their management, Spooling concept, concept of virtual devices, device drivers.

File Management

Information Management: File concepts, Access methods, File system structure, Directory structure, and disk structure, disk space allocation methods(Continuous, Linked allocation, Indexed allocation), Disks Scheduling, disk scheduling algorithms (SSTF, FCFS, Scan methods, C-

Scan), Free space management.

Unit – V

Distributed systems, security and protection

Network Operating System: Remote log in, Remote file transfer, Remote file access, Distributed O S, Distributed file transfer, Mutual exclusion in using centralised and distributed approach, Dead lock, Detection and Prevention.

Security and protection: Security threats, attack on security, computer worms and viruses Security design principles, authentication, protection mechanism.

References:

1. **Modern Operating Systems** 3rd edition, Andrew S. Tanenbaum,PHI Learning Private Limited.
2. **Operating System Concepts** 8th edition, Siberschatz, Galvin, Gagne, WSE Wiley.
3. **Operating Systems** 2nd edition, . Dietel H.M, Pearson Education.
4. **Operating Systems** 3rd edition, Achyut S. Godbole ,Atul Kahate, Tata Mc Graw Hill Education Private Limited.
5. **Operating Systems**, Stuart E. Madnick, John J. Donovan, Tata Mc Graw Hill Education Private Limited.
6. **Operating Systems**, S.R.Sathe, Anil Mokhade, Mac Millan Publishers India Limited.

5.

Paper No.: 3 **M.Sc.(C.S.) Semester – I**

Paper title: Web Design and Development using PHP

Unit – I

Basics Concepts of Web Technology	**Basic concepts:** Web standard: Standard Process, Advantage of Standard, Current Web Standard, Basic web designing: Introduction to web browser, architecture of web browser, web page, Static & dynamic web pages, home page, web-site. Web-servers & clients, Basic's of Internet, Internet Domain, Protocols definition, Overview of TCP/IP, Telnet, FTP, Communication between browser and web server
Fundamental of HTML	**Introduction to HTML:** Structure of HTML program, **HTML paired tags, Singular Tag, Text formatting:** paragraph, line break, headings , drawing lines, **Text styles:** Bold, italics, underline, **Centering & Spacing, Lists:** types of lists viz. unordered, ordered, definition lists, **Adding graphics:** image, background, border, using width and height attributes. **Tables:** creation and setting attributes of table, width & border attribute, Cell Padding, Cell Spacing, Colspan & Rowspan Attributes, background color. **Linking documents (Links):** External document references, internal document references. **Frames:** frameset and frame tag. **Forms in HTML:** Introduction to forms, FORM tag & it's attributes (Action, Method, Name), Simple form examples, Form controls: Text Field, Password Field, Multiline Text Area, Drop Down List ,Check Box, Radio Buttons, Scrolled List, Reset Button, Submit button.

Unit – II

PHP Building Blocks	**Introduction to PHP:** What, Why and Evolution of PHP?, Installing PHP, Create PHP Script, Running PHP Script. **Learning PHP Language:** Basic Building Blocks: Variable, Data Type, Operators & Expression, Constant. **Control Structures**: if, if else,if elseif..else, for,foreach, do-while, while, break, continue, switch.
Array	**Arrays:** Anatomy of an Array: indexed and Associative Array, Creating Arrays, Accessing Array Elements, Looping through Array, Multidimensional Array, and Manipulating Array using array functions.

Unit – III

Function, String & Date-time	**Functions:** What and why function, User-Defined Function, Function Arguments, Returning values, Calling Function, Variable Function, and Recursive Function. **String & Date-Time**: Creating & Accessing String, String Manipulation using string functions, Date-Time: Understanding Timestamp, Getting current date & time, Extracting date time values, format character for date, Formatting Date String.
Class & Object	**Classes and Objects:** Introduction to OOPS Concepts, Visibility Controls, Creating Class and Object, Create and using properties & methods, Overloading, Constructor, Destructor, Object Inheritance.

Unit – IV:	**Web Basics & State of Form**
Handling web-Form	**Handling FORM with PHP**: Capturing form Data with PHP, Dealing with Multi-value Fields, Validating Form Input, Generating Web Forms,

	Storing Variable in Forms, Working with Multipage Forms, Creating File Upload Forms, Redirecting form submission.
State of Web Page	**Preserving State in PHP**: Understanding cookies, Session & Query String, Saving State with Query String, Working with cookies, PHP Session to store data.
Unit – V	
Database Access	**Database Connectivity & SQL:** Introduction to data storage, Understanding Relational Database, Setting Up MySQL, Connecting to MySQL from PHP, Retrieving Data from MySQL (Select), Manipulating MySQL Data with PHP (insertion, updation & deletion).

