BANGALORE UNIVERSITY

SYLLABUS : 2K11

(Fifth – Sixth Semester)

SCHEME OF STUDY AND EXAMINATIONS
FOR BE DEGREE COURSE IN

COMPUTER SCIENCE AND ENGINEERING

UNIVERSITY VISVESVARAYA COLLEGE OF ENGINEERING
K.R. CIRCLE, BANGALORE – 560 001

COMPUTER SCIENCE AND ENGINEERING

V SEMESTER

Sl. No	Code	Subject	No. of Hr. / week		Duration of Exams		Sessional Marks	Exam Marks	Total Marks
			Theory	Practical	Theory	Practical			
1.	2K11CI 51	Database Management Systems	04	--	03	--	25	100	125
2.	2K11CI 52	Operating Systems	04	--	03	--	25	100	125
3.	2K11CI 53	Computer Networks I	04	--	03	--	25	100	125
4.	2K11CI 54	Software Engineering & Testing	04	--	03	--	25	100	125
5.	2K11CI 55	Computer Graphics	04	--	03	--	25	100	125
6.	2K11CI 56	Operation Research	04	--	03	--	25	100	125
7.	2K11CIL 57	Computer Graphics Lab	--	03	--	03	25	100	125
8.	2K11CIL 58	Java Programming Lab	--	03	--	03	25	100	125
Total			24	06	18	06	200	800	1000

VI SEMESTER

Sl. No	Code	Subject	No. of Hr. / week		Duration of Exams		Sessional Marks	Exam Marks	Total Marks
			Theory	Practical	Theory	Practical			
1.	2K11CI 61	Computer Networks II	04	--	03	--	25	100	125
2.	2K11CI 62	Probability and Stochastic Processes	04	--	03	--	25	100	125
3.	2K11CI 63	System Software	04	--	03	--	25	100	125
4.	2K11CI 64	Unix/Linux System Programming	04	--	03	--	25	100	125
5.	2K11CI 65	Artificial Intelligence	04	--	03	--	25	100	125
6.	2K11CI 66	Data Mining	04	--	03	--	25	100	125
7.	2K11CIL 67	Unix/Linux System Programming Lab+ System software Lab	--	03	--	03	25	100	125
8.	2K11CIL 68	Database Management Systems Lab	--	03	--	03	25	100	125
Total			24	06	18	06	200	800	1000

BE V SEMESTER COMPUTER SCIENCE AND ENGINEERING

2K11CI 51: DATABASE MANAGEMENT SYSTEMS

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week: 4 Examination Marks: 100 Sessional Marks: 25

PART A

Chapter 1: Introduction to DBMS **6 Hours**

Introduction to DBMS with Examples, File System Vs DBMS, People who deal with databases, Intended uses of a DBMS, Implications of the Database Approach. Data models, Schemas and instances, DBMS Architecture and data independence, Database languages and Interfaces, The database system environment, Classification of Database Management Systems.

Chapter 2: Conceptual Design and the ER Models **6 Hours**

Overview of Database design, ER model concepts, Notation for ER diagrams, Proper naming of schema constructs, Examples.

Chapter 3: Relational Model and Relational Algebra **6 Hours**

Relational model concepts, Constraints, Update operations on Relations and dealing with constraints violations, Relational Algebra, Relational algebra operations and Queries in the Relational Algebra, Mapping ER model to Relations.

Chapter 4: SQL **6 Hours**

SQL Standards, SQL92; Data definition, Queries, Update statements, Views and Assertions in SQL.

PART B

Chapter 5: Database Design **6 Hours**

Informal design guidelines for Relational Schemas, Functional dependencies, Normal Forms based on primary keys, Generalized definitions of 2NF and 3NF; BCNF, Algorithms for Relational Database Schema design, Multi-valued Dependencies and 4NF.Join dependencies and 5NF.Inclusion dependencies, Template dependencies, DKNF.

Chapter 6: Record Storage and Primary File Organization **6 Hours**

Introduction, Secondary storage devices, RAID Technology, Buffering blocks, Heap and sorted Files, Hashing Techniques, Index – Types of Index, Single level, multi-level and Multiple key indexes.

Chapter 7: Examples of Commercial Database Systems **6 Hours**

ORACLE: Architecture, Languages and interfaces, Embedded SQL. MS ACCESS: Architecture, Overview of the features.

Chapter 8: Emerging Technologies **6 Hours**

Data Warehousing, Data mining, WWW databases, Text and Digital library data bases, Multimedia databases, Parallel databases, Mobile databases.

References :

1. *Elmasri and Navathe, Fundamentals of Database Systems, Fourth Edition, Addison – Wesley, 2006.*
2. *Raghu Ramakrishnan, Database Management Systems, McGraw Hill, Thrid Edition, 2003.*
3. *Peter Rob and Carlos Coronel, Database Systems: Design, Implementation, and Management, Fifth Edition, Thomson learning*, *2006*.
4. *Abraham Silberschatz, Henry F Korth and S Sudarshan ,Database System Concepts, Sixth Edition, 2010.*

2K11CI 52 : OPERATING SYSTEMS

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per week : 4 Examination Marks : 100 Sessional Marks : 25

PART A

Chapter 1 : Introduction **6 Hours**

Batch Systems, Concepts of multi programming and time-sharing, parallel, distributed and real - time systems. Operating system structures - operating system components and services. System calls and system programs. Virtual machines.

