IT- 701 – Object Oriented Analysis and Design

Unit I: Overview of Object Oriented concepts: Objects and classes, abstraction, generalization and inheritance, encapsulation, multiple inheritance, aggregation abstraction classes, polymorphism, link and association, Need for object oriented approach

Unit II: System design life cycle, object oriented S/W development process model, Object Oriented Analysis, Object Modeling Technique (OMT): object model, function model, relationship among models, object diagrams, state diagrams, data flow diagrams, analysis.

Unit III: Object oriented Design: Overview of object design, Combination the models, Designing algorithms, design optimization, Implementation of control, Adjustment, Design of association, object representation, physical packaging, documenting design decision, comparison of use-case driven approach.

Unit IV: Translation Object Oriented design into implementation, Programming style, Documentation, characterization of object oriented languages, Comparison of object oriented language like C++, JAVA, object programming.

Unit V: Unified Modeling Language (UML): Class diagram sequence diagram Use case diagram, Collaboration, diagram, state, chart diagram, Activity diagram, component diagram, deployment diagram, Object oriented Database: Relational Vs .object oriented database, the architecture of object oriented database, query language for Object Oriented database.

References:-

- Satzinger, Jackson and Burd, "Object oriented Analysis and design with the Unified Process", CENGAGE Learning.
- Michael Blaha and J. Rumbugh, "Object oriented Modeling and design with UML", Pearson Education
- O'Docherty, "Object Oriented Analysis and Design Understanding, System Development with UML2.0", Wiley India.

List of Experiment:-

- Draw Object, state, Data flow Diagram of ATM.
- Draw Object, state, Data flow Diagram of Telephone Call.
- Draw Object, state, Data flow Diagram of Library Information System.
- Draw Object, state, Data flow Diagram of Airline reservation System.
- Draw Object, state, Data flow Diagram of Calculator.
- Draw Object, state, Data flow Diagram of College Management system.
- Draw Object, state, Data flow Diagram of Payroll System.
- Draw Object, state, Data flow Diagram of Railway Reservation system.
- Draw Object, state, Data flow Diagram of Online Sales.
- Draw Object, state, Data flow Diagram of Examination result display System of a University.

IT- 702 – Wireless & Mobile Computing

Unit I: Antenna , variation pattern, antenna types, antenna gain, propagation modes, types of fading. Model for wireless digital communication, multiple access technique-SDMA, TDMA, FDMA, CDMA, DAMA, PRMA, MAC/CA, Cellular network organization, operations of cellular system, mobile radio propogation effects, , handoff, power control, sectorization, traffic engineering, Infinite sources, lost calls cleared, grade of service, poison arrival process

Unit II: GSM- Services, system architecture, radio interface, logical channels, protocols, localization and calling, handover, security, HSCSD, GPRS-architecture, Interfaces, Channels, mobility management DECT, TETRA, UMTS.

Unit III: IEEE 802.11: LAN-architecture, 802.11 a, b and g, protocol architecture, physical layer, MAC layer , MAC management, HIPERLAN-protocol architecture, physical layer, access control sub layer, MAC sub layer. Bluetooth-user scenarios- physical layer, MAC layer.

Unit IV: Mobile IP, DHCP, Ad hoc networks: Characteristics, performance issue, routing in mobile host. Wireless sensor network, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. Introduction to WAP.

Unit V: Intruders, Intrusion detection, password management, viruses and related threads, worms, trojan horse defense, difference biometrics and authentication system, firewall design principle.

References:-

- J. Schiller, "Mobile Communication", Addision , Wiley
- William Stalling, "Wireless Communication and Network", Pearson Education
- Upen Dalal," Wireless Communication", Oxford Higher Education
- Dr. Kamilo Feher, "Wireless Digital communication", PHI
- William C.Y Lee, "Mobile Communication Design Fundamental" , John Wiley.

IT- 703 – Cloud Computing

Unit-I

Introduction: Historical development ,Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments .Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CRM and ERP ,Social networking .

Unit-II

Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance,

Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management.

Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

Unit –III

Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management,Conceps of Map reduce , Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute ,storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN) and Virtual SAN(VSAN) and their benefits .

Unit-IV

Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Secutity Architecture .

Unit-V

Market Based Management of Clouds , Federated Clouds/Inter Cloud: Characterization & Definition , Cloud Federation Stack , Third Party Cloud Services .

Case study : Google App Engine, Microsoft Azure , Hadoop , Amazon , Aneka

List of Experiments:

1. Installation and configuration of Hadoop/Euceliptus etc.
2. Service deployment & Usage over cloud.
3. Management of cloud resources.
4. Using existing cloud characteristics & Service models .
5. Cloud Security Management.
6. Performance evaluation of services over cloud .

