Davangere University, Davangere

DEPARTMENT OF COMPUTER SCIENCE

REVISED SYLLABUS

of

M.Sc.(Computer Science)

(With effect from 2016-2017 and onwards)

ದಾವಣಗೆರೆ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
ವಿಶ್ವವಿದ್ಯಾನಿಲಯಕಾರ್ಯಾಲಯ, ಶಿವಗಂಗೋತ್ರಿ, ದಾವಣಗೆರೆ–577 007
ದೂರವಾಣಿ ಸಂಖ್ಯೆ : 08192–208350

ಸಂಖ್ಯೆ:ದಾವಿವಿ/ಪ್ರಾಧಿಕಾರ/ಅಧ್ಯಯನ ಮಂಡಳಿ/2015-16 ದಿನಾಂಕ: 05-12-2015

Board of Studies (PG) proceedings

The proceedings of the meeting of Board of Studies (PG) held on : 05-12-2015 at 11.00 am, in Dept. of Computer Science, Davangere University, Davangere.

The members of BoS:

1. Prof. Algur,	Chairman	
2. Dr. Santhosh Deshpande	Member	
3. Dr. Ravindra Hegde	Member	

RESOLUTIONS

I. The Chairman apprised the members of BoS about the contents of the letter from the Registrar regarding of new syllabus as per the CBCS scheme. (ದಾವಿವಿ/ಪ್ರಾಧಿಕಾರಅಧ್ಯಯನ ಮಂಡಳಿ/2014–15/3926, ದಿನಾಂಕ:26/09/2014). Accordingly the Board resolved to M.Sc scheme and syllabus (CBCS scheme).

II. After discussion the board resolved to accept the scheme prepared for M.Sc., in Computer Science.

III. The Board prepared the M.Sc., in Computer Science I and II Year syllabus (CBCS) as per the regulations of the University and resolved to accept the same.

Prof. Siddu P. Algur
Chairman (BoS)
Computer Science (UG/PG)
Davanger University, Davangere

Scheme / Structure of Master of Computer Science

M.Sc.(Computer Science) I Semester (w.e.f. 2016-17and onwards)								
Subject Code	**Subject Title**	**Teaching Scheme Hrs/week**		**Credits**	**Examination**			
					Exam. Duration (Hrs)	**Marks**		
		Theory	**Practical**			**Theory/ Practical**	**IA**	**Total**
17MScCS11	Discrete Mathematics	4	--	4	3	75	25	100
17MScCS12	Digital Logic and Computer Design	4	--	4	3	75	25	100
17MScCS13	Programming with C	4	--	4	3	75	25	100
17MScCS14	System Software	4	--	4	3	75	25	100
17MScCS15	Data Structures	4	--	4	3	75	25	100
17MScCS16	Problem solving using C++ Lab.	--	6	3	3	75	25	100
17MScCS17	Data Structure Lab.	--	6	3	3	75	25	100
17MScCS18	**Self Study:** 1. Web Technologies 2. Java Script	2	--	2	--	--	100	100
	Total	**22**	**12**	**28**	**--**			**800**

II SEMESTER – MASTER OF COMPUTER SCIENCE

MSc.(Computer Science) II Semester (w.e.f. 2016-17and onwards)								
Subject Code	**Subject Title**	**Teaching Scheme Hrs/week**		**Credits**	**Examination**			
					Exam. Duration (Hrs)	**Marks**		
		Theory	**Practical**			**Theory/ Practical**	**IA**	**Total**
17MScCS21	Object Oriented Programming with C++	4	--	4	3	75	25	100
17MScCS22	Database Management Systems	4	--	4	3	75	25	100
17MScCS23	Operating System Concepts	4	--	4	3	75	25	100
17MScCS24	Data Communications and Networks	4	--	4	3	75	25	100
17MScCS25	**Open Elective** Computers Concepts and C programming	4	--	4	3	75	25	100
17MScCS26	OOP with C++ Programming Lab.	--	6	3	3	75	25	100
17MScCS27	Visual Programming and DBMS Lab.	--	6	3	3	75	25	100
17MScCS28	**Self Study:** 1. Statistical Methods 2. Graph Theory	2	--	2	--	--	100	100
	Total	**22**	**12**	**28**	**--**			**800**