Chapter 2 : Process Synchronization **6 Hours**

Introduction to Process concept, The critical section problem, synchronization hardware, semaphores, classical problems of synchronization, critical regions and monitors.

Chapter 3 : Process Management **6 Hours**

Process scheduling, cooperating processes, threads and interprocess communication. CPU scheduling - scheduling criteria, scheduling algorithms, multiple- processor scheduling and real-time scheduling. Algorithm evaluation.

Chapter 4 : Dead Locks **6 Hours**

Deadlocks - system model, characterization, Deadlock prevention, avoidance and detection. Recovery from dead lock. Combined approach.

PART B

Chapter 5 : Storage Management **6 Hours**

Memory management - logical and physical address space, swapping, contiguous allocation, paging and segmentation. Segmentation with paging in MULTICS and Intel 386. Virtual Memory - Demanding paging and its performance. Page replacement algorithms. Allocation of frames. Thrashing. Page size and other considerations. Demand segmentation.

Chapter 6 : File systems and Disk management **6 Hours**

File systems, Secondary Storage Structure, Protection and Security-File concept, access methods, directory structure, protection and consistency semantics. File system structure, allocation methods. Free space management. Directory implementation. Efficiency and performance. Recovery. Disk structure, disk scheduling methods. Disk management. Swap-space management. Disk reliability.

Chapter 7 : Protection and Security **6 Hours**

Protection - Goals of protection, domain of protection. Access matrix and its implementation. Revocation of access. Security - Authentication, passwords. Threats and threat monitoring. Encryption. Computer security classifications.

Chapter 8 : Case Study **6 Hours**

Windows NT, LINUX, Design principles, system components, environmental subsystems. File system, networking and programmer interface.

***References*:**

1. *Silberschatz and Galvin, Operating System Concepts, Fifth Edition, Addision-Wesley, 1997.*
2. *Milan Milancovic, Operating Systems, Concepts and Design. Second Edition, McGrawHill, 2004.*
3. *Harvey M Deital, Operating Systems, Third Edition, Addision-Wesley, 2000.*
4. *Dhananjaya M Dhamdhere, Operating Systems, Science Engineering & Math, 2008.*

2K11CI 53 : COMPUTER NETWORKS I

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.

Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks 100 Sessional Marks : 25

PART A

Chapter 1 : Introduction Data, Signals and Digital Transmission **6 Hours**

Data Communications; Networks; the Internet; Protocols and Standards; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite. Analog and digital signals; Transmission impairment; Data rate limits; Performance; Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes.

Chapter 2 : Analog Transmission and Multiplexing **6 Hours**

Digital - to - Analog conversion; Analog - to - Analog conversion; Multiplexing; Spread spectrum.

Chapter 3 : Transmission Media, Error Detection and Correction **6 Hours**

Twisted pair cable, Coaxial cable, Fiber-Optic cable, Radio waves, Microwaves, Infrared. Introduction to error detection / correction; Block coding; linear block codes; Cyclic codes, Checksum.

Chapter 4 : Data Link Control **6 Hours**

Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases, ALOHA, CSMA, CSMA/CD.

PART B

Chapter 5 : Multiple Access, Ethernet **6 Hours**

Random Access; Controlled Access; Channelization. Ethernet: IEEE standards; Standard Ethernet IEEE 802.3 and changes in the standard; Fast Ethernet; Gigabit Ethernet.

Chapter 6 : Wireless LANS and Connection of LANS **6 Hours**

IEEE 802.11; Bluetooth IEEE 802.16, Wireless Broadband IEEE 802.15. Connecting devices; Backbone Networks; Virtual LANs, CSMA/CA.

Chapter 7 : Interconnecting Devices **6 Hours**

Cellular telephony; Introduction to 2G, 3G, 4G and 5G.Switching: 2X2 Switch, Crossbar Switch, ButterflySwitch, Banniyan Switch. WDM, DWDM. Bridges: Working of Bridges, Wireless Bridges, Transparent Bridges.

Chapter 8 : Introduction to Network Layer **6 Hours**

Introduction to Routing, Different network topologies and their characteristics, Introduction to Router, Routing tables.

***References*:**

1. *Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition, Tata McGraw-Hill, 2006.*

2. *Communication Networks: Fundamental Concepts and Key Architectures - Alberto Leon, Garcia and Indra Widjaja,Third Edition, Tata McGraw- Hill, 2004.*
3. *Data and Computer Communication, William Stallings, Eighth Edition, Pearson Education, 2007.*
4. *Computer Networks: A Systems Approach - Larry L. Peterson and Bruce S. David, Fourth Edition, Elsevier, 2007.*
5. *Introduction to Data Communications and Networking – Wayne Tomasi, Pearson Education, 2005.*
6. *Computer and Communication Networks – Nader F. Mir, Pearson Education, 2007.*
7. *Computer Networks , Andrew S.Tanenbaum, Fourth Edition, Prentice Hall PTR, 2007.*

2K11CI 54 : SOFTWARE ENGINEERING & TESTING

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks 100 Sessional Marks : 25

PART A

Chapter 1: Introduction & System Engineering **6 Hours**

FAQs about software engineering, Professional and ethical responsibility, Emergent system properties, Systems and their environment, System Modeling, The system engineering process, System procurement.

