FACULTY OF ENGINEERING

Syllabus for the
M.E. C.S.E. (Information Technology)

(w.e.f 2008-2009)

UNIVERSITY OF PUNE

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University of Pune
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Note:- This syllabus is subject to change without prior notice by the concerned BOS
Proposed structure M.E. CSE (Information Technology) to be implemented from July-2008

Term-I

<table>
<thead>
<tr>
<th>Subject Code</th>
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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Lect.</td>
<td>Pract.</td>
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<tr>
<td>514401</td>
<td>Performance and Evaluation of Computer Systems</td>
<td>03</td>
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<tr>
<td>514402</td>
<td>Software Engineering Methodologies</td>
<td>03</td>
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<tr>
<td>514403</td>
<td>Advanced Operating Systems</td>
<td>03</td>
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<td>514404</td>
<td>Elective-I</td>
<td>03</td>
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<tr>
<td>514405</td>
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<tr>
<td>514406</td>
<td>Laboratory Practice-I</td>
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Term-II

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<td>Pract.</td>
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<td>Advanced Computer Architecture</td>
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<tr>
<td>514409</td>
<td>Advanced Trends in Database Systems</td>
<td>03</td>
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<td>514410</td>
<td>Information Technology Project Management</td>
<td>03</td>
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<tr>
<td>514411</td>
<td>Elective-III</td>
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<tr>
<td>514412</td>
<td>Elective-IV</td>
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<td>514413</td>
<td>Laboratory Practice-II</td>
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<td>Lect.</td>
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<table>
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<th>Subject Code</th>
<th>Elective-I</th>
<th>Subject Code</th>
<th>Elective-II</th>
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<tbody>
<tr>
<td>514404 A</td>
<td>Software Architecture</td>
<td>514405 A</td>
<td>Information Assurance and Security</td>
</tr>
<tr>
<td>514404 B</td>
<td>Real Time and Embedded Systems</td>
<td>514405 B</td>
<td>Compiler Design</td>
</tr>
<tr>
<td>514404 C</td>
<td>Adhoc Networks</td>
<td>514405 C</td>
<td>Geographical Information Systems</td>
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<th>Elective-III</th>
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<tr>
<td>514411 A</td>
<td>Internet and Web Technologies</td>
<td>514412 A</td>
<td>Component Based Development</td>
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<tr>
<td>514411 B</td>
<td>Advanced Topics in Operating Systems</td>
<td>514412 B</td>
<td>Advanced Network Programming</td>
</tr>
<tr>
<td>514411 C</td>
<td>Mobile Computing and M Commerce</td>
<td>514412 C</td>
<td>High Performance Computer Networks</td>
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<tr>
<td>514411 D</td>
<td>User Interface Design</td>
<td>514412 D</td>
<td>Open Elective II (Self Study)** / Service Oriented Architecture</td>
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</table>

** Open Elective - Institute will Interact with Industry to offer a need based topic. 
–BOS Information Technology will declare the list of subjects which can be taken under open elective.
514401 : Performance And Evaluation Of Computer System

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. **Overview of Performance Evaluation:**
   - Introduction, Selection of Techniques and Metrics, measuring the reporting performance, Benchmark suites, Amdahl’s law, SPEC CPU benchmarks, SPEC 95, 2000, server, memory, I/P Performance
   - Types of workloads, art of workload selection, workload characterization and techniques. Program execution monitors, Analytical modelling for performance.

2. **Digital Networks:**
   - X.25 based networks / ISDN, B-ISDN and ATM Technology, protocol stack, ATM switches architecture, ADSL. IP based network, IP addressing, routing IP traffic over ATM n/w, MPLS, GMPLS technology, Voice over IP.

3. **Probability Theory and use for evaluation:**
   - Notion of probabilities and basic properties, Continuous random variables, Bayes theorem, conditional probabilities, Discrete and Continuous random variables, Probabilities Generation function & Laplace transform, Transformation generation methods. Use for performances evaluation in networking. Linear regression models.

4. **Stochastic Processes:**
   - Stochastic processes, first and second order statistics, stationery stochastic processes, spectral densities, Brownian Motion Process, Ergodicity.