III SEMESTER – MASTER OF COMPUTER SCIENCE

MSc.(Computer Science) III Semester (w.e.f. 2016-17and onwards)								
Subject Code	**Subject Title**	**Teaching Scheme Hrs/week**		**Credits**	**Examination**			
					Exam. Duration (Hrs)	**Marks**		
		Theory	**Practical**			**Theory/ Practical**	**IA**	**Total**
17MScCS31	Software Engineering	4	--	4	3	75	25	100
17MScCS32	Programming in JAVA	4	--	4	3	75	25	100
17MScCS33	Computer Networks and Security	4	--	4	3	75	25	100
17MScCS34	Web Programming	3	--	3	3	75	25	100
17MScCS35	**Core Elective** 1. Design and Analysis of Algorithms 2. .NET Technologies 3. Artificial Intelligence 4. Internet of Things 5. Information Retrieval	3	--	3	3	75	25	100
17MScCS36	**Open Elective** Management Information Systems	4	--	4	3	75	25	100
17MScCS37	Java Programming Lab.	--	6	3	3	75	25	100
17MScCS38	Networks and Web Programming Lab.	--	6	3	3	75	25	100
	Total	**22**	**12**	**28**	**--**			**800**

IV SEMESTER – MASTER OF COMPUTER SCIENCE

MSc.(Computer Science) IV Semester (w.e.f. 2016-17and onwards)								
Subject Code	**Subject Title**	**Teaching Scheme Hrs/week**		**Credits**	**Examination**			
					Exam. Duration (Hrs)	**Marks**		
		Theory	**Practical**			**Theory/ Practical**	**IA**	**Total**
17MScCS41	Optimization Techniques	4	--	4	3	75	25	100
17MScCS42	Digital Image Processing	4	--	4	3	75	25	100
17MScCS43	Advanced Java and J2EE	4	--	4	3	75	25	100
17MScCS44	Data Mining	4	--	4	3	75	25	100
17MScCS45	**Core Elective** 1. Mobile Communications 2. System Simulation 3. Cloud Computing 4. Big Data Analytics 5. Object Oriented Analysis and Design using UML	4	--	4	3	75	25	100
17MScCS46	Advanced Java and J2EE Lab	--	6	3	3	75	25	100
17MScCS47	PROJECT Work	--	8	4	3	150	50	200
17MScCS48	**Self Study:**	1	--	1	--	--	100	100
	Total	**21**	**14**	**28**	**--**			**900**

COURSE OBJECTIVES:

M.Sc. in **Computer Science** is a two-year post-graduate programme with the **objective** to develop human resources with core competence in various thrust areas of **Computer Science**. The programme includes software engineering, system development, natural computation, mathematical foundations and artificial intelligence.

- Graduates will acquire the knowledge about the current technology, trends, tools, theory of Computer Science and software development concepts to develop applications and to identify the potential problems where creative computer-based solutions can be applied to solve the problems.
- Graduates will be successful software professionals in IT industry capable of assimilating new information and understanding newer technology and its application domain to provide efficient and effective software solutions wherever possible.
- Graduates will inculcate the skills of communicating proficiently and collaborate successfully with peers, colleagues and organizations for higher studies, research and entrepreneurship to create new applications for the betterment of the society and their better future.

OUTCOME BASED LEARNING:

PROFESSIONAL DEVELOPMENT: To train the students to acquire knowledge in their chosen programme and apply professionally and ethically with responsibility towards the need of the society

CORE PROFICIENCY: To expertise the students to organize, understand, evaluate, and solve problems by providing hands on experience through modern tools necessary for practice.

TECHNICAL ACCOMPLISHMENTS: To equip the students with the talent to interpret in core applications by building up a multidisciplinary concept.

PROFESSIONALISM: Inculcating professional behavior, strong ethical values, innovative research capabilities and leadership abilities.

LEARNING ENVIRONMENT: To provide quality learning experiences through effective classroom practices, active learning styles of teaching, and opportunities for meaningful interaction between students and faculty.

COURSE OUTCOME:

After successful completion of M.Sc. Computer Science degree, the graduates will be able to:

- Apply the knowledge of Computer Science, Mathematics, Statistics and computing fundamentals to design and develop applications to provide creative solutions to various real life applications.
- Integrate and apply efficiently the contemporary IT tools and design applications with appropriate considerations for any specific need on societal and environmental aspects.
- Involve in perennial learning for a continued career development and progress as a computer professional upholding the ethics, social, cultural and cyber regulations.

- Function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills and also to effectively present technical information in oral and written reports.
- Apply the inherent skills with absolute focus to function as a successful entrepreneur.