Chapter 2: Software Process **6 Hours**

Software process models, Process iteration, Software specification, Software design and implementation, Software validation, Software evolution, Automated process support.

Chapter 3: Software Project Management **8 Hours**

Management activities, Project planning, Project scheduling, Risk management, Limits to thinking, Group working Choosing and keeping people, Software Cost Estimation, Productivity, Estimation techniques, Algorithmic cost Modeling, Project duration and staffing, Quality assurance and standards, Quality planning, Quality control, Software measurement and metrics.

Chapter 4: Software Requirement Engineering **4 Hours**

Software Requirements, Functional and non-functional requirements, User requirements , System requirements, The software requirements document, Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis , Requirements validation , Requirements management.

PART B

Chapter 5 :Software Testing **6 Hours**

The Six Essentials of Software Testing : The State of the art and state of the practice. The clean sheet approach to getting started, Establishing a practical perspective, critical choices : What, When and how to test – Risk and Risk Management, Start testing early, Basic forms of the testing process, Testing the development cycle and the real world of contracts, Effective and cost effective testing. Critical Disciplines : Frameworks for Testing – Planning, Software Engineering Maturity and the SEI, Configuration Management, Standards, Formal Documents, Testware, Measurement, Tools.

Chapter 6 : Testing Methods **6 Hours**

Verification Testing : Basic verification methods, getting leverage on verification, verifying documents at different phases, getting the best from verification, three critical success factors for implementing verification, recommendation. Validation Testing : Validation overview, Validation Methods, Validation Activities, Recommendation Strategies for Validation Testing. Controlling Validation Costs: Minimizing the cost performing tests, Minimizing the cost of maintaining the tests, Minimizing validation testware development costs, Recommendations.

Chapter 7: Testing Tasks **6 Hours**

Testing Tasks, Deliverables and Chronology : Master test planning, verification testing tasks and deliverables, Validation testing tasks and deliverables, A testing orphan – User manuals, Product release criteria, Summary of IEEE/ANSI test related documents. Software Testing Tools : Categorizing testing tools, Tool acquisition. Measurements : Useful and other interesting measures, Recommendations.

Chapter 8 : Managing Testing Technology **6 Hours**

Organizational Approaches to Testing : Organizing and Reorganizing Testing, Structural Design Elements, Approaches to organizing the test functions, Selecting the right approach. Current Practices, Trends, Challenges: GUIs: What is new here, Usage testing, tester to developer ratios, Software measures and practices benchmark study. Getting Sustainable Gains in Place: Getting gains to happen, Getting Help, Follow up, Verification Check Lists.

References:

1. *Ian Sommerville, Software Engineering, Pearson Education, Seventh Edition, 2004.*
2. *Pressman R.S, Software Engineering, McGraw Hill, Seventh Edition, 2010.*
3. *Jalote P., An integrated approach to Software Engineering, Narosa.2005.*
4. *Ed Kit : Software Testing in the Real World, Addison Wesley,1995.*
5. *William Perry : Effective Methods for Software Testing, Third Edition, John Wiely,2006.*
6. *Bezier B : Software Testing Techniques, Second Edition, Van Nstrand Reinluold, 1990.*

2K11CI 55 : COMPUTER GRAPHICS

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.

Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks: 100 Sessional Marks : 25

PART A

Chapter 1 : Introduction **6 Hours**

Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable Pipelines; Performance Characteristics Graphics Programming: The Sierpinski gasket; Programming Two Dimensional Applications.

Chapter 2 : The OpenGL **6 Hours**

The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The threedimensional gasket; Plotting Implicit Functions.

Chapter 3 : Input and Interaction **6 Hours**

Interaction; Input devices; Clients and Servers; Display Lists; Display Lists and Modeling; Programming Event Driven Input; Menus; Picking; A simple CAD program; Building Interactive Models; Animating Interactive Programs; Design of Interactive Programs; Logic Operations.

Chapter 4 : Geometric Objects and Transformations-I **6 Hours**

Scalars, Points, and Vectors; Three-dimensional Primitives; Coordinate Systems and Frames; Modeling a Colored Cube; Affine Transformations; Rotation, Translation and Scaling;

PART B

Chapter 5 : Geometric Objects and Transformations-II **6 Hours**

Geometric Objects and Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices; Interfaces to three dimensional applications; Quaternion's.

Chapter 6 : Viewing **6 Hours**

Classical and computer viewing; Viewing with a Computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden surface removal; Interactive Mesh Displays; Parallel-projection matrices; Perspective-projection matrices; Projections and Shadows.

Chapter 7 : Lighting and Shading **6 Hours**

Light and Matter; Light Sources; The Phong Lighting model; Computation of vectors; Polygonal Shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global Illumination.

Chapter 8 : Implementation **6 Hours**

Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations.

