KUVEMPU  UNIVERSITY

Department of PG Studies and Research in MCA and Computer Science

Kuvempu University, Jnana Sahyadri,

Shankaraghatta-577451

CBCS SYLLABUS

FOR

M.Sc. in COMPUTER SCIENCE

(w.e.f. Academic year 2016-17)

KUVEMPU UNIVERSITY

SYLLABUS AND SCHEMNE OF EXAMINATION FOR M.Sc. COMPUTER SCIENCE

FIRST SEMESTER

	PAPER CODE	TITLE OF THE PAPER	HRS/ WEEK	TH/PR	IA	TOTAL	CREDITS
HARD CORE	MCS 1.1	ADVANCED COMPUTER ARCHITECTURE	04	75	25	100	04
	MCS 1.2	ADVANCED DATA STRUCTURES	04	75	25	100	04
	MCS 1.3	OBJECT ORIENTED PROGRAMMING USING JAVA	04	75	25	100	04
SOFT CORE	MCS 1.4	DATA COMMUNICATIONS	04	75	25	100	03
	MCS 1.5	COMPUTATIONAL MATHEMATICS	04	75	25	100	03
LAB	MCS 1.6	DATA STRUCTURES USING C LAB	03/Batch	40	10	50	02
	MCS 1.7	JAVA PROGRAMMING LAB	03/Batch	40	10	50	02
		TOTAL				**600**	**22**

SECOND SEMESTER

	PAPER CODE	TITLE OF THE PAPER	HRS/ WEEK	TH/PR	IA	TOTAL	CREDITS
HARD CORE	MCS 2.1	ADVANCED COMPUTER NETWORKS	04	75	25	100	04
	MCS 2.2	ANALYSIS AND DESIGN OF ALGORITHMS	04	75	25	100	04
	MCS 2.3	DATABASE MANAGEMENT SYSTEMS	04	75	25	100	04
SOFT CORE	MCS 2.4	THEORY OF COMPUTATION	04	75	25	100	03
	MCS 2.5	DIGITAL IMAGE PROCESSING	04	75	25	100	03
LAB	MCS 2.6	ANALYSIS AND DESIGN OF ALGORITHMS LAB	03/Batch	40	10	50	02
	MCS 2.7	DBMS LAB	03/Batch	40	10	50	02
OPEN ELEC	MCS 2.8	PROBLEM SOLVING USING C	02	40	10	50	02
		TOTAL				**650**	**24**

THIRD SEMESTER

	PAPER CODE	TITLE OF THE PAPER	HRS/ WEEK	TH/PR	IA	TOTAL	CREDITS
HARD CORE	MCS 3.1	WIRELESS COMMUNIATIONS	04	75	25	100	04
	MCS 3.2	SOFTWARE ENGINEERING	04	75	25	100	04
	MCS 3.3	LINUX INTERNALS	04	75	25	100	04
SOFT CORE	MCS 3.4	SOFT COMPUTING PARADIGM	04	75	25	100	03
	MCS 3.5	COMPUTER GRAPHICS	04	75	25	100	03
LAB	MCS 3.6	LINUX INTERNALS LAB	03/Batch	40	10	50	02
	MCS 3.7	COMPUTER GRAPHICS USING OPEN GL LAB	03/Batch	40	10	50	02
OPEN	MCS 3.8	R PROGRAMMING	02	40	10	50	02
		TOTAL				**650**	**24**

FOURTH SEMESTER

	PAPER CODE	TITLE OF THE PAPER	HRS/ WEEK	TH/PR	IA	TOTAL	CREDITS
HARD CORE	MCS 4.1	DATA MINING	04	75	25	100	04
	MCS 4.2	PATTERN RECOGNITION	04	75	25	100	04
SOFT CORE	MCS 4.3	INTERNET OF THINGS (IOT)	04	75	25	100	03
	MCS 4.4	CLOUD COMPUTING	04	75	25	100	03
PROJ	MCS4.5	PROJECT WORK		175	25	200	10
		TOTAL				**600**	**24**

TOTAL MARKS AND CREDITS

SL. NO.	SEMESTER	MARKS	CREDITS
1.	FIRST SEMESTER	600	22
2.	SECOND SEMESTER	650	24
3.	THIRD SEMESTER	650	24
4.	FOURTH SEMESTER	600	24
	GRAND TOTAL	2500	94

QUESTION PAPER PATTERN

1. Two questions from each unit and totally each question paper should contain 10 main questions.
2. There should be internal choice between questions related to each unit.
3. Each main question may consist of 2 or 3 sub questions.
4. Student should answer 05 main questions by selecting one main question from each unit
5. Each main question carries 15 marks for regular papers. (15 x 5 = 75)
6. For open elective question paper, each question carries 08 marks (8 x 5 = 40)

1.	a)	
	b)	UNIT 1
	OR	
2.	a)	
	b)	
3,	a)	UNIT 2
	b)	
	OR	
4	a)	
	b)	
5.	a)	UNIT 3
	b)	
	OR	
6,	a)	
	b)	
7.	a)	UNIT 4
	b)	
	OR	
8.	a)	
	b)	
9.	a)	UNIT 5
	b)	
	OR	
10	a)	
	b)	

MCS 1.1: ADVANCED COMPUTER ARCHITECTURE
(Max Marks: 75 + 25, Credits: 4)

Unit 1

Fundamentals Of Computer Design: Introduction; Classes of computers; Defining computer architecture; Trends in Technology, power in Integrated Circuits and cost; Dependability; Measuring, reporting and summarizing Performance; Quantitative Principles of computer design. Pipelining: Introduction; Pipeline hazards; Implementation of pipeline.