5. **Queuing Theory and Models:**
   - Queuing models, Little theorem application, Markov chain formulation. Discrete time and Continuous time Markov Chains (DTMC, CTMC), MMD, Queuing system M/M/1, M/M/1/K, M/M/S/, M/M/∞ queue analysis m-server case. Multimentional Markov chain application in Circuit Switching.

6. **Queuing Theory and Application:**
   - M/G/1 Queue, generalization of M/G/1 theory application to ATM. Imbedding instants in the M/G/1 theory M/G/1 with geometrically distributed messages. Chain imbedded to cell transmission, message transmission completion. Queue balance equation, Finite buffer case, Mean Value Analysis.

7. **Network Analysis:**
8. Simulation:

Introduction to simulation, simulation modelling and analysis in computer systems and networks, analysis of simulation results, Random Number generation, Statistical analysis of simulation.

Reference Books:

2. *Queuing Theory and Telecommunication* by Giovanni Grambene, Springer 2005
514402 : Software Engineering Methodologies

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Software Process Models:

2. Requirements Engineering

3. UML 2.0 Concepts
   Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Metamodel, Extensibility Mechanisms and its usage, Introduction to OCL, Specification techniques of diagrams in UML

4. Behavioral Model
   Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards

5. Dynamic Behavior:
   Sequence diagrams, object lifelines and message types, Refining sequence diagrams, Implementing memory in objects using state machines, States, events and actions, Nested machines and concurrency, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Drilling Down, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization, Communication Diagram, Timing Diagrams

6. Design Engineering:
7. **Object Oriented Design**

   Design of Objects, Design and Factoring, Design of Software Objects, Features and Methods, Cohesion of Objects, Coupling between Objects, Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving reusability, Reuse through delegation, Identifying and using service packages

8. **Principles of Testing**


   **White-Box Testing:** Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing

   **Black-Box Testing:** Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis, Equivalence Partitioning, State Based Testing, Compatibility Testing, User Documentation Testing, Domain Testing

9. **Project Planning and Estimation**


**Reference Books:**

514403 : Advanced Operating System

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. Distributed computing systems fundamentals:
   Introduction to Distributed computing systems, Models, Popularity.
   Distributed computing system. Design issues of Distributed operating system.
   Distributed computing environment.

2. Message Passing:
   Features of a good Message Passing System. Issues in IPC by Message Passing
   Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of
   Message Data, Process Addressing, Failure handling.

3. Remote Procedure Calls:
   RPC Model, Implementing RPC Mechanism. Stub Generation. RPC
   Messages, Marshaling Arguments and Results. Server Management, Parameter-
   Passing semantics, call semantics, Communication protocols for RPC’s, Client-
   Server Building, Exception handling, Security RPC in Heterogeneous
   Environments, Lightweight RPC.

4. Distributed Shared Memory:
   General Architecture of DSM systems. Design and implementation Issues of
   DSM, Granularity, Structure of Shared Memory Space. Consistency models,
   Replacement strategy, Thrashing. Synchronization: Clock Synchronization. Event
   Ordering, Mutual Exclusion, Deadlock, Election Algorithms.

5. Resource Management:
   Features of global scheduling algorithm. Task assignment approach, Load-
   Balancing and Load approach.

6. Process Management:
   Introduction, Process Migration, Threads.

7. Distributed File Systems:
   Features of good DFS, File models, File Accessing models. File- Sharing
   Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic
   Transactions, Design Principles, Case study: DCE Distributed File Service. Sun
   NFS, OSF, DCE.

9. Case Study:
   Case study of Chorus, Mach, Amoeba and OSF distributed Environment,
   Solaries.
Reference Books:
2. Advanced Operating System - Singhal
3. Distributed Systems concepts and design-G.Coulouris,J.Dollimore & T. Kindberg
514404 A : Software Architecture (Elective - I)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Introduction to Software Architecture :
   Software Architecture, Relationships to Other Disciplines, Multi-Disciplinary Overview,
   Foundations of Software Architecture, Software architecture in the context of
   the overall software life cycle, Architectural Styles, CASE study of
   Architectures

2. Software Architecture Design :
   Designing, Describing, and Using Software Architecture, IS2000: The
   Advanced Imaging Solution, Global Analysis, Conceptual Architecture View,
   Module Architecture View, Styles of the Module Viewtype, Execution
   Architecture View, Code Architecture View, Component-and-Connector
   Viewtype, Styles of Component-and-Connector Viewtype, Allocation
   Viewtype and Styles, Documenting Software Interfaces, Documenting
   Behavior, Choosing the Views, Building the Documentation Package

3. Archetype Patterns :
   Archetypes and Archetype Patterns, Model Driven Architecture with
   Archetype Patterns.
   Literate Modeling, Archetype Pattern, Customer Relationship Management
   (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype
   Pattern, Rule Archetype Pattern.