***References* :**

1. *Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, Fifth Edition, Pearson Education, 2008.*
2. *Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, Third Edition, Pearson Education, 2004.*
3. *F.S. Hill Jr.: Computer Graphics Using OpenGL, Third Edition, PHI, 2009.*
4. *James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.*

2K11CI 56 : OPERATION RESEARCH

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per week: 4 Examination Marks: 100 Sessional Marks: 25

PART A

Chapter 1 : Introduction **4 Hours**

Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation.

Chapter 2 : Linear Programming **6 Hours**

Introduction to: Prototype example; The linear programming (LP) model. Assumptions of LP; Additional examples.

Chapter 3 : Simplex Method **8 Hours**

The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method. Adapting to other model forms; Post optimality analysis; Computer implementation Foundation of the simplex method. The revised simplex method, a fundamental insight.

Chapter 4 : Duality Theory and Sensitivity Analysis **8 Hours**

The essence of duality theory; Economic interpretation of duality, Primal dual relationship; Adapting to other primal forms. The role of duality in sensitive analysis, The essence of sensitivity analysis; Applying sensitivity analysis. The dual simplex method; Parametric linear programming; The upper bound technique.

PART B

Chapter 5: Transportation **6 Hours**

The transportation problem; A streamlined simplex method for the transportation problem. The assignment problem, A special algorithm for the assignment problem.

Chapter 6 : Assignment Problems and Game Theory **6 Hours**

Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure.

Chapter 7 : Decision Analysis **6 Hours**

Solving by linear programming, Extensions. Decision Analysis: A prototype example; Decision making without experimentation; Decision making with experimentation; Decision trees.

Chapter 8 : Metaheuristics **6 Hours**

The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms

References :

1. *Frederick S. Hillier and Gerald J. Lieberman: Introduction to Operations Research: Concepts and Cases, Eighth Edition, Tata McGraw Hill, 2005.*
2. *Wayne L. Winston: Operations Research Applications and Algorithms, Fourth Edition, Cengage Learning, 2003.*
3. *Hamdy A Taha: Operations Research: An Introduction, Eighth Edition,* Pearson Education, 2007.
4. *S. D. Sharma : Operations Research, Kedarnath Ramnath & Co, 2002.*
5. *Prem Kumar Gupta, D S Hira : Operations Research, S Chand Pub, New Delhi, 2007.*
6. *Sharma J K : Operations Research: Theory and Applications, Fourth Edition, Macmilan, 2010.*

2K11CIL 57 : COMPUTER GRAPHICS LABORATARY

(Regular Laboratory with Mini Project)

Hours per week : 3 Examination Marks : 100 Sessional Marks : 25

PART A

In this laboratory the students has to write and execute programs in C/C++ like

1. Program to recursively subdivide a tetrahedron to from 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.
2. Program to implement Liang-Barsky line clipping algorithm.
3. Program to draw a color cube and spin it using OpenGL transformation matrices.
4. Program to create a house like figure and rotate it about a given fixed point using OpenGL functions.
5. Program to implement the Cohen-Sutherland line-clipping algorithm. Make provision to specify the input line, window for clipping and view port for displaying the clipped image.
6. Program to create a cylinder and a parallelepiped by extruding a circle and quadrilateral respectively. Allow the user to specify the circle and the quadrilateral
7. Program, using OpenGL functions, to draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
8. Program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Use OpenGL functions.
9. Program to fill any given polygon using scan-line area filling algorithm. (Use appropriate data structures.)
10. Program to display a set of values { fij } as a rectangular mesh.

PART B

Develop a suitable Graphics package to implement the skills learnt in the theory and the exercises indicated in PART A using OpenGL.

Note:

Any one question from PART A may be asked in the examination.

A report of about 10 – 12 pages on the package developed in PART B, duly certified by the department must be submitted during examination.

2K11CIL 58 : JAVA PROGRAMMING LABORATORY

(Regular Laboratory)

Hours per Week : 3 Examination Marks : 100 Sessional Marks : 25

1. Program to implement Stack operations (push, pop and Display).
2. Program to print all the solutions of a quadratic equation.
3. Program to read student's name, regno, marks and display the student details with total marks, using **single** and **multilevel inheritance**.
4. a)Program to implement Queue operations (insert, delete and display).
   b)Program to read two integers, perform division of two numbers, display the result with appropriate messages using the concept of **Exception Handling**.
5. Implement different String Operations(strcpy, strlength, strcat, strcmp, str.charAt(i)) using **method overloading**.
6. Program to multiply given two matrices of size mxn.
7. a)Program to count the frequency of words. (using **String Tokenizer**)
   b)Program to read N values using an array and sort them using Bubble Sort.
8. Program to perform addition, subtraction, division and multiplication of complex numbers. (use **method overloading**)
9. Program to find the values of unknowns in the polynomial degree of n.
10. Program to create threads A,B and C for three different tasks using **Thread class** with a thread for main method.
11. Program to overload the function **search()** to search an integer key value and key value of type double using Binary Search.
12. Applet program that automatically display the text with Font style, Font type using **getParameter(), getCodeBase() and getDocumentBase().**
13. Create two classes 'Teacher' and 'Student'. Perform interfacing of classes with appropriate attributes.
14. Develop an Applet that receives an integer in one text field and computes it's factorial value and returns it in another text field, when the button named "computes" is clicked.