Unit 2

Instruction –Level Parallelism – 1: ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware based speculation. Instruction – Level Parallelism – 2: Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation; Advanced Techniques for instruction delivery and Speculation; The Intel Pentium 4 as example.

Unit 3

Multiprocessors and Thread – Level Parallelism: Introduction; Symmetric shared-memory architectures; Performance of symmetric shared–memory multiprocessors; Distributed shared memory and directory-based coherence; Basics of synchronization; Models of Memory Consistency.

Unit 4

Review of Memory Hierarchy: Introduction; Cache performance; Cache Optimizations, Virtual memory, Memory Hierarchy design: Introduction; Advanced optimizations of Cache performance; Memory technology and optimizations; Protection: Virtual memory and virtual machines.

Unit 5

Hardware and Software for VLIW and EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically; Detecting and Enhancing Loop-Level Parallelism; Scheduling and Structuring Code for Parallelism; Hardware Support for Exposing Parallelism: Predicated Instructions; Hardware Support for Compiler Speculation; The Intel IA-64 Architecture and Itanium Processor; Conclusions.

References:

1. John L. Hennessey and David A. Patterson: Computer Architecture, A Quantitative Approach, 4th Edition, Elsevier, 2007.
2. Kai Hwang: Advanced Computer Architecture Parallelism, Scalability, Programability**,** 2nd Edition**,** Tata Mc Graw Hill, 2010.
3. David E. Culler, Jaswinder Pal Singh, Anoop Gupta: Parallel Computer Architecture, A Hardware / Software Approach, Morgan Kaufman, 1999.

MCS 1.2 : ADVANCED DATA STRUCTURES
(Max Marks : 75 + 25, Credits : 4)

Unit 1

Introduction to Stack, operations on stack, Applications- a desk calculator and bracket matching, abstract data types and their implementation, Introduction to Queues, implementation of Queues, applications of queues- simulation of an airport, random numbers, Linear Data Structures**:** Concepts and Terminology, Storage Structures for arrays, Polish Expressions.

Unit 2
Linked Stacks and Queues**:** Pointers and linked structures, Linked Stacks, Linked Queues, Application: Polynomial arithmetic, abstract data types and their implementation.

Unit 3
Binary Trees, Binary Search trees, Building a binary search tree, Height Balance: AVL Trees, Splay Trees-A Self adjusting data structure.

Unit 4: Multi-way Tree**s,** Orchards, Trees, and Binary Trees, Lexicographic search trees-Tries, External Searching-B-Trees, Red-Black Trees.

Unit 5: Graphs and their representation**:** Definition and examples, Directed and undirected graphs Computer Representation, Graph Traversal, Topological Sorting, greedy algorithm- shortest paths, minimal spanning trees.

References:

1. Data Structures and Program Design in C++ : Robert L Kruse, Alexander J. Ryba
2. An Introduction to Data Structures with Applications : Trembley and Paul G.Sorenson
3. Data Structures Using C and C++ : Y Langsam, M.J Augenstein and A.M. Tenenbaum

MCS 1.3: OBJECT ORIENTED PROGRAMING USING JAVA
(Max Marks : 75 + 25, Credits : 4)

Unit 1
Object Orientation: History of Java, Java features, Difference between C/C++ and Java, Java program structure, Java tokens, Statements, JVM, Introduction to packages in Java, Operators & Expressions, Data types, Constants and Variables, Type conversions, Control Statements, Class, objects, inheritance, overloading and overriding.

Unit 2
Packages and Interfaces- Creating, Accessing, Using packages, CLASS path, access protection, importing packages, interfaces- defining, implementing and applying an interface, variables in interface. Multithreaded programming: Introduction, Life cycle of Thread, Creating threads by extending classes & implementing run able interface.

Unit 3
Exception Handling: Errors, Type of errors, Exceptions, Use of keywords Try Catch. Networking: Introduction, Socket overview, TCP/IP Client / Server Sockets and Programming. JDBC: Driver types, Connectivity, Statements.

Unit 4
String Handling and the collections framework: String constructors, string operations, character extraction, String comparison, searching strings, modifying strings, string buffer and string builder. Collections framework- Collection interfaces, collection classes, maps.