4. Introduction to Design Patterns :
   Design Patterns, Creational Patterns, Patterns for Organization of Work,
   Access Control Patterns, Service Variation Patterns, Service Extension
   Patterns

5. Pattern Types :
   Object Management Patterns Adaptation Patterns, Communication Patterns,
   Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns
   for Interactive Systems
   Adaptable Systems, Frameworks and Patterns, Analysis Patterns

6. Advanced Patterns :
   Patterns for Concurrent and Networked Objects, Patterns for Resource
   Management, Pattern Languages, Patterns for Distributed Computing
7. Enterprise Architecture Integration:
   Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-
   Level EAI, User Interface-Level EAI, The EAI Process—Methodology or
   Madness, An Introduction to EAI and Middleware, Transactional Middleware
   and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database-
   Oriented Middleware and EAI, Java Middleware and EAI, Implementing and
   Integrating Packaged Applications—The General Idea, XML and EAI, 
   Message Brokers—The Preferred EAI Engine, Process Automation and EAI.

8. Enterprise Architecture Patterns:
   Layering, Organizing Domain Logic, Mapping to Relational Databases, Web
   Presentation, Domain Logic Patterns, Data Source Architectural Patterns,
   Object-Relational Behavioral Patterns, Object-Relational Structural Patterns,
   Object-Relational Metadata Mapping Patterns, Web Presentation Patterns,
   Distribution Patterns, Offline Concurrency Patterns.

Reference Books:

1. Applied Software Architecture ,Christine Hofmeister, Robert Nord, Deli Soni,
   Addison-Wesley Professional; 1st edition (November 4, 1999) ,ISBN-10:
3. Documenting Software Architectures: Views and BeyondPaul Clements,
   Software Engineering Institute, Felix Bachmann Len Bass, Software
   Engineering Institute, David Garlan James Ivers Reed Little Robert Nord Judith Stafford
   9780201703726
4. Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5 by Frank
   Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt, Publisher:
   0471958697
5. Design Patterns: Elements of Reusable Object-Oriented Software (Addison-
   Wesley Professional Computing Series) by Erich Gamma, Richard Helm, Ralph
   Johnson, John Vlissides Publisher: Addison-Wesley Professional; 1st edition
6. Patterns of Enterprise Application Architecture, Martin Fowler, Addison-
7. Enterprise Integration: An Architecture for Enterprise Application and Systems
   978-0471400103
514404 B : Real - Time and Embedded Systems (Elective - I)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Embedded Architecture :
   Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design- Structural Description, Behavioral Description, Design Example: Model Train Controller

2. Embedded Processor And Computing Platform :
   ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.

3. Networks :
   Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, ethernet, Myrinet, Internet, Network-Based design- Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.

4. Real-Time Characteristics :

5. System Design Techniques :
Reference Books:

1. Introduction:


2. Ad Hoc Routing Protocols:


3. Multicast routing In Ad Hoc Networks:


4. Transport Layer, Security Protocols:

5. Qos and Energy Management:


References Books:

## 514405 A: Information Assurance And Security (Elective - II)

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<th>Teaching Scheme</th>
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<td>Theory: 100 Marks</td>
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1. **Fundamental Concepts:**
   - Motivation for security, Basics of computer networks, Internet, Network tools and utilities.

2. **Introduction to Security Concepts:**
   - Threats and vulnerabilities in today's digital world; Security terminology, Common attacks.

3. **Hacker techniques:**
   - Gathering information, becoming part of a network, launching attacks, hacker tools.

4. **Securing a system:**
   - Firewalls, Safe web surfing

5. **Securing a transaction:**
   - Encryption, digital signatures, virtual private networks

6. **Cyber Crime:**
   - Internet fraud, Identity theft, Industrial espionage, Cyber terrorism

7. **Tools and Techniques for Security:**
   - Security hardware and software, intrusion detection systems, security standards.