Note: The evaluation is based on any one program from the list of programs.

BE VI SEMESTER INFROMATION SCIENCE AND ENGINEERING

2K11CI 61 : COMPUTER NETWORKS II

Note :

FOUR questions from PART A and FOUR questions from PART B to be set
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per week : 4 Examination Marks : 100 Sessional Marks : 25

PART A

Chapter 1: Network Layer **6 Hours**

Network layer design issues: Store-and-forward packet switching, Services provided to the transport layer , Implementation of Connectionless service, Implementation of connection-oriented service, Comparison of virtual-circuit and Datagram subnets. Network topologies.

Chapter 2 : Network Layer **6 Hours**

Routing algorithms: Principles ofrouting algorithms, static routing, dynamic routing, flow based routing, Dijkstra routing, link state routing, hierarchical routing, Broadcast routing, Multicast routing,Routing in Mobile hosts: Routing in Ad-Hoc networks-AODV, DSR, Routing in Sensor networks- Leach, SPIN, Zigbee Protocol, IEEE 802.15.4;Label switching and MPLS.

Chapter3: Network Layer **6 Hours**

Congestion control algorithms: General principles of congestion control, congestion prevention policies, congestion control in virtual-circuit subnets, congestion control in datagram subnets- Warning bit, Choke packets, Hop-by-Hop choke packets, Load shedding, Random early detection, Jitter control.

Techniques for achieving good quality of service: Overprovisioning, Buffering, Traffic shaping,Leaky Bucket algorithm, Token Bucket algorithm, Resource Reservation-Admission control, Proportional routing, Packet scheduling,

Chapter4: Internetworking **6 Hours**

Concatenated virtual circuits, Connectionless internetworking, Tunneling, Fragmentation. IP Addresses, CIDR, NAT, Internet Protocols-ICMP, ARP, RARP, BOOTP, DHCP, OSPF, BGP, Internet Multicasting, IPv4, IPv6.

PART B

Chapter 5 : Transport Layer **6 Hours**

The transport services: Services provided to the upper layers, Transport service primitives, Berkeley Sockets. **Elements of transport protocols:** Addressing, Connection Establishment, Connection release, Flow control and Buffering, Multiplexing, Crash Recovery. **TCP:** TCP Header, TCP Connection Establishing and Releasing, TCP transmission policy, TCP timer management.

Chapter 6 : Transport Layer **6 Hours**

UDP header, Integrated services, Differentiated services, QOS, Virtual Private Networks(VPNs), Overlay Networks.

Chapter 7 :Network Security **6 Hours**

Overview, General principles of network security algorithms, Private Key, Public Key, General concepts of RSA, DES, Triple DES, Diffie-Hellman Key Exchange.

Chapter 8 :Application Layer **6 Hours**

Domain Name System :The DNS name space, Resource space, Resource records and Name servers,**Electronic Mail:** Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery,**Multimedia**: VOIP, Video on Demand, MBone(Multicast Backbone), Compression Techniques-MPEG-7, JPEG; HTTP, SNMP,MIB, SMTP.

References :

1. *A S Tanenbaum, Computer Networks, Fourth Edition, PHI, 2002.*
2. *W Stallings, Data and Computer Communications, Fifth Edition, PHI, 2012.*
3. *S Keshav, An Engineering Approach to Computer Networking, Addison-Wesely, 1997.*
4. *Stevens, UNIX Network Programming, PHI, 2001.*
5. *B A Forouzan and D M Mukhopadhyay, Cryptography and Network Security, Second Edition, McGraw Hill, 2004.*
6. *James F Kurose, Keith W Ross, Computer Networking: A Top-Down Approach, Edition, 2005.*

2K11CI 62 : PROBABILITY AND STOCHASTIC PROCESS

Note :

FOUR questions from PART A and FOUR questions from PART B to be set
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks 100 Sessional Marks : 25

PART A

Chapter 1: Introduction **6 Hours**

Probability Models, Sample Space, Events, Algebra of Events, Graphical Methods of Representing Events, Probability Axioms, Combinatorial Problems, Conditional Probability, Independence of Events, Bayes Rule, Bernoulli Trials

Chapter 2 : Random Variables **6 Hours**

Random Variables and their event spaces, PMF, Distribution functions, Probability generating function, exponential distribution, reliability, failure density, and hazard function.

Chapter 3: Expectation **6 Hours**

Moments, Expectation of Functions, Transform Methods, Moments and Transforms of Some Important distributions, computation of mean time to failure.

Chapter 4 : Conditional Distribution and Expectation **6 Hours**

Mixture distributions, conditional expectations, Imperfect fault coverage and reliability, random sums.

PART B

Chapter 5 : Stochastic Processes **6 Hours**

Classification of Stochastic Processes, The Poisson Process, Renewal Process, Availability Analysis, Random Incidence, Renewal Model of Program Behavior

Chapter 6 : Markov Chains **6 Hours**

Discrete Parameter Markov Chains, Computation of n-step probabilities, state classification and limiting distributions, distribution of times between state changes, Irreducible finite chains with aperiodic states, M/G/1 queuing system, discrete parameter birth death processes.