Unit 5

Applets and Graphics: Applets basics, Life cycle, Life cycle of Applet programming Graphics class, Line, Rectangle, Circle, Ellipse, Arcs and Polygon. AWT components: Components, Container, Panel, Windows, Frame, Dialogue box. AWT Controls: Button, Checkbox, Text field, Text area, Layouts, Menus and Menu bars.

References:

1. The Complete Reference JAVA – 2 : Herbert Schildt.
2. Sun Certified Programmer for Java 5 : Kathy Sierra, Bert Bates.
3. Programming with JAVA : E.Balaguruswamy, BPB Publications.
4. JAVA Programming : Steven Holzner, BPB Publications.

MCS 1.4 : DATA COMMUNICATIONS
(Max Marks: 75 + 25, Credits: 3)

Unit 1

Introduction: Data Communications, Data Representation, Direction of data flow, Networks, Physical Structures, Physical topology, Categories of networks, Protocol and Standards; Signals : Analog and Digital : Analog Signals, Period and Frequency, Phase, Time and Frequency domain, Composite Signals, Frequency Spectrum, Band width, Digital Signals, Analog verses Digital, Data Rate limits, Transmission impairments.

Unit 2

Digital Transmission: Line coding, Uni-polar Polar, Bipolar, Block Coding Steps in transmission, Sampling, Pulse Amplitude Modulation (PAM).Transmission mode: Parallel, Serial; Analog Transmission: Modulation of digital data, ASK, FSK, PSK, QAM, Modulation of analog Signals, AM, FM, PM.

Unit 3

Multiplexing: FDM, WDM, and TDM; Transmission Media: Guided Media, Unguided Media. Circuit Switching and Telephone Network: Circuit Switching, Space Division Switch, Time-Division Switch, Telephone networks.

Unit 4

Error detection and Correction: Types of errors, Error Detection: Parity check, CRC, Error correction.Data Link Control and Protocols: Flow and error control, Stop and wait ARQ, GO-BACK-N ARQ, HDLC, and PPP.

Unit 5

Multiple Accesses: Random Access, Multiple Access, CSMA, CSMA/CD, CSMA/CA, Channelization. Cellular Telephone and Satellite Networks : Cellular Telephony, First Generation, Second Generation, GSM, Satellite Networks, Orbits, Foot print, GEO, MEO, LEO.

References:

1.Data Communications & Networking : Forouzan
2.Understanding Local area Network : Neil Jenkins
3.Computer Networks : Tanenbaum, Andrew S, Prentice Hall of India

MCS 1.5 : COMPUTATIONAL MATHEMATICS
(Max Marks : 75 + 25, Credits: 3)

Unit 1

Matrices and Gaussian Elimination: Introduction, Gaussian Elimination, Matrix Notation and Matrix Multiplication, Triangular Factors and Row Exchanges, Inverses and Transposes, Special Matrices and Applications, Determinants, Properties of the Determinant. Vector Space: Vector Spaces and Subspaces, Solving Ax = 0 and Ax = b. Linear Independence, Basis and Dimension, Rank Nullity, Row space and Column Space of a Matrix, Change of Basis.

Unit 2

Linear Transformation: Linear Transformations Definitions and Examples, Properties of Linear Transformation, Range and Kernel, Matrix Representation of a Linear Transformation, Isomorphism.

Unit 3

Orthogonality: Orthogonal Vectors and Subspaces, Cosines and Projections onto Lines. Projections and Least Squares, Orthogonal Bases and Gram-Schmidt, the Fast Fourier Transform. Eigen values and Eigenvectors: Introduction, Diagonalization of a Matrix, Difference Equations and Powers A^k, Differential Equations and e^{At}, Complex Matrices, Similarity Transformations.

Unit 4

Probability Distributions : Introduction, Probability Models, Sample Space, Events, Algebra of Events, Probability Axioms, Conditional Probability, Discrete and continuous variables, Central Tendency, Probability Distribution, Independence of Events, Discrete Probability Distributions: Binomial Distributions, Examples on Binomial Distributions, Poisson distribution, normal distribution.

Unit 5

Statistics: Introduction, Measures of Dispersion, Calculation of mean, median, mode & standard deviation of grouped and ungrouped data. Computation of correlation coefficients, Rank correlation, Variance, Covariance.

References:

1. Linear Algebra And Its Applicatins : Gilbert Strang
2. Elemtary Linear Algebra : Stanley I. Grossman
3. Murray R.Spiegel, "Probability And Statistics", Mcgrawhill, Schaum's Outline Series
4. A.Papoulis And S.Unnikrishnan Pillai, "Probability, Random Variables And Stochastic Processes", Mcgrawhill 4th Edition.
5. Probability And Statistics, Murray R. Spiegel, John Schiller & R. Alu Srinivasan, Second Edition

MCS 1.6: DATA STRUCTURES USING C LAB

MCS 1.7: JAVA PROGRAMMING LAB

MCS 2.1: ADVANCED COMPUTER NETWORKS
(Max Marks: 75 + 25, Credits: 4)

Unit 1

Review of Network Models: Layered tasks; The OSI model and layers in the OSI model; TCP / IP protocol suite; Addressing. Layered tasks; The OSI model and layers in the OSI model; TCP / IP protocol suite; Addressing. SONET / SDH: Architecture; SONET layers; SONET frames; STS multiplexing; SONET networks; Virtual tributaries.