Recommended Text:

1. Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub
2. Kumar Saurabh, "Cloud Computing" , Wiley Pub
3. Krutz , Vines, "Cloud Security " , Wiley Pub
4. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub
5. Sosinsky, " Cloud Computing" , Wiley Pub

IT 704 Elective –I (IT- 710- Advanced Concepts In Database Systems)

Unit I: An overview of database, The Extended Entity Relationship Model and Object Model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.

Unit II: Query Processing, Optimization & Database Tuning: Algorithms For Executing Query Operations. Heuristics For Query Optimizations, Estimations of Query Processing Cost, Join Strategies for Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS.

Unit III: Distributed Database System: Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing In R * System, Concurrency Control In Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols.

Unit IV: Enhanced Data Model For Advanced Applications: Database Operating System, Introduction to Temporal Database Concepts, Spatial And Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues in Real Time Database Design.

Unit V: Accessing databases from Web, JavaScript, JDBC, Java Servlets , database technology to Web related areas such as semi-structured databases and data integration, XML, XQuery, XPath, XML Schemas, distributed database design, distributed database transactions, and distributed query processing

References:-

- Majumdar & Bhattacharya, “Database Management System”, TMH.
- Elmasri, Navathe, “Fundamentals of Database Systems”, Addison Wesley.
- Korth, Silbertz, Sudarshan, “ Database Concepts”, McGraw Hill.
- David M. Croenke and David J. Auer “Database Processing” Eleventh Edition, PHI
- Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill.
- Peter Rob and Coronel, “Database Systems, Design, Implementation and Management”, Cengage Learning
- Data C J,” An Introduction To Database System”, Addison Wesley.
- Bernstein, Hadzilacous, Goodman, “Concurrency Control & Recovery”, Addison Wesley.

IT 704 Elective –I (IT- 711- Simulation and Modeling)

Unit I: PHYSICAL MODELING: Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of systems, Iconic, analog and Mathematical Modeling.

Unit II: COMPUTER BASED SYSTM SIMULATION: Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, calumnious system models, analog and hybrid simulation, feedback systems, Buildings simulation models- Financial Model for an office Building, Sensitivity analysis for office building Model.

Unit III: SYSTEM DYNAMICS MODELING: Identification of problem situation, Exponential Growth Model and Decay Model, Logistic Curve, System Dynamic Diagrams, Simulation of System Dynamics- Waiting Times in Single Server Queuing System.

Unit IV: PROBABILITY CONCEPTS IN SIMULATION: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers-Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers- Rationale, Applicability and Synchronization.

Unit V: SIMULATION SOFTWARE: Introduction, Comparison of Simulation Package with Programming Languages, Classification of Simulation Software, Desirable Software features, General Purpose Simulation Package-ARENA, EXTEND, Study of SIMULA, DYNAMO,

References:-

- Gorden G., "System simulation", Printice Hall.
- Averill M Law " Simulation Modeling and Analysis", TMH
- Seila,Ceric and Tadikamalla " Applied Simulation Modeling", Cengage Learning.
- Severance" System Modelling & Simulation : An Introduction",John Wiley
- Payer T., "Introduction to system simulation", McGraw Hill.
- Allan Carrie, "Simulation and Modeling", McGraw Hill.

IT 704 Elective –I (IT- 712- Human-Computer Interaction)

Unit I: Introduction, Human Computer Interaction (HCI) concepts and definitions, Nature of interaction human and Machine, interaction design, understanding and conceptualizing interaction, understanding users, interfaces and interactions, data gathering.

Unit II: Introduction to User Centered System Design (UCSD), Natural computing, user centered system design, core concepts, interactive design and its strength and weakness, types of user model, user model and evaluation, Heuristic evaluation.

Unit III: Psychological user models. Black box models of human performance, including perception, motor control, memory and problem-solving. Quantitative analysis of performance. Human processor, keystroke level model, and GOMS descriptions of user performance.

Unit IV: Modeling of system understanding. Mental models and metaphor, use of design prototypes, controlled experiments. Cognitive walkthrough. Evaluation from the perspective of a novice learning to use the system.

Unit V: Task analysis and design. Contextual and qualitative studies, use-case driven design. Research techniques. Cognitive dimensions of notations, CSCW, ubiquitous computing, new interaction techniques, programmability.

References:-

- Alan Dix, Janet E. Finlay, "Human-Computer interaction", Pearson Education.
- Olsen, "Human-Computer Interaction", Cengage Learning.
- Preece, J. Sharp, H. & Rogers, "Interaction design: beyond human-computer interaction Y. Wiley.
- Smith Atakan Serengal, "Human-Computer Interaction", Cengage Learning.

IT 704 Elective –I (IT- 713- Automata and Compiler Design)

Unit I: Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Arden's theorem.