Chapter 7 : Markov Chains **6 Hours**

Continuous parameter markov chains – birth and death process, non-birth-death process, markov chains with absorbing states.

Chapter 8 : Network of Queues **6 Hours**

Open queuing Networks, Closed Queuing Networks, Non exponential service time distributions and multiple job types, non product form networks.

***References*:**

1. *K S Trivedi, Probability & Statistics with Reliability, Queuing, and Computer Science Applications, PHI, Second Edition, 2001.*
2. *Sheldon M Ross, Introduction to Probability Models, Elsevier Press, Tenth Edition, 2009.*
3. *Paul J Fortier and Howard E Michel, Computer Systems Performance Evaluation and Prediction, Elsevier Press, First Edition, 2003.*
4. *A Papoulis and S UnnikrishnaPillai, Probability, Random Variables and Stochastic Processes, McGrawHill, Fourth Edition, 2002.*
5. *Richard A Johnson, Probability and Statistics for Engineers, Pearson Education, Seventh Edition, 2007.*

2K11CI 63: SYSTEM SOFTWARE

Note :

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE question selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per week : 4 Examination Marks : 100 Sessional Marks : 25

PART A

Chapter 1 : Machine Architecture **6 Hours**

Introduction, System software and machine architecture, Simplified Instructional Computers (SIC), SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

Chapter 2 : Assemblers-1 **6 Hours**

Machine Independent Assembler Features – A Simpler SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.

Chapter 3 : Assemblers-2 **6 Hours**

Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expressions, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations – One –Pass Assembler, Multi-Pass Assembler, Implementation Examples – MASM Assembler.

Chapter 4 : Loaders And Linkers **6 Hours**

Basic Loader Functions – Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader; Machine-Independent Loader Features- Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples, MS_DOS Linker.

PART B

Chapter 5 :Editors And Debugging Systems **6 Hours**

Text Editors – Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems – Debugging Functions and Capabilities, Relationship With Other parts of the System, User-Interface Criteria.

Chapter 6 : Macro Processor – 1 **6 Hours**

Basic Macro Processor Functions - Macro Definition and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels.

Chapter 7 : Macro Processor – 2 **6 Hours**

Conditional - Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options – Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples – MASN Macro Processor, ANSI C Macro Processor.

Chapter 8 : LEX And YACC **6 Hours**

Lex And Yacc – The Simple Lex Program, Counting Words, And Lines, Symbol Tables, Grammars, A YACC Parser, The Definition Section, The Rules Section, Symbol, Symbol Values and Actions, Parsing a Command Line, Compiling and Running a Simple LEX and YACC.

References:

1. *System Programming and Operating Systems – D.M.Dhamdhere, Second Edition, Tata McGraw – Hill,1999*
2. System Software - Leland L Beck, System Software, Third Edition, Addison-Wesley, 1997.
3. Lex and Yacc – John.R.Levine, Mason and Doug Brown, O'Reilly, SPD, 1998.

2K11CI 64 : UNIX/LINUX SYSTEM PROGRAMMING

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks: 100 Sessional Marks 25

PART A

Chapter 1 : Introduction **6 Hours**

Unix and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standard. UNIX and POSIX APIs: The POSIX APIs. The UNIX and POSIX Development Environment, API Common Characteristics.

Chapter 2 : UNIX Files-1 **6 Hours**

File Types, The UNIX and POSIX File System. The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

Chapter 3 : UNIX Files-2 **6 Hours**

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

Chapter 4 :UNIX Processes **6 Hours**

The Environment of a UNIX Process: Introduction, main function, Process termination, Command-line arguments, Environment List, Memory layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

PART B

Chapter 5: Process Control **6 Hours**

Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, System Function, Process Accounting, User Identification, Process Times, I/O Redirection.

Chapter 6 : Process Relationships **6 Hours**

Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

Chapter 7 : Signals and Daemons **6 Hours**

Signals: The Unix Kernel Support for Signals, Signal, Signal Mask, Sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.1b, Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client Server Model.

Chapter 8 : Inter Process Communication **6 Hours**

Interprocess Communication: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores, Shared Memory, Client Server Properties, Stream Pipes, Passing File Descriptors, An Open Server Version 1, Client Server Connection Functions.

References :

1. *Terrence Chan: Unix System Programming Using C++, PHI, 1999.*
2. *W Richard Stevens: Advanced Programming in the Unix Environment, Addison-Wesley/PHI, 2005.*
3. *Maurice J Bach: The Design of the Unix Operating System, PHI, 1986.*
4. *Uresh Vahalia: Unix Internals, Pearson Education, 1996.*

2K11 CI 65 : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Note:

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks: 100 Sessional Marks 25

PART A

Chapter 1: Introduction:
Artificial Intelligence: Its scope, history and applications, The Propositional Calculus, The Predicate Calculus, Using Inference Rules to produce Predicate Calculus Expressions, Application: A logic based financial advisor.

Chapter 2. Structures and strategies for state space search:
Graph theory, strategies for space search, using state space to represent reasoning with the predicate calculus.