Reference Book:

1. **Web Enabled commercial Application Development Using HTML, DHTML, JavaScript** by -Ivon Bayross.
2. **BEGINNING PHP 5.3** by *MATT DOYLE* WROX publication
3. **PHP, MySQL and Apache All in One** by Juliea C. Meloni, SAMS series
4. **PHP Cookbook** by *Adam Trachtenberg and David Sklar.*

Paper No.: 4 **M.Sc.(C.S.) Semester – I**

Paper title: Advanced Database Management System

Unit – I

Overview of Database Concepts

Overview of Database Concepts: Database and Need for DBMS , Characteristics of DBMS, Database Users, 3-tier architecture,(its advantages over 2-tier), Component of a database management System, Views of data: Data Abstraction & Instances and schemas, Codd's Rules, Constraints, Different types of keys.

Data Models: Traditional database models, Relational model**,** Object-Based Data Model, Semi-structured Data Model, Data modeling using the Entity-Relationship approach, Entities, Relationships, Attributes, Representation of entities, Mapping Cardinalities, E-R Features: Generalization & Aggregation.

Relational Data Model

Relational Model: Relational Model, Structure of Relational Database and Expressing Relation, Relational Algebra: Unary & binary Operation, Relational database languages.

Relational Database design: Functional dependencies, and Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF) Loss less joins and dependency preserving decomposition.

Unit – II

SQL Basics

SQL Basic: Data types, Table Creation CREATE, ALTER, DROP, Adding constraints, INSERT, UPDATE, DELETE, Views, Index & Sequence, Functions: Aggregate, String, Date, Numeric, Queries: Sub-queries & Nested queries, grant/revoke privileges

PL / SQL

PL/SQL: PL/SQL Definition, PL/SQL Block, function, procedure, cursor, trigger, exception handling.

Unit – III

Indexing & Query Processing

Indexing and Hashing: Basic Concepts, Ordered Indices- primary & secondary, B+ Tree Index Files, B- Tree Index Files, Static Hashing, Dynamic Hashing.

Query Processing: Introduction to Query Processing, Structure of Query processor, General Strategies for Query Processing, Transformation into an Equivalent Expression, Expected Size of Relations in the response: Selection; Projection; join, Query Improvement, Query Evaluation: One & Two Variable Expression (Nested Loop, Sort and Merge Method).

Transaction Management & Concurrency Control

Transaction Management: Transaction: Concept, properties of Transaction, Transaction States, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability.

Concurrency Control: Lock-Based Protocol and Timestamp based Protocols, Multiple Granularity. Deadlock Handling: Deadlock

	Prevention, Detection and Recovery.
Unit – IV:	
Database System Architecture	**Database System Architecture:** Centralized and Client – Server Architecture, Server System Architectures, Parallel System, Distributed Systems.
Distributed & Parallel Database	**Distributed Database:** Homogeneous and Heterogeneous databases, Architecture and design of distributed databases (DDBMS), Advantageous and Disadvantageous of DDBMS, Distributed data storage: Fragmentation & Replication, Transparency, Distributed Transactions, Commit Protocols (Two-phase Commit) for distributed databases. **Parallel Database:** I/O Parallelism, Partitioning Techniques and its comparision, Handling of Skew, Interquery Parallelism, Intraquery Parallelism, Design of Parallel system.
Unit – V	
Object Oriented Databases	**Object Oriented Databases(OODBMS):** Characteristics of an Object-Oriented Data Model, Complex data types, Structured Types and Inheritance in SQL, Table Inheritance, Array & Multiset Types in SQL, Object Identity & Reference types in SQL, Implementing Object Relational features, Pros and Cons of OODBMS.

References:

1. **Database system concept** by Korth, 6th Edition
2. **Database Management Systems** by Bipin Desai
3. **Fundamental of Database Systems** by R. Elmasri; S. Navate; Benjamin Cummings;
4. **Principles of Database Management** by James Martin
5. **Introduction to database systems** by C. J .Date

Paper No.: 5 **M.Sc.(C.S.) Semester – I**

Paper title: Practical-1 based on theory paper-1 and 2

PRACTICAL ASSIGNMENT OF C++:

Any 5 programming exercise given at the back of each unit-wise chapters from the reference book at sr.no. 1 or 4. (Total 25-30 Programs).