SPECIFIC OBJECTIVES OF THE PROGRAMME:

- Understand the concepts and applications in the field of Computing Sciences like Web designing and development, Mobile application development, and Network and communication technologies.
- Apply the learning from the courses and develop applications for real world problems.
- Understand the technological developments in the usage of modern design and development tools to analyze and design for a variety of applications.
- Communicate in both oral and written forms, demonstrating the practice of professional ethics and the concerns for social welfare.

Syllabus

MSc(Comp. Sc.) I Semester

(w.e.f. 2016-17 and onward)

16MScCS11: Discrete Mathematics	
Teaching: 4 hrs./week	**Max. Marks: 75**
Credits: 04Hrs.: 52	**I. A. Marks: 25**

UNIT I **8Hrs**

Sets and Logic: Sets, propositions, conditional propositions and logical equivalence, arguments and rules of inference, quantifiers, nested quantifiers.

UNIT II **12Hrs**

Proofs: mathematical systems, direct proofs, and counterexamples, proving some properties of real numbers, resolution proofs, mathematical induction, strong form of induction and the well-ordering property.

Functions, Sequences, and Relations: Functions, sequences and strings, relations, equivalence relations, matrices of relations, relational databases.

Partially ordered sets, lattices, finite Boolean algebra, functions on Boolean algebra.

UNIT III **10Hrs**

Introduction to Number Theory: Divisors, representations of integers and integer algorithms, the Euclidean algorithm.

Counting Methods and the Pigeonhole Principle: Permutations and combinations, generalized permutations and combinations, algorithms for generating permutations and combinations, discrete probability, binomial coefficients and combinatorial identities, The Pigeonhole Principle.

Recurrence Relations: Solving Recurrence Relations.

UNIT IV **12Hrs**

Graph Theory: Introduction, Paths and Cycles, Hamiltonian Cycles and the Traveling Salesperson problem, a shortest-path algorithm, representations of graphs, isomorphisms of graphs, planar graphs.

Trees: Terminology and characterizations of trees, spanning trees, minimal spanning trees, binary trees, tree traversals, decision trees and the minimum time for sorting, isomorphism of trees.

UNIT V **10Hrs**

Semi Groups and Groups: Semigroups, products and quotients of semigroups, groups, products and quotients of groups.

Groups and coding: Coding of Binary information and error detection, decoding and error detection.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 5/e, Tata McGraw Hill.
2. Deo N., Graph theory with application to Engineering and Computer Science, Prentice Hall of India,
3. Kolman, Busby, Ross, Discrete Mathematical Structures, Pearson Education.

References:

1. J.P. Tremblay andR.Manohar, Discrete Mathematical structures with applications to Computer Science, Tata McGraw Hill.
2. Robin. J.Wilson, Introduction to Graph theory.
3. Goodaire E., Parmenter M., Discrete Mathematics with Graph Theory, 2/e, Pearson Education.
4. Rosen K. H.,Discrete Mathematics and Its Applications, 3/e, McGraw Hill, Singapore

16MScCS12: Digital Logic and Computer Design

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs. 52 **I. A. Marks: 25**

UNITI **10Hrs**

Digital computers and digital systems, binary logic and gates, Boolean algebra, map simplification, map manipulation, NAND, NOR and Exclusive-OR gates, integrated circuits. Combinational logic design: Combinational circuits, analysis procedure, decoders, encoders, multiplexers, binary adders, binary subtraction.

UNIT II **10Hrs**

Sequential circuits: Latches, flip-flops, sequential circuit analysis, sequential circuit design, designing with D and JK flip-flops.
Registers, shift registers, ripple counters, synchronous binary counters.

UNIT III **10Hrs**

Random access memory, RAM integrated circuits, array of RAM ICs, read-only memory, programmable logic array.
Register transfer operations, microoperations, multiplxer-based transfer, bus-based transfer, data paths, arithmetic/logic unit.

UNIT IV **12Hrs**

Computer architecture concepts, operand addressing, addressing modes, instruction set architectures, data transfer instructions, data manipulation instructions, program control instructions, program interrupts.

UNIT V **10Hrs**

Central Processing Unit designs: The complex instruction set computer, the reduced instruction set computer. Input-Output and Communication, memory systems hierarchy.

Text Books:

1. M. M. Mano and C. R. Kime, Logic and Computer Design Fundamentals, Pearson Education
2. Morris Mano M., Digital logic and Computer Design, PHI

References:

1. Floyd and Jain, Digital Fundamentals, 8/e, Pearson Education.
2. William Stallings, Computer Organization and Architecture, Pearson.
3. D. A. Patterson and J. L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 4/e, Morgan Kaufmann.