Chapter 3. Heuristic Search:
Heuristic search- An algorithm for heuristic search. Admissibility, monotonicity and informedness. Heuristics in games. Complexity issues. Control and implementation of state space search- Recursion based search, pattern directed sesarch, production systems, the black board architecture for problem solving.

Chapter 4. Knowledge Based Systems:
Overview of expert system technology. Rule based expert systems, Model- based, Case – based and Hybrid Systems. Reasoning in uncertain situations, The stochastic approach to uncertainity. Non - monotonic systems. Reasoning with fuzzy sets.

PART B

Chapter 5. Knowledge Representation:
Knowledge representation - languages.Issues in knowledge representation.A survey of network representation. Conceptual graphs. A network representation language. Structured representations. Further issues in knowledge representation.

Chapter 6. An Introduction to LISP:
LISP: A brief Overview, Search in LISP: A functional approach to the farmer, wolf, goat, and cabbage problem. Higher- order functions and procedural abstraction. Search strategies in LISP. A recursive Unification function.

Chapter 7. Machine Learning : Connectionist:
Foundations for connectionist networks, preception learning, back propagation learning. Competitive learning.Hebbian coincidence learning. Attractor networks or memories. Machine learning: social and emergent - models; the genetic algorithm. Classifier systems and genetic programming. Artificallife and society based learning.

Chapter 8: Automated Reasoning:

Automated reasoning - Weak methods in theorem proving. The general problem solver and difference tables. Resolution theorem proving.Further issues in automated reasoning.

References :

1. *George. F. Luger , Artificial Intelligence - Structures and Strategies for Complex Problem Solving, Fourth Edition, Pearson Education, 2002.*
2. *P. H. Winston, Artificial Intelligence, Third Edition, Addision-Wesely, 1992*
3. *E. Rich and Knight, Artificial Intelligence, Second Edition, TMH, 1994.*

2K11CI 66 : DATA MINING

Note :

FOUR questions from PART A and FOUR questions from PART B to be set.
Students should answer FIVE questions selecting atleast TWO from each PART.
For every SIX hours of syllabus ONE question may be set.

Hours per Week : 4 Examination Marks : 100 Sessional Marks : 25

PART A

Chapter 1: Introduction **6 Hours**

Importance of Data Mining, Data Mining Functionalities, Different kinds of Data, Classification of Data Mining Systems, Primitives, Major Issues and challenges in Data Mining.

Chapter 2: Data Preprocessing **6 Hours**

Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Chapter 3: Classification and Prediction **6 Hours**

Supervised and unsupervised learning, Definition of classification, Issues in Classification, Decision Tree Induction, Bayesian classification, Rule Based Classification, K-nearest neighbor method, Prediction using Linear and Non-linear Regression, Classification Accuracy and Error Measures.

Chapter 4: Clustering **6 Hours**

Types of Data in Cluster Analysis, Classification of clustering methods, K-means and K-Methods Algorithms, BIRCH, DBSCAN, STING, Expectation-Maximization and Outlier Analysis.

PART B

Chapter 5: Association Rule Mining-1 **6 Hours**

Basic concepts, Classification of Association Rules, Apriori Algorithms, Multilevel Association rules, FP Tree, Categorical Association Rules, Multidimensional Association Rules.

Chapter 6: Association Rule Mining-2 **6 Hours**

Mining Frequent closed Itemsets, Metarule-guided Association Rules, Constraint Based Association Rules.

Chapter 7: Data Warehouse and OLAP Technology **6 Hours**

OLAP and OLTP, Data Ware house Model, Star Schema and Show flake Schema, Dataware Architecture, Data ware house Implementation, Data Cube Computation.

Chapter 8: Big Data **6 Hours**

Basic concepts of Big data, Four dimensions of Big Data: Volume, Velocity, Variety and Veracity. Introduction to storage, Map Reduce and Query Stack. Overview of Big Data Stores, Processing of Big Data. Overview of tools and techniques to analyze Big Data.

References :

1. *Jiawei Han and Micheline Kamber, Data Mining, Concepts and Techniques, Elsevier,Second Edition, 2001.*
2. *Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Data Mining Algorithms, 2005.*
3. *Big Data Now, O'REILLY Media, First Edition, 2012.*
4. *David Hand, Heikki Mannila, Padhraic Smyth, Principles of Data Mining, PHI, 2001.*
5. *Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education, 2008.*

2K11CIL 67: LINUX/UNIX PROGRAMMING LABORATORY AND SYSTEM SOFTWARE LABORATORY(Regular laboratory)

Hours per Week : 3 Examination Marks : 100 Sessional Marks : 25

UNIX / LINUX PROGRAMS

1. A) shell script that accepts any number of non recursive arguments and print them in reverse order
   B) C program to create child process to read commands from standard input and execute them
2. A) C program to create file with 16 bytes of ordinary data from the beginning and other 16 bytes of ordinary data from an offset of 48. display the contents to demonstrate how hole in a file is handled.
   B) C program that accepts valid filename as command line argument and print the type of the file
3. A) Shell script which prints command line arguments one by one after translating all lower case to upper case
   B) C program to run the command and determine the time taken by it
4. A) Shell script to check file permissions process status , date and the current user using case conditional statements.
   B) AWK script to print the transpose of matrix
5. A) Shell script that accept valid login name and print corresponding home directory

B) Shell script that accepts two file names as arguments sort both to temporary files and merge the sorted output and finally delete the temporary files.