Unit II: Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler. Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Implementation of Lexical Analyzer. The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG. Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers,

Unit III: Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC, Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Unit IV: Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Unit V: Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection

References:-

- Louden, "Compiler construction", Cengage learning .
- Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa.
- A.V. Aho, R. Sethi and J.D Ullman, "Compiler: principle, Techniques and Tools", AW.
- Michal Sipser, "Theory of Computation", Cengage learning.
- H.C. Holub, "Compiler Design in C", Prentice Hall Inc.
- Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
- K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation",PHI.

IT 705 Elective –II (IT- 720- Embedded System)

Unit I: Introduction to Embedded System, Categories, Requirements, Applications, Challenges and Issues. Core of Embedded system, Memory, Sensors and Actuators, communication interface, Embedded firmware, system components.

Unit II: Fundamental issues of hardware software co-design, computational models in embedded designdata flow graph, control flow graph, state machine model, sequential programmed model, concurrent model, unified modeling language.

Unit III: Architecture of 8085 microcontroller, memory organization, registers, interrupts, addressing modes, instruction sets.

Unit IV: Embedded firmware design approaches- OS based, Super loop based. Embedded firmware development languages- Assembly language based, high level language based, mixed. Programming in embedded C.

Unit V: Types of Operating system, Task, process and threads, Multi processing and multi task, Task scheduling, Task communication, Task synchronization.

References:-

- Shibu K V, "Introduction to Embedded System", TMH.
- David E Simon, "An Embedded Software Primer", Pearson education Asia, 2001.
- Steven F. Barett, Daniel J. Pack, "Embedded Systems" Pearson education, First Impression 2008.
- Vahid Frank, Tony Givargis, "Embedded System Design", John Wiley and Sons, Inc.
- Dream Tech Software Team, "Programming for Embedded Systems" Wiley Publishing house Inc.
- Sriram V Iyer, Pankaj Gupta, "Embedded Realtime Systems Programming", TMH.
- Raj Kamal, "Embedded Systems", TMH.

IT 705 Elective –II (IT- 721- E-Commerce and Governance)

Unit I: Introduction to e-commerce: History of e-commerce, e-business models B2B, B2C, C2C, C2B, legal; environment of e-commerce, ethical issues, electronic data interchange, value chain and supply chain, advantages and disadvantages of e-commerce.

Unit II: Electronic Payment Systems: Credit cards, debit cards, smart cards, e-credit accounts, e-money, Marketing on the web, marketing strategies, advertising on the web, customer service and support, introduction to m-commerce, case study: e-commerce in passenger air transport.

Unit III: E-Government, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, its scope and content, benefits and reasons for the introduction of e-governance, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying, interactive services / G2C2G.

Unit IV: E-readiness, e-government readiness, E- Framework, step & issues, application of data warehousing and data mining in e-government, Case studies: NICNET-role of nation wide networking in egovernance, e-seva.

Unit V: E-Government systems security: Challenges and approach to e-government security, security concern in e-commerce, security for server computers, communication channel security, security for client computers.

References:-

- Gary P. Schneider, "E-commerce", Cengage Learning India.
- C.S.R. Prabhu, "E-governence: concept and case study", PHI Learning Private Limited.
- V. Rajaraman, "Essentials of E-Commerce Technology", PHI Learning Private Limited.
- David Whiteley, "E-commerce study , technology and applications", TMH.
- J. Satyanarayan, "E-government: The science of the possible", PHI Learning Private Limited.
- P.T. Joseph, "E-Commerce An Indian Perspective", PHI Learning Private Limited.
- Hanson and Kalyanam, "E-Commerce and Web Marketing", Cengage Learning India.

IT 705 Elective –II (IT- 722- High Performance Computing)

Unit I: Introduction to high performance computing: Aim, Architectures, Cluster, Grid, Meta-computing, Middleware, Examples of representative applications.
Programming models: Parallel programming paradigms, task partitioning and mapping, shared memory, message passing, peer-to-peer, broker-based. Introduction to PVM and MPI.

Unit II: Architecture of cluster-based systems, Issues in cluster design: performance, single-system-image, fault tolerance, manageability, programmability, load balancing, security, storage.
High performance sequential computing: Effects of the memory hierarchy, Out-of-order execution, superscalar processors, Vector processing.

Unit III: Shared-memory processing: Architectures (extensions of the memory hierarchy), Programming paradigms, OpenMP.
Distributed-memory processing: Architectural issues (networks and interconnects), Programming paradigms, MPI (+MPI2).

Unit IV: Grids: Computational grids, Data grids ,Architecture of Grid systems, Grid security infrastructure. Examples of Grids: Globus.
The productivity crisis & future directions: Development overheads, Petaflops programming, New parallel languages: UPC, Titanium, Co-Array FORTRAN.