4. Alan B Marcovitz, Introduction to logic and Computer Design, McGraw Hill.
5. Ronald J. Tocci, Digital Systems: Principals and Applications, 8/e, Pearson Education .
6. Bartee J. C., Digital Computer Fundamentals, 6/e, TMH.

16MScCS13: Programming with C

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs. 52 **I. A. Marks: 25**

UNIT I **10Hrs**

Features of C, IDE of C, Structure of C program, Compilation & execution of C program.
Identifiers, variables, expressions, keywords, data types, constants, scope and life of variables –
Local and Global Variable, operators, precedence and associativity of operators, type conversion, basic input/output and library functions.

UNIT II

12Hrs

Control structures- conditional control, loop control structures, Break, Continue, Exit, and goto statements.
Functions: User defined and library function, function prototype, function call, function argument,passing arguments to function, return values, nesting of function, command line argument, recursion.

UNITIII **10Hrs**

Storage Class specifier – Auto, Extern, Static, Register.
Single and multidimensional arrays, array declaration and Initialization, array as function arguments, string-declarationandinitialization, string functions.

UNIT IV **10Hrs**

Pointers, pointers V/s arrays, pointer to functions, function returning pointers, static and dynamic memory allocation in C, dynamic memory allocation functions.
Structure and Union, bitwise operator, preprocessor directives.

UNIT V **10Hrs**

File management-definingandopening a file, closing a file, text file, binary file, functions for file handling, Random access to files, file name as command line argument.
Introduction to graphics functions.

Text Book:

1. Balagurusamy, Programming in ANSI C, 3rd Edition, Tata McGraw Hill, 2503
2. V. Rajaraman, Computer Basics and C programming, PHI.
3. B. W. Kernighan and D. M. Ritchie, C Programming Language, 2/e, PHI
4. Deitel H.M., Deitel P.J., C How To Program, 3/e, PHI
5. M.T. Somashekhara, Problem Solving with C, PHI,2509

16MScCS14: System Software

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs.: 52 **I. A. Marks: 25**

UNIT I **10Hrs**

Introduction: System software and machine architecture, the simplified instructional computer (SIC), traditional (CISC) machines, RISC machines

UNIT II

10Hrs

Assemblers- Basic Assembler Functions, Machine-Dependent Assembler Features, Machine-Independent Assembler Features, Assembler Design Options, Implementation Examples

UNIT III **10Hrs**

Loaders and Linkers: - Basic Loader Functions, Machine-Dependent Loader Features, Machine-Independent Loader Features. Loader Design Options, Implementation Examples, MS-DOS Linker.

UNIT IV **10Hrs**

Macro Processors: - Basic Macro Processor Functions, Machine-Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

UNIT V **12Hrs**

Compilers: - Basic Compiler Functions, Machine-Dependent Compiler Features, Machine-Independent Compiler Features, Compiler Design Options, Implementation Examples.

Text Books:

1. Leland L.Beck,System Software: An introduction to Systems Programming, 3rd E, Addison Wesley
2. Dhamdhere D.M, Introduction to System Software, Tata McGraw Hill.

References:

1. Donovan J J, Systems Programming, McGraw Hill.
2. A.V. Aho, R. Semi, J.D. Ullman, Compilers - Principles, techniques and tools, Pearson Education.
3. D.M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw Hill.
4. SantanuChattopadhyay, Compiler Design, PHI.
5. Johns.Robin& Stewart, 'The art of Programming', Narosa Pub. House,

16MScCS15: Data Structures	
Teaching: 4 hrs./week	**Max. Marks: 75**
Credits: 04 Hrs. 52	**I. A. Marks: 25**

UNIT I **10Hr**

Introduction: Pseudo code, abstract data type, a model for an abstract data, algorithm efficiency.

Searching:Linear List Searches—sequential search, binary search, analyzing linear search, linear search C algorithm, hashed list searches.

UNIT II

12Hrs

Linear List:Linear list concept, linked lists, linked list algorithms, processing a linked list, linear list applications, complex linked list structures, building a linked list—C implementation, linked list abstract data type.

UNIT III **8Hrs**

Stacks:Basic stack operations stack, linked list design, stack applications, ADT—linked-list implementation, array implementation of stacks, ADT—array implementation.

UNIT IV **10Hrs**

Queues:Queueoperations, queue—linked list design, Queuing theory, queue applications, categorizing data- C implementation, ADT- linked-list implementation, queue- array implementation.