Unit 2

Frame Relay and ATM: Frame relay; ATM and ATM LANs. IPv6, Address Mapping and Error Reporting: IPv6: Advantages, Packet format, and Extension headers; Transition from IPv4 to IPv6: Dual stack, Tunneling, and Header translation; Address mapping: ARP, RARP, and DHCP; Error reporting: ICMP.

Unit 3

Multicast Routing Protocols: Unicast, multicast and broadcast; Applications; Multicasting routing; Routing protocols RIP, OSPF, BGP, Simulation for Routing protocols. SCTP : SCTP services; SCTP features; Packet format; An SCTP association; Flow control; Error control; Congestion control.

Unit 4

Congestion Control and Quality of Service: Data traffic; Congestion and congestion control; Congestion control in TCP, Frame relay; Quality of Service; Techniques to improve QoS; Integrated services; Differentiated services. Application layer: Client-Server model, Socket interface, DNS, SMTP, FTP, HTTP, and WWW.

Unit 5

Multimedia: Digitizing audio and video; Audio and video compression; Streaming stored audio / video; Streaming live audio / video; Real-time interactive audio / video; RTP; RTCP.

References:

1. Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. Nader F. Mir: Computer and Communication Networks, Pearson, 2007.
3. William Stallings: Data and Computer Communication, 8th Edition, Prentice Hall India, 2007.

MCS 2.2: ANALYSIS AND DESIGN OF ALGORITHMS
(Max Marks : 75 + 25, Credits : 4)

Unit 1

Notion of algorithm, Fundamentals of algorithmic problem solving, linear data structures, graphs, trees, sets and dictionaries. Analysis of algorithm efficiency: Analysis frame-work, asymptotic notations and basic efficiency classes, mathematical analysis of non recursive and recursive algorithms, empirical analysis of algorithms.

Unit 2

Brute Force and Divide and Conquer- General method, Binary Search, Finding the maximum and minimum, merge sort, quick sort, Strassen's matrix multiplication, Decrease-and-Conquer and

Transform-and-Conquer: Insertion sort, depth first search, topological sorting, presorting, Gaussian elimination, balanced search trees, heap sort, Horner's rule.

Unit 3

Greedy Method: General method, optimal storage on tapes, knapsack problem, job sequencing, Minimum Cost Spanning Trees- Prims's algorithm and Kruskal's algorithm, optimal storage on tapes, optimal merge patterns, single source shortest paths, Huffman trees.

Unit 4

Dynamic Programming: General method, principle of optimality, multistage graphs, all pairs shortest paths, 0/1 knapsack, traveling salesman problem, Warshall's and Floyd's algorithms.

Unit 5

Backtracking : General method, 8-queen problem, sum of subsets, Hamiltonian cycles, traveling salesman problem. Branch and Bound : Introduction FIFO solution , LC branch and bound, Rat in maze, TSP, Np completeness and approximation algorithm : Introduction, polynomial time, NP completeness and reducibility, approximation of algorithms.

References:

1. Computer Algorithms/C++ : Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajashekaran
2. Fundamentals of Computer Algorithms : Horowitz, E. and Sahani, S
3. The Design and Analysis of Computer Algorithms : Aho A.V., Hopcroft, J.E. and Ullaman
4. Computer Algorithms – An Introduction to Design and Analysis : Sara Baase.
5. Design and Analysis of Algorithms : Goodman, S.E. and Hedetnieml. S.T
6. Data Structures and Algorithms : Aho, A.V., Hopcroft, J.E. & Ullman
7. The Art of Computer Programming : Knuth D.E

MCS 2.3 : DATABASE MANAGEMENT SYSTEMS
(Max Marks : 75 + 25, Credits : 4)

Unit 1

Introduction **:** Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

Unit 2

Entity-Relationship Model **:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues.

Unit 3

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra.

Unit 4

SQL : SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; PL/SQL : Introduction, Language fundamentals, conditional and sequential control, Iterative processing and loops. Exception handlers, triggers, Functions, procedures, Creating and planning PL/SQL.

Unit 5

Database Design : Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.Transaction Management : The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery.

References:

1. Database System concepts : Silberchatz-korth-sudarshan
2. Fundamentals of Database systems : Elmasri navathe
3. Database Management Systems : Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, McGraw-Hill, 2003

MCS 2.4 : THEORY OF COMPUTATION
(Max Marks : 75 + 25, Credits : 3)

Unit 1

Alphabets Strings and Languages, Automata and Grammars Finite Automata (FA) - Its Behavior DFA-Formal Definition Simplifies Notations Language of DFANFA-Formal Definition Language of NFA Equivalence of DFAs and NFAs.