Unit V: Performance Issues and Techniques: Cost and Frequency Models for I/O, paging, and caching. Notion of Cacheing; temporal and spatial locality models for instruction and data accesses; Intra-process parallelism and pipelining.
Typical Compiler Optimizations of Programs; Improving Performance: Identifying program bottlenecks - profiling, tracing; simple high-level-language optimizations - locality enhancement, memory disambiguation, moving loop-invariants.

References:-

- Charles Severance, Kevin Dowd, O'reilly, "High Performance Computing", Second Edition July 1998
- David j. Kuck, "High Performance Computing", Oxford Univ Pr, 1996
- Gary W. Sabot, "High Performance Computing ", Addison-Wesley, 1995
- Dowd K, "High Performance Computing", O' Reilly Series, 1993.
- R.E. Bryant and D. O'Hallaron, "Computer Systems:A Programer's Perspective", Pearson Education, 2003.

IT 705 Elective –II (IT- 723- Bioinformatics)

Unit I: Introduction to bioinformatics: Definition and History of Bioinformatics, Application and research of bioinformatics, finding Bioinformatics data online Bioinformatics, private and future data sources, Meta data Summary and reference systems.

Unit II: Bioinformatics Database: Characteristics and categories of Bioinformatics database, Navigating databases, Information retrieval Systems, Sequence database Nucleotide(primary and Secondary), Protein sequence, Structure Databases: File Formats, Protein Structure, PDB, MMDB, CATH, Other Database Enzyme, MEROPS, BRENDA, Pathway databases

Unit III: Bioinformatics Tools: Need for tools, Industry Trends, Data Mining Tools, Data Submission tools: Nucleotide Sequence, protein Submission tools, Data Analysis tools: Nucleotide Sequence, protein Sequence, Prediction Tools: Phylogenetic trees, Gene prediction, Protein Structure and Function prediction, Modeling Tools: 2D and 3D Protein Modeling.

Unit IV: Bioinformatics Algorithms: Classification of Algorithms, Biological Algorithm, Sequence Comparison Algorithm, Substitution Matrices Algorithms, Sequence Alignment Algorithm ,Gene Prediction Algorithm.

Unit V: Bioinformatics Software: Local Alignment Search Tool (BLAST),Purpose of BLAST,BLAST Analysis, Purpose of BLAST II, Scoring Metrics, PAM, BLOSUM, Working of BLAST. Introduction of HMMER, Practical example of HMMER.

References:-

- Orpita Bosu and Simminder Kaur Thukral, ”Bioinformatics Databases,Tools and Algorithms”, Oxford University Press 2007.
- Harshawardhan P.bal, “Bioinformatics Principle and Applications”, TMH.
- Lesk, A.M.2002, “Introduction to Bioinformatics”, Oxford University Press.
- Rastogi, S.C. ,Mendiratta N, “Bioinformatics Concepts,Skill & Applications”, CBS Publishers.
- Claverie, J.M and Notredame C, “Bioinformatics for Dummies”, Wiley Editior.

IT 705 Elective –II (IT- 724- Unix & Shell Programming)

UNIT–I

General Overview of the System: System structure, user perspective, O/S services assumption about Hardware The Kernel and buffer cache architecture of Unix O/S, System concepts, Kernel data Structure, System administration, Buffer headers, Structure of the buffer pool, Scenarios for retrieval of the buffer, Reading and writing disk block, Advantage and disadvantage of buffer cache.

UNIT–II

Internal Representation of Files: Inodes, Structure of regular, Directories conversions of a path name to an inode, Super block, Inode assignment to a new file, Allocation of disk blocks, Open read write file and record close, File creation, Operation of special files change directory and change root, change owner and change mode. STAT and FSTAT, PIPES mounting and unmounting files system, Link Unlink

UNIT–III

Structures of Processes and process control: Process states and transitions layout of system memory, the context of a process, manipulation of process address space, Sleep process creation/termination. The user Id of a process, changing the size of a process. Killing process with signals, job control, scheduling commands: AT and BATCH,TIME,CORN.

UNIT-IV

Introduction to shell scripts: shell Bourne shell, C shell, Unix commands, permissions, editors, grep family, shell variables, scripts, metacharacters and environment, if and case statements, for while and until loops. Shell programming.

UNIT-V

Introduction of Awk and perl Programming: Awk pattern scanning , BEGIN and END patterns, Awk arithmetic and variables, and operators, functions, perl; the chop() function, variable and operators.Networking tools:Resolving IP addressing, TELNET, FTP, Socket programming, introduction of Linux structure .

References:-

1. M.J. Bach “Design of UNIX O.S. “, PHI Learning
2. Y.Kanetkar “Unix shell programming”, BPB Pub.
3. B.W. Kernighan & R. Pike, “The UNIX Programming Environment”, PHI Learning
4. S.Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, New Delhi.
5. Beck “Linux Kernel, Pearson Education, Asia.
6. Sumitabha Das “ Unix concepts and Applications”.Tata McGraw Hill,Second Edition,2001