8. **Emerging Areas:**
   - Wireless security, anti-virus and anti-phishing tools, computer forensics, biometrics, establishing security plans and risk mitigation.
514405 B : Compiler Design (Elective - II)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Compiler structure:
   Analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.

2. Lexical analysis:
   Interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams, LEX.

3. Syntax analysis:
   CFGs, ambiguity, associability, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

4. Syntax directed definitions:
   Inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.
   Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

5. Run time system:
   Storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

6. Intermediate code generation:
   Intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues.

7. Code generation and instruction selection:
   Issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.
Reference Books:
7. Fraser and Hanson. A Retargetable C Compiler: Design and Implementation, Addison-Wesley.
514405 C : Geographical Information Systems (Elective - II)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

Aims: To understand fundamental concepts and principles of Geographical Information Systems.

1. Fundamentals of GIS and Cartography:

2. Data Management, Models and Quality Issues:
   Conceptual Models, Geographical Data Models, Data Primitives, Data Types - Raster and Vector Approach, Data Modeling and Spatial Analysis, Sources of Geographical Data, Data Collectors and Providers, Creating Digital Data Sets, Data Presentation, Data Updating, Data Storage, Spatial Data Costs, Quality of GIS Output, Sources of Errors in Spatial Data, Factors affecting Reliability of Spatial Data, Faults from Assumptions.

3. Remote Sensing Fundamentals:

4. Image Processing:

5. Terrain Mapping, Geocoding and Segmentation:
6. **Issues and Applications in GIS:**
   Changes in Technology, Data Supply and Users, Role of Satellite Imagery and Data Sets, Urban and Municipal Applications, Other Applications.

**Reference Books:**

514406 : Laboratory Practice – I

Teaching Scheme
Practicals: 6 Hrs/week

Examination Scheme
Term Work: 50 Marks
Total Credits : 03

Experiments/Assignments based on 514401, 514403 and Elective Subjects and/or small project. The lab in charge should frame minimum of five assignments.

514407 : Seminar – I

Teaching Scheme
Practicals: 4 Hrs/week/student

Examination Scheme
Term Work: 50 Marks
Total Credits : 02

The students will deliver a talk on their experience during the semester referring to at least two research papers and will deliver a seminar on topic of current interest in Information technology, computer science, and Engineering field. The student is expected to review and study at least four research papers from IEEE transactions based on the theory subjects.
514409 : Advance Trends in Database Systems

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Distributed databases:
   Schemas, Architectures, Queries, Transactions, implementation aspects.

2. Data warehousing:
   Data preprocessing, Data Warehousing; Warehouse DBMS, multidimensional
data warehouses, data warehouse architectures. Data cubes, Dashboards, BI

3. Data Mining:
   KDD process, Data mining applications, Data mining Techniques and
   Algorithms, frequent Patterns, association rules, correlation, classification,
prediction

4. Introduction to Active databases syntax, semantics and applications.

5. Introduction to Object Databases; OR mapping classes and inheritance, TP
   Monitors and architecture of TP systems

6. Web mining introduction, crawling the web, web search and information
   retrieval

Reference Books:

1. Avi Silberschatz Henry F. Korth S. Sudarshan Database System Concepts
   Fifth Edition McGraw-Hill

2. Jiawei Han and Micheline Kamber Data Mining: Concepts and Techniques,
   2nd ed.


   Warehouses, Springer-Verlag, 1999

5. Advanced Database Systems (The Morgan Kaufmann Series in Data
   Management Systems) (Hardcover) by Carlo Zaniolo (Author), Stefano Ceri
   (Author), Christos Faloutsos (Author), Richard T. Snodgrass (Author), V.S.
   Subrahmanian (Author), Roberto Zicari (Author)

   Michael Kifer, Arthur Bernstein, Philip M. Lewis

7. Java Persistence with Hibernate
   Second Edition of Hibernate in Action, Christian Bauer and Gavin King
514410 : Information Technology Project Management

Teaching Scheme                                                                 Examination Scheme
Lectures: 3 Hrs/week                                                            Theory: 100 Marks

1. Introduction to IT project management :
   Project management context, pre-project scenario

2. Project management processes :
   Product oriented processes, project oriented processes, processes by
   life cycle, processes by knowledge areas

3. Project integration management :
   Develop project charter, Develop project management plan, Direct and
   manage project execution, monitor and control project integrated change
   control procedure, close project