Unit 2

Regular expressions (RE) Definition, FA and RE, RE to FA, FA to RE, Algebraic laws for RE, applications of REs. Regular grammars and FA, FA for regular grammar, Regular grammar for FA Proving languages to be non-regular -Pumping Lemma, applications. Some closure properties of Regular languages -Closure under Boolean operations.

Unit 3

Pushdown Automata Acceptance by final state and empty store, Equivalence to CFG Deterministic and Non-deterministic PDA Problems and Solutions.

Unit 4

Turing Machines: Turing Machines TM -Formal definition and behaviour Transition diagrams, Language of a TM, TM as accepters and deciders TM as a computer of integer functions Programming techniques for TMs -Storage in state, multiple tracks, subroutines, etc. Variants of TMs –Multi tape TMs, Nondeterministic TMs, TMs with semi-infinite tapes, multi stack machines, Equivalence of the various variants with the basic model.

Unit 5

The Chmosky Hierarchy :Languages, Grammars and Machines, Recursively Enumerable Languages, Counting Alphabets, Languages and Computing Machines, The idea of Enumeration, The idea of

Diagnoalization, The ideas of Acceptance and Membership, Recursive Languages, Context Sensitive Languages and Grammars, The ideas of context, Other Grammars and Automata, Linear and Deterministic Context-Free Languages.

References :

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation",Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH 4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

MCS 2.5 : DIGITAL IMAGE PROCESSING
(Max Marks: 75 + 25, Credits: 3)

Unit 1

Introduction: Origins of digital image processing, Electromagnetic spectrum, Applications, Components of image processing system, Image sensing and acquisition, Digitization, Sampling and Quantization.

Unit 2

Image Enhancement: Basic gray level transformations, histogram processing, enhancement using arithmetic/ logic operations, basics of spatial filtering, smoothing and sharpening spatial filters, Frequency domain: introduction to the Fourier transform and the Frequency domain, smoothing and sharpening frequency domain filters, Discrete Fourier transforms, Properties of DFT, FFT.

Unit 3

Image Restoration and Color image processing. A model of the image degradation/restoration process, noise models, Spatial Filtering- mean filters, order static filters, adaptive filters, Color models, pseudo color image processing, smoothing and sharpening.

Unit 4

Morphological image processing: introduction, structuring elements, dilation and erosion, opening and closing, Hit-or-Miss transformation, basic morphological algorithms.

Unit 5

Image segmentation : detection of discontinuities ,edge linking and boundary detection, thresholding, Region based approach, segmentation by morphological watersheds.

References:

1. Digital Image Processing : Rafael C.Gonzaleze & Richard E. Woods
2. Digital Image Processing and Analysis : B. Chanda, D. Mutta Majumder
3. Digital Image Processing : Anil K Jain

MCS 2.6 : ADA LAB

MCS 2.7 : DBMS LAB

MCS 2.8 : PROBLEM SOLVING USING C
(Max Marks: 40+10, Credits: 2)

Unit 1

Introduction: Algorithms, Flow Charts, C structure, Variables, Data types, Constants, Declarations, Type conversion, Storage classes.

Unit 2

Operators and Input and output statements: Operators, types of operators: arithmetic, logical, relational, unary and conditional operators. Precedence, Associativity, Order of evaluation scanf, getchar, gets, printf, putchar, puts.

Unit 3

Control Statements – if, else-if, switch, Control Structures – while, for, do-while, break and continue, goto statements.

Unit 4

Arrays and Strings– Single dimension, two dimensional, Multi dimensional Arrays, Strings, String handling functions.

Unit 5

Functions- Categories of functions, Pointers, Pointer arithmetic, Call by value, Pointer Expression, Pointer as function arguments, recursion, Passing arrays to functions, passing strings to functions.

References

1. Let us C, Yashwant Kanetkar, BPB Publications
2. Programming with C, Balaguruswamy
3. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2nd Edition

MCS 3.1 : WIRELESS COMMUNICATION
(Max Marks: 75 + 25, Credits: 4)

Unit 1

Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing, Wireless Networks – 1: GSM and SMS : Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications.

Unit 2

Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRSWireless Networks – 3: CDMA, 3G and WiMAX : Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

Unit 3
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6.

Unit 4:
Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

Unit 5
Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

References:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003.
3. Raj kamal: Mobile Computing, Oxford University Press, 2007.
4. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

MCS 3.2 : SOFTWARE ENGINEERING
(Max Marks : 75 + 25, Credits: 4)

Unit 1
Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies. Software Process & Agile Software Development .Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, the rational Unified process, Agile methods.

Unit 2
Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management.

Unit 3
System Modeling, Architectural Design & Design and implementation: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering, Software architecture: the role of software architecture, architectural views, component and connector view, Architectural styles for C&C view, Documenting architectural design. Design: Design concepts, Function oriented design, detailed design, verification, matrix (Complexity matrix for function oriented design).