6. A) Shell script to display the calendar of the current month with current date replaced by * (or) ** depending on whether the date has one digit or two .
   B) Terminal locking using shell script.

SYSTEM SOFTWARE PROGRAMS

Execution of the following programs using LEX:

1. Program to count the number of vowels and consonants in a given string.
2. Program to count the number of characters, words, spaces and lines in a given input file.
3. Program to count number of (i) positive and negative integers (ii) positive and negative fractions.
4. Program to count the number of comment lines in a given C program. Also eliminate them and copy that program into separate file.
5. Program to count the number of scanf and printf statements in a C program. Replace them with readf and writef statements respectively.

Execution of the following programs using YACC:

1. Program to test the validity of a simple expression involving operators +, -, *, and /.
2. Program to recognize nested IF control statements and display the number of levels of nesting.
3. Program to recognize a valid arithmetic expression that uses operators +, -, * and /.

Note :

The evaluation is based on execution of one program from Linux/Unix and one from system software(LEX or YACC).

2K11CIL 68 : DATABASE MANAGEMENT SYSTEMS LABORATORY

(Programming and Mini Project Laboratory)

Hours per Week : 3 Examination Marks 100 Sessional Marks 25

PART A

I. Consider the Insurance database given below. The primary keys are underlined and the datatypes are specified.

PERSON (driver – id #: String, name: string, address: string)
CAR (Regno: string, model: string, year: int)
ACCIDENT (report-number: int, date: date, location: string)
OWNS (driver-id #:string, Regno:string)
PARTICIPATED (driver-id: string, Regno:string, report-number:int, damage amount:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter atleast five tuples for each relation.

iii. Demonstrate how you
   1. Update the damage amount for the car with a specific Regno in the accident with report number 12 to 25000.
   2. Add a new accident to the database.

iv Find the total number of people who owned cars that were involved in accidents in 2002.
v. Find the number of accidents in which cars belonging to a specific model were involved.

II. Consider the following relations for an order processing database application in a company.

CUSTOMER (cust #: int , cname: string, city: string)
ORDER (order #: int, odate: date, cust #: int, ord-Amt: int)
ORDER – ITEM (order #: int, Item #: int, qty: int)
ITEM (item # : int, unit price: int)
SHIPMENT (order #: int, warehouse#: int, ship-date: date)
WAREHOUSE (warehouse #: int, city: string)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter atleast five tuples for each relation.
iii. Produce a listing: CUSTNAME, #oforders, AVG_ORDER_AMT, where the middle column is the total numbers of orders by the customer and the last column is the average order amount for that customer.
iv. List the order# for orders that were shipped from *all* the warehouses that the company has in a specific city.
v. Demonstrate how you delete item# 10 from the ITEM table and make that field *null* in the ORDER_ITEM table.

III. Consider the following database of student enrollment in courses & books adopted for each course.

STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course #:int, cname:string, dept:string)
ENROLL (regno:string, course#:int, sem:int, marks:int)
BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter atleast five tuples for each relation.
iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.

iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the ‘CS’ department that use more than two books.
v. List any department that has *all* its adopted books published by a specific publisher.

IV. The following tables are maintained by a book dealer.

AUTHOR (author-id:int, name:string, city:string, country:string)
PUBLISHER (publisher-id:int, name:string, city:string, country:string)
CATALOG (book-id:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (category-id:int, description:string)
ORDER-DETAILS (order-no:int, book-id:int, quantity:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter atleast five tuples for each relation.
iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
iv. Find the author of the book which has maximum sales.
v. Demonstrate how you increase the price of books published by a specific publisher by 10%.

V Consider the following database for a banking enterprise

BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)
BORROWER(customer-name:string, loan-number:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter atleast five tuples for each relation
iii. Find all the customers who have atleast two accounts at the *Main* branch.
iv. Find all the customers who have an account at *all* the branches located in a specific city.
v. Demonstrate how you delete all account tuples at every branch located in a specific city.

PART B

One mini project to be completed and submitted. A miniproject is to be implemented using an RDBMS like INGRES, ORACLE, SYBASE etc. (Excluding dbase like systems). The project could be for

- Hotel Management
- Hospital administration
- Inventory control
- Manufacturing centre
- Placement centre
- Gas agency
- Railway/Roadway/Airway reservation system
- Academic administration
- Sports databases
- Career opportunities
- Employee database
- Payroll system
- Library management
- Examination system management
- Banking operations

- Finance companies
- Product Management
- Pharmacy
- Mall
- News
- Population
- CET
- College
- Insurance
- Movies
- Manufacturing
- Voting
- Weather
- Books
- Websites
- Travel
- Real Estate
- Wild life
- Students
- Income tax
- Import-Export
- Doctor
- Railways

Note : The evaluation is based on Execution of any one program from PART A and demonstration of Mini Project. The student has to submit a report to the examiner.