4. Scope management :
   Scope planning, scope definition, creating Work Breakdown Structure,
   Scope verification, scope management

5. Schedule management :
   Activity definition, activity sequencing, activity resources estimation, schedule
   development, schedule control

6. Cost management :
   Cost estimating, cost budgeting, cost control

7. Quality management :
   Planning for quality, quality assurance, quality control

8. Risk management :
   Risk management planning, risk identification, risk analysis, risk
   response planning, risk monitoring and control

9. Procurement management :
   Planning for procurements, planning for contracting, requesting
   seller responses, seller selection, contract administration, contract
   closure

10. Human resources management :
    Human resources planning, acquiring project team, developing project
    team, managing project team

11. Communications management :
    Communications planning, information distribution, managing
    stakeholders
12. Project closing and beyond

Reference Books:

1. Information Technology Project management,
2. A guide to Project Management Body of Knowledge
4. Information Technology Project Management
   by Kathy Schwalbe, Course technology, Thomson Learning, (2000)
5. Information Technology Project Management, by Joseph Phillips T
Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Name Services and Configuration:
   - DNS, DHCP, X500 Directory Services, LDAP, Internet Security,
   - Authentication and Encryption, Watermarks, Firewall, SSL, Digital Signatures,
   - Kerberos

2. Network Management:
   - Infrastructure for Network Management, Intranet Standard Management
   - framework, SMI, MIB, SNMP, CGI Scripts, Scripting Language, Perl, PHP,
   - Java Script and VB Script, Internet Servers, Proxy Server, Search Engine.

3. Web Services:
   - Web services, Evolution and differences with Distributed computing, XML,
   - WSDL, SOAP, UDDI, Transactions, Business Process Execution Language for
   - Web Services, WS-Security and the Web services security specifications, WS-
   - Reliable Messaging, WS-Policy, WS-Attachments. Web 2.0 technologies
   - Introduction to Ajax, Ajax Design Basics, JavaScript, Blogs, Wikis, RSS
   - feeds.

4. Content Delivery and Preparation:
   - Introduction to WWW, TCP/IP, HTTP, FTP, UDP, N-Tier, Markup Languages
   - VRML– HTML, DHTML, DNS, URL, Browsers, Platform for Web Services
   - Development
   - MVC Design Pattern, .NET, J2EE Architecture, J2EE Components &
   - Containers, Specification, Application servers, Struts

5. Dynamic Web Programming:
   - Java Applets, Java script, JSP, JSTL, ASP, PHP, Servlets, Servlet Life cycle,
   - C#, Component Technologies, Java beans, CORBA, Introduction to EJBs,
   - JDBC, Secure Electronics Transactions over Web, Secure E-mail, SSL, TLS,
   - Network layer Security.

6. APIs:
   - Java Mail API, JNDI, JMS, Introduction and evolution of Portals, Portal
   - Application Development, Overview of IBM Portlet API, Overview of JSR
   - 168 API, Developing sample JSR 168 portlet, Overview of Internationalization
   - and localization.

Reference Books:

1. Ravi Kalakota and Andrew B Whinston, “Frontiers of Electronic commerce”,
   Addison Wesley.
2. Eric Ladd, Jim O’ Donnel, “Using HTML 4, XML and Java”, Prentice Hall of
   India – QUE,
4. Scot Johnson, Keith Ballinger, Davis Chapman, “Using Active Server Pages”, Prentice Hall of India,
8. Deitel & Deitel, Java How to Program, Prentice Hall
12. Deitel & Deitel, Java How to Program, Prentice Hall
514411 B : Advance Topics in Operating Systems (Elective - III)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Introduction to Operating Systems Internals :
   Study and comparison of different operating system architectures: Windows, Linux, Solaris

2. Process Management :
   - Linux: Process Descriptor and Task Structure, Process Creation, Implementation of threads, Process Termination, Process Scheduling,

3. Memory Management :
   - Windows: Memory manager & its services, System memory pools, Virtual address space layout, address translation, page fault handling.
   - Linux: Pages, Zones, kmalloc, vmalloc, slab layer, slab layer allocator, statically allocating on the stack, High memory mapping.

4. File Management :
   - Windows: Windows file system formats, FS driver architecture, troubleshooting FS problems, NTFS design goal and features, NTFS drivers, NTFS on disk structure.