Unit 4
Component-based software engineering: Components and component model, CBSE process, Component composition. Distributed Software engineering, Distributed system issues, Client-server computing, Architectural patterns for distributed systems, Software as a service.

Unit 5
Planning a software Project: Process planning, Effort estimation, Project scheduling and staffing, Software configuration, management plan, Quality plan, Risk Management, Project monitoring plan. Software Testing : Testing fundamentals, Black-box testing, White-box testing, Testing process.

References:

1. Ian Sommerville : Software Engineering, 9th edition, Person Education Ltd, 2011.
2. Pankaj Jalote: Software Engineering, Wiley India Pvt
3. Roger S Pressman: Software Engineering-A Practitioners approach, 6th edition, McGraw-Hill, 2010
4. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley India, 2010

MCS 3.3 : LINUX INTERNALS
(Max Marks: 75 + 25, Credits: 4)

Unit 1
Introduction: The unix operating system, The Unix Architecture, Features of UNIX, POSIX and Single UNIX specification, Locating commands, Internal and External commands, Command Structure, Flexibility of command Usage, man command, cal command, date command, echo, printf, bc, script, passwd, who, uname, tty, stty. The File System : The file, The Parent-Child Relationship, The HOME Variable, pwd, cd, mkdir, rmdir, Absolute Pathname, Relative Pathname, ls.

Unit 2
The Unix File system, cat, cp, rm, mv, more, The lp subsystem: Printing a File, wc, od, cmp, comm, diff, compressing and archiving files, gzip, and gunzip, tar, zip and unzip. Basic File Attributes**:** Listing file attributes, listing directory attributes, File Ownership, File Permissions, changing file permissions, Directory Permissions, Changing File Ownership. Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

Unit 3
The Shell: The shell's Interpretive Cycle, Pattern Matching, Escaping and Quoting, Redirection, /dev/null and /dev/tty, Pipes, tee, Command Substitution, Shell variables, Shell scripts, read, using command line arguments, exit and exit status of command, the logical operators && and ||-conditional execution, the if conditional, using test and [] to evaluate expressions, the case conditional, expr, $0: calling a script by different names, for, while statement. Advanced Shell Programming: The sh command, export, cd, the Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, exec Statement.

Unit 4:
The process: Process basics, process status, system process, Mechanism of process creations, Internal and external commands, process states and zombies, running jobs in background, nice, killing process with signals, job control, at and batch, cron, timing process, wait, waitpid, waited, wait3, wait4**,**

Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter**,** Files, system function.

Unit 5

Filters using regular expressions: grep, basic regular expressions, extended regular expressions and egrep, sed, line addressing, using multiple instructions, context addressing, writing selected lines to a file, text editing, substitution, basic regular expressions revisited. Awk-Advanced Filters: Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, get line, Built-in variables, Arrays, Functions, Interface with the Shell, Control Flow.

References:

1. Sumitabha Das, UNIX System V.4, Concepts and Applications, TMH.
2. Terrence Chan: Unix System Programming Using C++, Prentice-Hall of India /Pearson Education, 1999.
3. W.Richard Stevens, Stephen A. Rago: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education / Prentice-Hall of India, 2005.

MCS 3.4 : SOFT COMPUTING PARADIGM
(Max Marks : 75 + 25, Credits : 3)

Unit 1

Introduction to Artificial Neural Network-Basic Concepts of Neural Networks, Human Brain, Model of Artificial Neural Networks, Neural Network Architecture-Single Layer Feed forward Network, Multilayer Feed forward Network, Recurrent Networks, Learning Methods, Early Neural Network Architecture- ADALINE Network, MADALINE Network. Applications of Neural Networks.

Unit 2

Backpropagation Network – Backpropogation Learning- Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Calculation of Error, Training of Neural Network, Method of Steepest Descent, Backpropogation Algorithm. Applications.

Unit 3

Associative Memory- Autocorrelators, Heterocorrelators- Addition and Deletion of Pattern Pairs, Energy function for BAM. Adaptive Resonance Theroy- Cluster Structure, Vector Quantization, Classical ART Networks, Simplified ART Architecture, ART1, ART2.

Unit 4

Fuzzy set theory – Fuzzy vs Crisp, Crisp sets, Fuzzy sets, Crisp Relations, Fuzzy relations, Fuzzy Systems – Crisp Logic, Predicate logic, Fuzzy Logic, Fuzzy rule based system, deffuzzification methods, Applications of Fuzzy Logic.

Unit 5

Genetic Algorithms – Concepts, Creation of offsprings, working principle, Encoding, Fitness Function, Reproduction. Genetic Modelling – Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise operator, Bit-wise operators used in GA, Generational cycle, Applications.