Recursion: How recursion works, designing recursive algorithms, C implementation of recursion.

UNIT V **12Hrs**

Introduction to trees:Basic tree concepts, binary trees, binary tree traversals, expression trees, general trees—changing general tree of binary tree, insertions into general trees, general tree deletions.

Graphs:Terminology, operations, graph storage structures, graph algorithms, networks, abstract data type.

Text Books:

1. Richard F. Gilberg, Behrouz A. Forouzan, Data structures-A Pseudocode Approach with C, Thomson Learning.

2. A.M.Tenenbaum, Y, Langsam, M.J.Augustein, R.L.Kruse, B.P.Leung and C.L.Tondo, Data Structures using C, PHI**.**

References:

1. **Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson Education**
2. Samanta. D., Classic Data Structures, Prentice Hall

Self-Study

16M.Sc18.1: Web Technologies	
Contact Hours: 02 Hrs/week	
Credits:2	**I. A. Marks: 100**

Web Foundations: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the WebProgrammers Toolbox. Evolution of the Web, Peak into the History of the Web, Internet Applications,Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, WebSearch Engines, Application Servers.

Introduction to XML: Introduction, Syntax , Document structure, Document type definitions,Name spaces , XML schemas, displaying raw XML documents, Displaying XMLdocuments with CSS, XSLT style sheets, XML processors, Web services.

Perl and CGI: Origins and uses of Perl, Scalars and their operations, Assignment statements and simpleinput and output, Control statements, Fundamentals of arrays, Hashes, References, Functions,Pattern matching, File input and output; Examples. Using Perl for CGI Programming: TheCommon Gateway Interface; CGI linkage; Query string format; CGI.pm module; Asurvey example; Cookies.

Reference Books:

1. Pam Selle, Tim Ruffles, Christopher Hiller, Jamie, “Choosing a JavaScript Framework”, 7th Edition, Addison Wesley, 2512.
2. Brad Green, ShyamSeshadri , “AngularJS”, 1st edition, O'Reilly Media, April 2513.
3. Jeff Forcier, “Python Web Development with Django”, 1st edition, Pearson Education, 2508.

4. Michael Hartl, “Ruby on Rails Tutorial: Learn Web Development with Rails (2nd Edition) (Addison-Wesley Professional Ruby)”.

16M.Sc18.2: Java Script

Contact Hours: 2 hrs./week
Credits: 2 **I. A. Marks: 100**

Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics,Primitives, operations, and expressions, Screen output and keyboard input, Controlstatements, Object creation and modification, Arrays, Functions, Constructors, Patternmatching using regular expressions, Errors in scripts, Examples.

JavaScript and HTML Documents: The JavaScript Execution Environment, The Document Object Model, Elements Access inJava Script, Events and Event Handling, Handling Events from Body Elements, HandlingEvents from Text Box and password Elements, The DOM2 Event Model, The navigatorObject, Dom Tree Traversal and Modification.

Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colorsand Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to aMouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

Reference Books:

1. Kenneth Rosonet al, Java Scripting: The Complete Reference, Osborne/McGraw Hill.
2. SumitabhaDas,Java Scripting, , 4th Edition, Tata McGraw Hill.

16MScCS16: : Problem solving using C Lab.	
Teaching: 6 hrs./week	**Max. Marks: 75**
Credits: 03	**I. A. Marks: 25**
Following features of c shall be implemented User defined functions, array manipulation, dynamic memory allocation, pointer to array, array of pointers, structures, union, files, command line parameters.	
Students shall gain familiarity with UNIX/Linux platform for executing C programs.	

16MScCS17: : Data Structure Lab.	
Teaching: 6 hrs./week	**Max. Marks: 75**
Credits: 03	**I. A. Marks: 25**

Assignments based on the paper 16MScCS15: Data Structures using C shall be implemented.

Assignments should include but not limited to-

- Linked lists: inserting, deleting, inverting a linked list
- Stacks and Queues: adding, deleting, searching elements
- Circular Queue: Adding & deleting elements
- Evaluation of expressions
- Polynomial addition, Polynomial multiplication
- Sparse Matrices: Multiplication, addition.
- Recursive and Non-recursive traversal of Trees
- Binary tree operations
- Application of Trees.
- Graph algorithms

MSc(Comp. Sc.) II Semester
(w.e.f. 2016-17 and onward)

16MScCS21: Object Oriented Programming with C++	
Teaching: 4 hrs./week	**Max. Marks: 75**
Credits: 04 Hrs.: 52	**I. A. Marks: 25**

UNIT I **10Hrs**

Overview of C++: Object Oriented Programming concepts, advantages, C++ program development environment, the C++ language standards, C++ as a superset of C.
Classes & Objects: classes, structure & classes, union & classes, inline function, scope resolution operator, static class members: static data member, static member function, passing objects to function, returning objects, object assignment, constructors & destructors, friend function, friend classes.