PRACTICAL ASSIGNMENT OF OPERATING SYSTEM:

1. Commands for files and directories cd, cp, mv, rm, mkdir, more, less
2. creating and viewing files, using cat, file comparisons, View files,
3. Disk related commands- checking disk free spaces, Essential linux commands.
4. batch commands, kill, ps, who, sleep,
5. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file,
6. file related commands - ws, sat, cut, grep, dd, etc.
7. Mathematical commands - bc, expr, factor, units. Vi, joe, vim editor.

Following programs should be implemented in C++.

8. Program for FCFS scheduling
9. Program for SJF Scheduling
10. Program for Priority scheduling
11. Program for Round Robin scheduling.
12. Program for pager replacement algorithms

Case Study: Android / Windows 8 / LINUX.

Paper No.: 6 **M.Sc.(C.S.) Semester – I**

Paper title: Practical-2 based on theory paper-3 and 4

PRACTICAL ASSIGNMENT OF HTML & PHP

1. Any 5 WebPage design using the HTML Tags.
2. Any 5 PHP Program based on using Building Blocks : Operators, Data types , Variables
3. Any 5 PHP Program based on using Array 2d & 3d , Functions
4. Any 5 PHP Program based on using String & Date-time functions, Class & Object
5. Any 5 PHP Program based on using State & Form Elements
6. Any 5 PHP Program based on using Database connectivity & SQL.

PRACTICAL ASSIGNMENT OF SQL Using Oracle/MySQL:

1. Creating database tables and using data types :

   Create table, • Modify table, • Drop table
2. Practical Based on Data Manipulation.

   Adding data with Insert, • Modify data with Update, • Deleting records with Delete
3. Practical Based on Implementing the Constraints.

   NULL and NOT NULL, • Primary Key and Foreign Key Constraint

   Unique, Check and Default Constraint
4. Practical for Retrieving Data Using following clauses.

   Simple select clause, • Accessing specific data with Where, Ordered by, Distinct and Group By with having clause
5. Practical Based on Aggregate Functions.

   AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time Functions.
8. Practical Based on indexing - Create index, synonyms
9. Implement Nested Queries/inner queries on multiple tables.
10. Practical Based on performing different operations on a view.

Paper No.: 7 **M.Sc.(C.S.) Semester – II**

Paper title: Data Structures, Algorithms & Analysis

Unit – I

Basic Concepts of Data Structure

Data structures basics, Mathematical/algorithmic notations & functions, Complexity of algorithms, String processing: storing strings, Linear arrays and their representation in memory, traversing linear arrays. Inserting & deleting operations, Multidimensional arrays, Record structures and their memory representation. Stacks and their array representation. Arithmetic expressions: Polish notation, Recursion. Tower of Hanoi problem.

Unit – II

Queues:

Queues: Representation of queue, Insert & delete operations on queue,Deques, Priority queues. Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation, Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists.Circular linked list

Unit – I

Basic Concepts of Software Engineering

S/w Engineering Fundamentals: Definition of Software, The birth of s/w engineering, s/w Product: Software development paradigms, software Characteristics and Application, Software Development life cycle, water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques.

Project Management: Concepts, Software Process and Project Metrics; Software Measurements; Software Projects Planning: Objectives, Scope and Feasibility, Software Project Estimation, Decision Tree, Empirical Estimation Models: COCOMO Model, Software Equation.

Unit – III

Tree

Tree: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms, Header nodes, threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort, Path length & Huffman's' algorithm, General trees.

Unit – IV:

Graph Theory

Graph theory: Definitions and Representation of graphs, Breadth first search, depth first search. Greedy method, single source shortest path, minimum spanning trees, Prims' algorithm.

Unit – V

Searching & Sorting

Sorting: Time and Space Complexity of sorting, Insertion Sort, Selection Sort.Merging & Merge-sort, Radix sort, Hashing. Divide and conquer,

Searching: binary search with its variants, Quick sort, Linear search and Binary search algorithms.

References Books:

1. Seymour Lipschutz: "Theory & Problems of Data Structures", Schaum's Outline Series (McGraw-Hill)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications. (TMH)
4. Kutty: Data Structures using C++ (PHI)
5. Bhagat Singh, Naps : Introduction to Data Structures (TMH)
6. E.Horowitz and S. Sahani, Fundamentals of Computer Algorithm, Galgotia Publications

Paper No.: 8 M.Sc.(C.S.) Semester – II

Paper title: S/w Engineering & Testing

Project Scheduling and Tracking.