References:

1. S. Rajasekaran, G.A Vijayalakshmi Pai, " Neural Networks, Fuzzy Logic, Genetic Algorithms", Prentice Hall of India Publishers, 2003
2. Rao, Vallinu B.,and Rao, Hayagriva . Neural networks and fuzzy Logic, second edition, BPB Publication
3. S.R Sivanandam, M. Paulraj, " Introduction to Artificial Neural Network", Vikas Publishers, 2005
4. Berkan C. Riza, Trubatch L, Sheldon, Fuzzy Systems design Principlea. IEEE Press , standard publishers distributers

MCS 3.5 : COMPUTER GRAPHICS
(Max Marks : 75 + 25, Credits: 3)

Unit 1

Graphics Output Primitives and Attributes : Introduction to open GL, Coordinate reference frames, Specifying two dimensional world coordinate reference frame in Open GL, Open GL point functions, Open GL line functions, Video Display Devices(CRT), Raster Scan Display, Random Scan Display, Color CRT Monitors, Flat Panel Displays, Line drawing algorithms, Circle generation algorithms, Ellipse generation, Algorithms, Fill area primitives, Polygon fill areas, OpenGL polygon fill area functions, General scan line polygon fill algorithm, Fill methods for areas with irregular boundaries, Open GL fill area attribute functions.

Unit 2

Two – Dimensional and Three - Dimensional Geometric Transformations : Basic two dimensional geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, Two dimensional composite transformations, Other two dimensional transformations, Three dimensional Translation, Rotation, Scaling, Other three dimensional transformations, Affine transformations, Open GL geometric transformation functions.

Unit 3

Two Dimensional Viewing : The two dimensional viewing, Clipping window, Normalization and viewport transformations, Clipping algorithms, Two dimensional point clipping, Two dimensional line clipping algorithms, Polygon fill area clipping, Curve clipping, Text clipping.

Unit 4

Three Dimensional Viewing : The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, Orthogonal projections, Oblique parallel projections, Perspective projections, The viewport transformation and three dimensional screen coordinates.

Unit 5

Visible- Surface Detection Method: Back face detection, Depth Buffer Method, A-Buffer Method, Scan-Line Method, Depth-Sorting Method, BSP-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method.

References:

1. Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), 3rd Edition.
2. Edward Angel, 'Interactive Computer Graphics' – A top down approach using Open GL, Pearson, 5th Edition
3. Peter Shirley, Steve Marschner, Computer Graphics, Cengage Learning (Indian edition), 2009.

MCS 3.6: LINUX INTERNALS LAB

MCS 3.7: COMPUTER GRAPHIS LAB WITH OPEN GL

MCS 3.8: R PROGRAMMING
(Max Marks: 40+10, Credits: 2)

Unit 1

Introduction: The R environment, related software and documentation, R and statistics, R and the window system, Using R interactively, An introductory session, R commands, case sensitivity, etc. Recall and correction of previous command. Executing commands from or diverting output to a file. Data permanency and removing objects. Simple manipulation- Numbers and vectors.

Unit 2

Object , their models and attributes: Intrinsic attributes, changing the length of an object, getting and setting attributes, the class of an object; Ordered and unordered factors: A specific example, The function tapply() and ragged arrays, ordered factors. Arrays and matrices.

Unit 3

List and data frames; Reading data from files; probability distributions; Grouping, loop and conditional execution.

Unit 4

Writing your own functions; Statistical models in R; Graphical procedures.

Unit 5

Packages, OS facilities; sample session; invoking R; The command-line editor.

References

1. An Introduction to R : An Introduction to R Notes on R: A Programming Environment for Data Analysis and Graphics Version 3.2.4 (2016-03-10) (pdf document)
2. R- Statistical and Graphical Software Notes (pdf document)

MCS 4.1: DATA MINING
(Max Marks : 75+25, Credits : 4)

Unit 1

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Preprocessing: Needs Preprocessing the Data,

Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Some Considerations in Multi-Source Data Fusion.

Unit 2

Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Architectures of Data Mining Systems, Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases, Granular Nested Causal Complexes.

Unit 3

Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Dynamic Itemset Counting Algorithm, FP-Tree Growth Algorithm, From Association Mining to Correlation Analysis, Constraint-Based Association Mining,Mining Association Rules with Rough Sets.

Unit 4

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Other Classification Methods, Prediction, Classifier Accuracy. Uncertain Knowledge Association Through Information Gain.

Unit 5

Cluster Analysis Introduction:Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Density-Based Methods, Clustering High-Dimensional data, Constraint-based cluster analysis, Outlier Analysis, Mining Complex Types of Data Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

References:

1. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Ed., 2005.
2. Arun K Pujari, Data Mining Techniques, Univerities Press, 2nd Ed., 2010.
3. Da Ruan, Guoqing Chen, Etienne E. Kerre, Geert Wets, Intelligent Data Mining: Techniques and Applications (Studies in Computational Intelligence), Springer, 1st Ed., 2010.
4. Masoud Mohammadian, Intelligent Agents for Data Mining and Information Retrieval, Idea Group Publishing, 2004.