5. I/O Management :
   - Windows: I/O system components, Device drivers, IO processing, PnP manager.
   - Linux: Anatomy of block device, Buffer & Buffer Heads, the bio structure, Request queue, I/O scheduler.

6. Device driver for printer and network card for linux and windows.
   - Study effect of different parameters of setting of TCP/IP for linux and windows OS. Creating device driver for linux and windows

Textbooks:
Introduction:
Generations of mobile computing, Spectrum allocation, Standard Bodies, Players in the Wireless Space, three tier architecture of mobile computing, Mobile Computing through Internet, Basic cellular system, concept of frequency reuse channels, hand-off mechanism, cell splitting

1. GSM & GPRS :
   GSM features and Architecture, Network Aspects in GSM, GSM Frequency Allocation, Mobility management, hand-off mechanisms, cell splitting, Security issues used in GSM, GPRS features and architecture, network operations, data services in GPRS, applications and limitations, SMS and MMS services architecture and operation details

2. Emerging Telecommunication Technologies :

3. Security Issues in Mobile Computing :

4. M-Commerce :
   Introduction to m-commerce: Emerging applications, different players in m-commerce, m-commerce life cycle Mobile financial services, mobile entertainment services, and proactive service management

5. Management of mobile commerce services :
   Content development and distribution to hand-held devices, content caching, pricing of mobile commerce services The emerging issues in mobile commerce: The role of emerging wireless LANs and 3G/4G wireless networks, personalized content management, implementation challenges in m-commerce, futuristic m-commerce services
Text Book:
1. Mobile Computing (Technology, Applications and Service Creation)  
   Asoke. K Talukder and Roopa R. Yavagal. TATA McGRAW HILL 
   Wireless and Mobile Network Architecture : Yi-Bing Lin, Wiley 

Reference Books:
1. Mobile Commerce and Applications, Upkar Varshney, A tutorial at IEEE International Conference on Wireless Communications (WCNC)
3. Location-based Mobile Commerce Services, ACM Transactions on Internet Technology, August 2003, (Upkar Varshney)
5. Group-oriented Mobile Services, ACM/Kluwer Journal on Mobile Networks and Applications (MONET), 2004 (Upkar Varshney)
514411 D : User Interface Design (Elective - III)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Introduction to Human-Computer Interaction as an emerging field:
   Disciplines contributing to HCI, Human Information Processing
   Psychology of everyday things, Importance of human factors in
   design – cultural, emotional, technological, business, Need Satisfaction
   curve of technology, Levels of human computer interaction

2. Foundations of User Interface Design (U.I.D):
   Goals of UID, Goal directed Design, User Interface Models,
   Understanding and Conceptualizing Interface, Psychology of users designing
   for collaboration and communication, Process of Interaction Design, Standards
   & Guidelines, Usability Testing, GIU.

3. UCD Models, UCD methodology:
   User centered design life cycle - cooperative, participative, contextual
   Understanding users, user experience levels, human information processing
   - i/o channels ISO 13407, Human memory, user study techniques, user
   models, User research - Personas, scenarios, story boarding
   Focus Groups, Card Sorting, Questionnaires, Interviews, On-site
   observation, Role Playing, Walkthroughs,

4. User research:
   Interviews, Questionnaires, social interaction & emotional design,

5. Interaction Design:
   Goals of interaction design, Interaction design strategies
   Task analysis & design, GOMS model, navigation design, screen design
   Defining interactivity, types of interactions, interaction models
   Interaction models, styles, Advancements in interaction devices
   Ergonomics principles in interaction design

6. Design - Types participatory:
   Scenario/task based, usage centered, user centered,
   User interface models, Interface metaphors and conceptual models
   User support systems – online help, documentation
   Accessibility of User Interfaces
   Heuristics, Principles, patterns in interaction design
   HCI frameworks, Architectural patterns for user interface
   Designing for effectiveness, comprehension, satisfaction
7. Evaluation criteria for UI testing:
   Usability Testing, Suitability Testing, Accessibility Testing
   Testing methods - Think Aloud, Video taping, Customer Satisfaction questionnaires
   Advantages & disadvantages of user centered design
   Case studies in UCD

8. Usable Web - Web Site Usability:
   Web User Interfaces, Rich web experience design
   Navigations, Links, Searching, Comparisons, Readability
   Collaborative systems, groupware & coordination technology

9. Object Oriented User Interfaces (OOUI):
   Identifying needs and establishing requirement, Object Oriented User Interface, Migrating GUI to Object Oriented User Interfaces.