UNIT II
10Hrs

References & Dynamic Allocation Operators: array of objects, pointers to object, type checking C++ pointers, the this pointer, pointer to derived types, pointer to class members, reference parameter, call by reference and return by reference, passing references to objects, returning reference, C++'s dynamic allocation operators, allocating objects,

UNIT III **12Hrs**

Overloading as polymorphism:function& operator overloading, operator overloading restrictions, operator overloading using friend function.
Namespaces: global namespace and namespace std, nested namespaces
Inheritance : base class access control, inheritance & protected members, protected base Class inheritance, inheriting multiple base classes, constructors, destructors & inheritance, execution of constructor & destructor functions, passing parameters to base class constructors, granting access, virtual base classes .
Virtual Functions & Polymorphism: virtual function, pure virtual functions, early vs. late binding.

UNIT IV **10Hrs**

Templates and Exception Handling: Exception handling in C++, try, throw, catch sequence, multiple catch blocks, uncaught exceptions, catch-all exception handler, Templates: Reason for templates, compactness and flexibility, function template, class templates.
The C++ I/O System Basics: C++ Streams, the basic stream classes, c++ predefined streams, formatted I/O, file processing.

UNIT V **10Hrs**

Overview of the Standard Template Library: The Standard Template Library, Design goals, Header files, STL components, STL Example: vectors, lists, maps, sets. Containers-Vector, Deque, List, Associative Containers, Set, Multiset, Map, Multimap. Iterators: Input iterators, Output iterators, Forward iterators, Backward iterators.

References:

1. Herbert Schildt, C++ The Complete Reference,Tata McGraw Hill Publication.

2. Al Stevens,C++ Programming, Wiely Publications.
3. B. A. Forouzon, R. F. Gilberge, Computer Science: A Structured Approach Using C++, Thomson Learning.
4. Stroubstrup B., The C++ Programming Language, Addison Wesley.
5. William H. Murray, Chris H. Pappas, Data structures with STL Prentice Hall.

16MScCS22: Database Management System

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs.: 52 **I. A. Marks: 25**

UNIT I **12hrs**

Introduction: Data modeling for a database, abstraction and data integration, the three-level architecture, components of DBMS, advantages and disadvantages, data associations, data model classification, Entity-Relationship model.

UNIT II

10hrs

File organization and storage, secondary storage devices, RAID technology, operations in file, heap files and sorted files, hashing techniques, type of single level ordered index, multi-level indexes, B-trees and B+trees, indexes on multiple keys, other types of indexes.

UNIT III **12hrs**

The Relational Model: Relational database, relational algebra, relational calculus SQL- Data definition, relational database manipulation using SQL, views, embedded data manipulation. Relational Database Design: Anomalies in a database, functional dependency, normal forms, lossless join and dependency, BCNF, normalization through synthesis, higher order normal forms.

UNIT IV **10hrs**

Transaction processing, desirable properties of transaction, schedules and recoverability, serializability of schedules concurrency control, locking techniques, time stamp orderingmulti version concurrency control, granularity of data items.

UNIT V **8hrs**

Database recovery techniques based on deferred up data and immediate updating, shadowpages, ARIES recovery algorithm, database security and authorization, security issue access control based on granting/revoking of privileges, introduction of statistical database security.

Text Books:

1. Bipin C Desai, An Introduction to Database Systems, Galgotia Publications.
2. Elmasri and Navathe, Fundamentals of Database Systems, Addison Wesley

References:

1. Silberschatz A, Korth H.F and Sudarshan S, Database System Concepts, Tata McGraw Hill

2. S K Singh, Database Systems-Concepts, Design and Applications, Pearson Education.
3. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications.
4. Date, C. J., An Introduction to Database Systems, Addison-Wesley.

16MScCS23: Operating System Concepts

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs.: 52 **I. A. Marks: 25**

UNIT I **8Hrs**

Introduction: Computer-system organization, computer-system architecture, operating-system structures, operating-system operations, distributed systems, special-purpose systems, computing environments, open-source operating systems.