MCS 4.2: PATTERN RECOGNITION
(Max Marks: 75 + 25, Credits: 4)

Unit 1

Introduction: Machine perception, pattern recognition systems, design cycle, learning and adaptation, Applications of pattern recognition. Probability**:** Introduction, probability of events, random

variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

Unit 2
Statistical Decision Making: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leaving one-out technique. Characteristic curves, estimating the composition of populations.

Unit 3
Nonparametric Decision Making**:** Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

Unit 4
Unsupervised Learning and Clustering: Unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, Hierarchical clustering, Online clustering, component analysis.

Unit 5
Artificial Neural Networks: Introduction, nets without hidden layers. Neural networks with hidden layers, the back Propagation algorithms, Hopfield nets, and an application.

References:

1. Pattern Classification Duda R. O., and Hart P E., and Stork D G., Wiley Publishers
2. Pattern Recognition and Image Analysis, Earl Gose, Richard J and Steve J, PHI
3. Pattern recognition (Statistical, structural and Neural Approaches), Robert Schalkoff
4. Pattern Recognition, Sergios Thedoridis & Konstantinos Koutrumbas, Elsevier Academic Press, 4th Edition.

MCS 4.3: INERNET OF THINGS (IOT)
(Max Marks: 75+25, Credits: 3)

Unit 1
Introduction: Definition, phases, Foundations, Policy, Challenges and Issues, identification, security, privacy. Components in internet of things**:** Control Units, Sensors, Communication modules, Power Sources, Communication Technologies: RFID, Bluetooth, Zigbee , Wifi , Rflinks , Mobile Internet, Wired Communication.

Unit 2
Programming The Microcontroller For IOT: Basics of Sensors and actuators – examples and working principles of sensors and actuators , Cloud computing and IOT , Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors, Communication**:** Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using Wi-Fi / Ethernet.

Unit 3
Resource Management In The Internet Of Things : Clustering - Software Agents - Data Synchronization - Clustering Principles in an IOT Architecture - The Role of Context - Design

Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.

Unit 4

Business Models For The Internet Of Things : The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as a Basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation, Ontology, Value Creation in the Internet of Things, Application of Ontology Engineering in the IOT-Semantic Web-Ontology - The Internet of Things in Context of EURIDICE - Business Impact.

Unit 5

From The Internet Of Things To The Web Of Things: Resource-oriented Architecture and Best Practices- Designing REST ful Smart Things – Web enabling Constrained Devices - The Future Web of Things - Set up cloud environment – send data from microcontroller to cloud – Case studies – Open Source e-Health sensor platform – Be Close Elderly monitoring – Other recent projects.

References:

1. Charalampos Doukas , Building Internet of Things with the Arduino, Create space, April 2002
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011
3. Luigi Atzor et.al, "The Internet of Things: A survey, ", Journal on Networks, Elsevier Publications, October, 2010

MCS 4.4: CLOUD COMPUTING
(Max Marks: 75+25, Credits: 3)

Unit 1

Introduction to Cloud Computing, The Evolution of Cloud Computing, Hardware Evolution, Internet Software Evolution, Server Virtualization, Web Services Deliver from the Cloud, Communication-as-a-Service, Infrastructure-as-a-Service, Monitoring-as-a-Service, Platform-as-a-Service, Software-as-a-Service, Building Cloud Network.

Unit 2

Federation in the Cloud, Presence in the Cloud, Privacy and its Relation to Cloud-Based Information Systems, Security in the Cloud, Common Standards in the Cloud, End-User Access to the Cloud Computing.

Unit 3

Introduction, Advancing towards a Utility Model, Evolving IT infrastructure, Evolving Software Applications, Continuum of Utilities, Standards and Working Groups, Standards Bodies and Working Groups, Service Oriented Architecture, Business Process Execution Language, Interoperability Standards for Data Center Management, Utility Computing Technology, Virtualization, Hyper Threading, Blade Servers, Automated Provisioning, Policy Based Automation, Application Management, Evaluating Utility Management Technology, Virtual Test and development Environment, Data Center Challenges and Solutions, Automating the Data Center.

Unit 4

Software Utility Application Architecture, Characteristics of an SaaS, Software Utility Applications, Cost Versus Value, Software Application Services Framework, Common Enablers, Conceptual view to Reality, Business Profits, - Implementing Database Systems for Multitenant Architecture.

Unit 5

Other Design Considerations - Design of a Web Services Metering Interface – Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

References:

1. John W. Rittinghouse and james F. Ransome, "Cloud Computing Implementation, Management and Security", 2010, CRC Press, Taylor & Francis Group, Boca Raton London New York.
2. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
3. Bunker and Darren Thomson, "Delivering Utility Computing", 2006, John Wiley & Sons Ltd.
4. George Reese, "Cloud Application Architectures", O'reilly Publications, 2009.

MCS 4.5: PROJECT WORK