Unit – II

Requirement, Analysis & Design

Software Requirements and Analysis: System Engineering, Product Engineering: Characteristics of a Good SRS, Requirement analysis, Principal, Software prototyping,, Specification and its review. Analysis modeling: data modeling, mechanics for structured analysis, system analysis tools and techniques, DFD, ER- Diagrams. Data Dictionary (DD),

System Design: Design concept and principles and its elements, effective modular design, Cohesion & Coupling, Feature of modern graphics interface (GUI). Design Methods: data design, interface design guidelines, procedural design.

Unit – III

Quality Assurance & Software Testing

Software Quality Assurance: Definition of Quality and factors, QA, SQA, Software Quality Metrics, Process and Product Quality, The SEI Process Capability Maturity Model (CMM), ISO ,Six-Sigma. Software Quality Assurance, Need for SQA, SQA Activities, Building blocks of SQA, SQA Planning & Standards, Software Reliability, Reliability Measures.

Introduction to Software Testing: Need of s/w testing, Error, fault and failure. s/w Testing fundamentals, Testing objectives, test information flows, Testing lifecycle, Test Cases – Test case designing (Concept & introduction should be covered here)

Unit – IV:

Level & Types of Testing

Levels of Testing: Unit Testing, Integration Testing, System Testing, Acceptance Testing, Alpha testing & Beta testing, Static vs. Dynamic testing, Manual vs. Automatic testing, Testers workbench, 11 steps of testing process (Only steps should be covered)

Different types of Testing: Installation Testing, Usability testing, Regression testing, Performance testing, Load testing, stress testing, Security testing, Static & Dynamic testing, Static testing techniques, Review types : Informal Review, Technical or peer review, Walkthrough, Inspection, static analysis, Review meeting and reporting , Review guidelines & Review checklist, Data flow analysis, Control flow analysis, Cyclometric Analysis, Dynamic testing – need & Advantages

Unit – V

Test Case & Testing Tools

Black Box & White Box Testing (Test Case Design Techniques): Functional Testing (Black Box), Equivalence partitioning, BVA, Decision table based testing, Cause-Effect graphing, Syntax testing (Concept & Test case generation only), Structural Testing (White Box), Coverage testing, Statement coverage, Branch & decision coverage, Path

coverage, Validation testing Activities, Low level testing, High level testing, Black box Vs. White Box

Object Oriented Testing: Issues in OO testing, class testing, GUI testing, Object Oriented Integration & system testing.

Computer Aided Software testing tools (CAST): Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools. e.g. WinRunner, LoadRunner, Rational ROBO.

Reference Book

1. **Software Engineering – A Practitioners Approach** Roger S. Pressman, 3rd /4th Edition, Mcgraw Hill, International Education.
2. **An Integrated Approach To S/w Engineering,** Pankaj Jolote, 1st/2nd Edition, Narosa.
3. Software Testing Techniques, Barrios Bier, 2nd Edition, Van N Ostrand Reinhold.
4. Software Engineering Concepts-Richard Fairley, CDAC. Tata McGraw-Hill Series. ISO-9000 Standards (Relevant To Software).
5. Introducing Software Testing , by Louise Tamres (Pearson pub)
6. Effective Methods for software Testing, by William Perry
7. Software Testing in Real World,by Edward Kit
8. Software Testing Techniques,by Boris Beizer (Dreamtech pub)
9. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984.
10. Glenford Myers, "The Art of Software Testing", John Wiley & Sons Inc., New York.

aper No.: 9 **M.Sc.(C.S.) Semester – II**

Paper title: Advanced Computer Networks

Unit – I

Introduction: Layered network architecture, review of ISO-OSI Model. Data communication techniques: Pulse Code Modulation, (PCM), Data modems, Multiplexing techniques-Frequency-Division, Time-Division Transmission Media – Wires, Cables, Radio, Links, Satellite Links, Fiber-Optic Links.

Asynchronous Transfer Mode (ATM): Cells, Header and Cell Formats, Layers in ATM, Class 1,2,3,4 Traffic Random Access Data Networks, Concept of Random Access, Pure ALOHA: Throughput Characteristics Slotted ALOHA, throughputs for Finite and Infinite, Population S-ALOHAS. MARKOV Chain Model for S-ALOHA .