UNIT II **12Hrs**

Process Management: Process concept, Process scheduling, Operations on processes, Inter-process communication.Multi-Threaded Programming: Overview, Multithreading models, Thread Libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling, Thread scheduling.

UNIT III **10Hrs**

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock. Process Synchronization: The Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors

UNIT IV **10Hrs**

Memory Management Strategies: Background, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation.
Virtual Memory Management: Background, Demand paging, Page replacement, Allocation of frames, Thrashing.
Mass storage structures, Disk structure, Disk attachment, Disk scheduling, Disk management, Swap space management

UNIT V **12Hrs**

File System: File concept, Access methods, Directory structure, file system implementation, Directory implementation, Allocation methods,Free space management.

Case Study: The Linux system, design principles, kernel modules, process management, scheduling, memory management, file systems, input and output, interprocess communication, network structure, security.
Mobile OS: Windows mobile and CE, Android and Symbian

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 8/e, John Wiley and Sons.
2. Raj Kamal, Mobile Computing, 2/e, Oxford.

References:

1. Gary Nutt, Operating System, 3/e, Pearson Education,
2. Milan Milenkovic, Operating Systems, Tata McGraw Hill.
3. William Stallings, Operating Systems, PHI
4. A.S. Tanenbaum, Modern Operating Systems, Pearson Education.

16MScCS24: Data Communication and Networks

Teaching: 4 hrs./week **Max. Marks: 75**
Credits: 04 Hrs.: 52 **I. A. Marks: 25**

UNIT I **10Hrs**

Introduction: Data Communications, Networks, the internet, protocols and standards, network models – OSI model, TCP/IP protocol suite, addressing.

UNIT II **10Hrs**

Data and Signals: Periodic analog signals, digital signals, transmission impairment, data rate limits, performance.
Digital transmission: Digital to digital conversion, analog-to-digital conversion, transmission modes.

UNIT III **12Hrs**

Physical Layer and Media: Analog transmission: Digital-to-analog conversion, analog-to-analog conversion. Multiplexing Spread spectrum. Transmission media – Guided media and unguided media.

UNIT IV **10Hrs**

Switching: Circuit-switched networks, datagram networks, virtual-circuit networks, structure of a switch.
Telephone networks, dialup modems, digital subscriber line, cable-tv networks,

UNIT V **10Hrs**

Detection and Correction: Errors, redundancy, detection versus correction, block coding, linear block codes, cyclic codes, checksum.

Data Link Control: Framing, flow and error control, noisless and noisy channels, HDLC, point-to-point control.
Multiple Access: Random access ALOHA, controlled access, channelization.

Text Books:

1. **Behrouza A Forouzan, Data Communications and Networking, McGrawHill.**
2. Computer Networks **-** Andrew s. Tanenbaum, Pearson Education.

References:

1. Data and Computer Communications, William Stallings, Pearson education
2. Data Communications, Computer Networks and Open Systems, fourth edition**-** Fred Halsall, Addison Wesley.

16MScCS25OE: Computer Concepts and C programming	
Teaching: 4 hrs./week	**Max. Marks: 75**
Credits: 04 Hrs.: 52	**I. A. Marks: 25**

UNIT I **10Hrs**

Computer Fundamentals: Block structure of a computer, characteristics of computers, problem solving with computers, generation of computers, classification of computers, input and output units.
Number System : Bit, byte, binary, decimal, conversion from one system to the other, error detecting codes, representation of characters, integers, and fractions, Binary Arithmetic - Addition, subtraction and multiplication.

UNIT II

12Hrs

Computer languages: Machine language, assembly language, higher level languages.
Operating system: Batch, multi-programming, time sharing, PC operating system, network operating system, on-line and real time operating system, mobile OS.
Problem Solving With Computer: Problem definition, analysis, algorithm, flowchart, coding, debugging, testing and documentation.

UNIT III **10Hrs**

Features of C, IDE of C, Structure of C program, Compilation & execution of C program.

Identifiers, variables, expressions, keywords, data types, constants, scope and life of variables –

Local and Global Variable, operators, precedence and associativity of operators, type conversion, basic input/output and library functions.

UNIT IV **12Hrs**

Control structures- conditional control, loop control structures, Break, Continue, Exit, and goto statements.