Unit – II

Local Area Networks (LAN): IEEE 802.4 and 802.5 Protocols, Performance of Ethernet and Token ring protocols, FDDI Protocol, Distributed Queue Dual Bus (DQDB) protocol.

Network Layer Protocols: Design issues: Virtual Circuits and Datagrams

Routing Algorithms: Optimality Principle, Shortest Path Routing-Dijkstra, Bellman-Ford and Floyd-Warshall Algorithm.

Unit – III

Data Link Protocols: Stop and Wait Protocols: Noise Free and Noisy Channels Performance and Efficiency, Verification of Protocols using Finite State Machine. HDLC Data Link Protocol. Integrated Services Digital Network: Interfaces, Devices, Channel Structure. Dead Locks and their avoidance, Network Layer in ATM, Internetworking: Bridges, Routers and Gateways, Internet Architecture and Addressing.

Transport Layer Protocols: Design issues: Quality of Services, Primitives Connection Management: Addressing, Connection Establishment and Releases, Use of Timers, Flow Control and Buffering, Multiplexing, Crash Recovery. Elements of TCP/IP Protocol: User Datagram Protocol Connection Management, Finite State Machine.

Session Layer Protocols: Dialog Management, Synchronization, OSI Session Primitives Connection Establishment.

Unit – IV:

Error Detection: Parity Check Codes, Cyclic Redundancy Codes.

Queuing Models: Data Traffic Characteristics: Poisson Process Birth-Death Process: Markov Chain Models M/M/1 Queues: Delay and Little's Formula M/M/S/K Queues: Average Queue Length, Delay and Waiting Time Blocking Probability. M/G/1 Queues, Imbedded Markov Chains, Poolaczek-Kinchin Transform Formula, Delay Formula Using Residual Service Time.

Unit – V

Presentation and Application Layer Protocols: Presentation Concepts NMP- Abstract Syntax Notation-1 (ASN-1), Structure of Management, Management Information Base.

Cryptography: Substitution Transposition Ciphers, Data Encryption Standards (DES) Chaining, Breaking DAS, Public Key Cryptography and Authentication Protocols, Electronic Mail, World Wide Web.

References

1. A.S. Tanenbaum: Computer Networks, 2nd Edition., PHI
2. J.F. Hays: Modelling And Analysis Of Computer Communication Networks, Plenum Press
3. D. Bertsekas And R. Gallager: Data Network, 2nd Edition, PHI, India
4. D.E. Comer: Internetworking With TCP/IP, Vol. 1,2, PHI
5. G. E. Keiser: Local Area Networks, McGraw-Hill, International Edition
6. W.Stalling:Data And Computer Communication, Maxwell-,Macmillan, International Ed.

Paper No.: 10 M.Sc.(C.S.) Semester – II

Paper title: Numerical Techniques & Discrete Mathematics Structure

Unit – I

Introduction to Numerical Techniques & Linear & Polynomial Equation

Error and Approximation in Numerical Computation: Storage of Real Number and Integer, Error due to Storage, Significant Digits for Numerical, Types of Error: Absolute Error, Relative Error and Percentage Error, Round –off Error & Chopping.

Matrix: Different Types of Special Matrix, Laws of Matrix, Algebra of Matrices, Determinant and Rank of a matrix.

Transcendental and polynomial equations. Type of Equation, The roots of equations, definitions and examples, Method to solve Non-Linear Equation: Bisection method, Regula-falsi method, Secant method and Newton-Raphson Method. Rate of Convergence for all above methods.

System of linear algebraic equations: System of linear algebraic equation. Method to Solve Linear algebraic Equation: Cramers rule, Gauss elimination method, Triangularization Method, Jacobi-Iteration, Gauss–Seidel iterative method.

Unit – II

Numerical differentiation and integration: Numerical differentiation: methods based on finite differences. Numerical Integration: The trapezoidal rule, the simpson's rule and gauss-lengendre integration method.

Numerical Solution of ordinary: Differential equations. Ordinary differential equations of the first order basic concepts & various analytic methods (separable equation, equation educable to separable form, exact differential equation, integrating factors, linear first order differential equation). Reduction of higher order differential equations to the system of first order differential equations initial and boundary value problems: definitions and examples, Euler's method for solving the initial value problems, Rung-Kutta methods for the system of first order differential equations.

Unit – III

Interpolation and approximation: Interpolation with equal intervals: finite difference tables, The Gregory Newton formula for forward & backward interpolation. Interpolation with unequal intervals: Newton's divided difference interpolation formula, Lagrange's interpolation, the least square approximation

Unit – IV:

Discrete structure: Fundamentals set subsets and operations on sets; semi groups finite and infinite set, relation and properties of relations, equivalence relations.

Boolean Algebra, Posets and lattices: partial order relation, Poset, Lub, Gid, maximal and minimal elements of a posets. Def and examples of boolean algebra, lattices, distributive laws in lattices, complemented lattice's prepositional calculus, boolean functions , min and max, terms, simplification of boolean function with Karnaugh Map & Quine MC Cucky method.

Introduction to Combinatorics: Basic Theorems on permutations and combination, ordinary exponential generating functions recurrence equations.

Unit – V

Graph And Algorithms: Basics definition of graphs, connectivity of graph, cut points , cycles, hamiltonian graph , different characterization of trees, bipartite graphs, algorithms on graphs, Breadth First Search and Depth First Search ,Dijkstra Algorithm for Shortest Path algorithms, Floyd's Algorithm for all Pairs of Shortest Paths, Kruskal's And Prim's Algorithm for Minimum Spanning Tree.

Finite State Machines and Languages: finite state machines, semigroups,machine languages and regular languages , simplification of machines.

References:

1. M.K. Jain,S.R.K. Lyengar And R.K. Jain, "**Numerical Methods For Scientific And Engineering Computation**"(1993),New Age Int (P) Ltd. ,New Delhi.
2. S. Rajasekaran **"Numerical Methods in Science and Engineering"** S.Chand & Company Publ.
3. P. B. Patil, Prabhakar Baliram Patil, U. P. Verma, "**Numerical Computational Method"**, Alpha Science International Limited, 2009
4. E. Kreyszing "Advanced Engineering Mathematics" Wileyeastern Ltd. (7^{th} Edition),New Delhi.
5. P.L. Meyer "Introductory Probability And Statistical Applications ",Oxford And IBH Pvt. Ltd. (Second Edition), New Delhi.
6. Korfhage R.R: Discrete Computational Structure-Academic Press.
7. Bernard Kolman & Robert C Busy: Discrete Mathematical Structure For Computer Science-PHII.
8. K.A.Ross &C.R.B. Wright: Discrete Mathematics- (PHI)
9. Narsingh Deo. Graph Theory With Application To Engineering And Computer Science- (PHI)
10. **Discrete Mathematics** By Norman Biggs

Paper No.: 11 **M.Sc.(C.S.) Semester – II**

Paper title: Practical-3 based on theory paper-7 and 8

PRACTICAL ASSIGNMENT BASED Data Structure Algorithms and Analysis:

(to be implementation using C/C++/Java)

1. Write an application to implement Tower of Hanoi Problem Algorithm.
2. Write an application to implement Abstract data type stack
3. Write an program to evaluate Post fix expression using stack
4. Write a program to implement Abstract data type queue.
5. Write a program to implement singly linked list that performs various operation such as insertion, deletion, searching a node in linear linked list.
6. Write a program to implement Preorder Traversal of a binary tree.
7. Write a Program to search a given element using Binary Search.
8. Write a Program to implement Selection Sort.
9. Write a Program to implement Merge Sort.
10. Write a Program to Perform insertion or search in a specified level of a stack implemented tree- structured symbol table.
11. Write a program to find minimum and maximum form a given array.

PRACTICAL ASSIGNMENT BASED Software Testing:

At least 10 practical should be conducted on any s/w testing tool.

Paper No.: 12 **M.Sc.(C.S.) Semester – II**

Paper title: Practical-4 based on theory paper-9 and 10

PRACTICAL ASSIGNMENT BASED Advance Computer Networks:

1. Study of Networking Devices & tools
2. Practical setup of Lab Intra-Network.
3. Installation of Server & Client System
4. Peripheral Device Sharing of Devices in LAN
5. Proxy Network Setting.

Note: Any Five Addition practical Assignment as per faculty directive.

PRACTICAL ASSIGNMENT BASED Numerical Methods & Discrete Mathematical Structures: (to be implementation using C/C++/Java)

Program based on following Method to be performed

1. **Bisection Method**
2. **Regula-Falsi Method**
3. **Secant Method**
4. **Newton-Raphson Method**
5. **Gauss Elimination Method**
6. **Jacobi Method**
7. **Gauss-Seidel Method**
8. **Newton Divided Difference Interpolation Method**
9. **Lagrange's Interpolation Method.**
10. **Rung-Kutta methods**

Note: Any Five Addition practical Assignment as per faculty directive.