UNIT V **10Hrs**

Single and multidimensional arrays, array declaration and Initialization, examples on Single and multidimensional arrays

References:

1. Ann Ambrose, Dolores J. Wells, Computer Concepts BASICS, Thomson Learning
2. A. Leon and M. Leon, Fundamentals of Information Technology, Leon Vikas publishing
3. Balagurusamy, Programming in ANSI C, 3rd Edition, Tata McGraw Hill, 2503
4. V. Rajaraman, Fundamentals of Computers, ,PHI
5. M.T. Somashekhara, Problem Solving with C, PHI,2509

Self-Study

16M.Sc28.1: Statistical Methods	
Contact Hours: 2 hrs./week	
Credits: 2	**I. A. Marks: 100**

Description of data: Introduction-Data, Type of Variables, One dimensional and two dimensional tables, mean, weighted mean, median, mode, Quartiles, Variance, Coefficient of variation, skewness, Histogram, Box plots, Quantile plots, QuantitleQunatile plots, Scatter plot, Loess curve fitting.

Correlation and Regression: Meaning of correlation and regression, coefficient of correlation, Linear regression, Multiple regression, Logistic Regression.

Sampling and Hypothesis testing -1: Introduction-Sampling, SRSWR, SRSWOR, Cluster Sampling, Stratified Sampling, Basic terminologies of testing hypothesis, Confidence interval, Sample size determination.

Hypothesis Testing: Hypothesis test for: proportions, means(Large and small samples), test for independence of attributes (m x n contingency table) Inference based on choice of suitable test procedure.

Text Books:

1. J. Susan Milton, Jesse C. Arnold, Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences, 4th Ed, TATA McGraw-Hill Edition 2507.
2. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 2505.
3. Kishor S Trivedi, probability and statistics with reliability queuing and computer science applications, 1sted, PHI, 2500.

Reference Books:

1. Gupta S C and Kapoor V K, Fundamentals of Mathematical Statistics, 1sted, Sultan Chand & Sons, New Delhi, 2500.

16M.Sc28.2: Graph Theory	
Contact Hours: 2 hrs./week **Credits: 2**	**I. A. Marks: 100**

Introduction to Graph Theory: Definitions and Examples, Sub graphs, Components, and Graph Isomorphism, Vertex Degree, Perfect graphs, Planar graphs.

Connectivity and Paths: Walk, Paths and Circuits, Euler Graph, Operations on Graphs, Connectivity, Hamiltonicity: Hamilton Paths and Cycles.

Graph Coloring: Matchings, Vertex Coloring, Edge Coloring, Other Coloring Problems, Four Color Problems.

Text Books:

1. NarsinghDeo **, Graph Theory with Application to Engineering and Computer Science,** , 4th Edition, PHI Learning.
2. NarsinghDeo**, Graph Theory and Applications**, 3rd Edition, PHI Learning

Reference Books:

3. **R.Diestel, Graph Theory,** Springer-Verlag, 2nd Edition, 2500.

16MScCS26: : Oops with C++ Programming Lab.	
Teaching: 6 hrs./week	**Max. Marks: 75**
Credits: 03	**I. A. Marks: 25**

Following features of C++ programming language shall be implemented:

Control structures, user defined functions, overloaded functions, dynamic memory allocation, classes and objects, operator overloading, inheritance, virtual polymorphism, class and function templates, files, Exception Handling and Templates, STL.

16MScCS27: Visual Programming and RDBMS Lab.	
Teaching: 6 hrs./week	**Max. Marks: 75**
Credits: 03	**I. A. Marks: 25**

Section I: Assignments related to VB/VB.NET language shall be carried out including the following features:

- Decision and iterative constructs
- Procedures, functions and exceptional handling
- Arrays, enumeration and structure
- Working with forms, GUI interface with windows forms and designing menus
- Objects and classes, overloading, inheritance, over riding
- Interfaces, namespaces and collections
- Events and delegates
- Multithreading and garbage collection
- Database programming
- Components and assemblies

Section II: Lab. Assignment related to the paper 12MScCS22: Database Management System shall be carried out to include the following:

1. SQL : Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.
2. PL/SQL programming
3. The student is to develop a logical and physical database design for the given problem. The logical design performs the following tasks: 1) Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints. 2) Identify the functional dependencies in each relation, 3) Normalize to the highest normal form possible.
4. Create physical design based on above logical design using Oracle/MYSQL on Windows platform or MySQL/PostgreSQL on Linux platform
5. Write DML and DDL using all possible SQL statements with the help anyone host language VB (ie embedded SQL)
6. Write DML and DLL using PL/SQL and PL/pgSQL for the above problems