10. Advanced UI – Techniques and Technology:

Reference Books:

1. Elements of User Interface Design - Theo Mandel, John Wiley & Sons
2. Interaction Design – Preece, Roger, Sharp, John Wiley & Sons
3. Essentials of User Interface Design – Alan Cooper – Wiley India.
4. Object Modeling & User Interface Design - Mark Hamelen ,
5. Human Computer Interaction by Alan Dix
514412 A : Component Based Development (Elective - IV)

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. Introduction to Component Based Development :

2. Case for Components :

3. Software Component Infrastructure :

4. Management of CBD :

5. Component Technologies
   Overview of the CORBA Component Model, Transactional COM+: Designing Scalable Applications, The Enterprise JavaBeans Component Model, Choosing Between COM+, EJB, and CCM, Software Agents as Next Generation Software Components,

Reference Books:

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory: 100 Marks
Total Credits: 03

1. The Transport Layer: TCP and UDP with policy control:
   TCP Connection Establishment and Termination, TIME_WAIT State, Port Numbers, Concurrent Servers, Buffer Sizes and Limitations.

2. Sockets and Socket Programming:
   Introduction, Socket Address Structures, Value-Result Arguments, Byte Ordering Functions, Byte Manipulation Functions, socket Function. TCP Client-Server: TCP Echo Server, TCP Echo Client, Crashing of Server Host, Crashing and Rebooting of Server Host, Shutdown of Server Host. UDP Sockets: UDP Echo server, UDP Echo Client.

3. Routing Sockets:
   Datalink Socket Address Structure, Reading and Writing, Interface Name and Index Functions

4. Name and Address Conversions:
   Domain Name System, Functions. Advanced Name and Address Conversions: Functions and Implementation

5. IPv4 and IPv6 Interoperability:
   IPv4 Client, IPv6 Server, IPv6 Client, IPv4 Server, IPv6 Address Testing Macros, IPV6_ADDRFORM Socket Option

6. Multicasting and Broadcasting:
   Broadcast Addresses, Unicast versus Broadcast, Multicasting: Multicast Addresses, Multicasting versus Broadcasting on A LAN, Multicasting on a WAN, Multicast Socket Options, Simple Network Time Protocol, SNTP.

7. Threads:
   Thread Functions: Creation and Termination, TCP Echo Server, Thread-Specific Data, Web Client and Simultaneous Connections

8. Client-Server Design Alternatives:
   TCP Client Alternatives, TCP Test Client, Iterative Server, Concurrent Server, Thread Locking around accept, TCP Preforked Server, Descriptor Passing, TCP Concurrent Server, One Thread per Client, TCP Prethreaded Server.

Reference Books:
3. UNIX Internals – “A new Frontier”, PHI
1. Network Performance analysis:
   Objectives and requirements for Quality of Service (QoS) in high performance networks. Architecture of high performance networks (HPN), design issues, protocols for HPN, VHF backbone networks, virtual interface architectures, virtual interface for networking, High-speed switching and routing - internet and PSTN IP switching techniques, SRP protocols, SRP authentication, and key exchange, comparison of TCP/IP, FTP, TELNET, queuing systems, network modeling as a graph.

2. Gigabit Ethernet:
   Architecture, standards, interface, applications, network design.

3. High speed networks:
   A. Frame relay: Frame relay protocols and services, frame relay congestion control.
   B. ATM: Architecture, protocol, switching, traffic and congestion control, flow control, error detection and control, traffic management, ATM service categories, ATM in LAN environment, classical IP over ATM.
   C. ISDN: ISDN overview, interfaces and functions, physical layer, Network layer, ISDN services.
   D. B-ISDN: Driving forces and need, B-ISDN standards and services, B-ISDN Functional Architecture, B-ISDN Transmission structure, B-ISDN protocol architecture.

4. ADSL and DSL Technologies:
   Background and technological capabilities, Standards and associations, Architecture, Conceptual overview of VDSL, Deployment Case study, Market status and future.

5. Fiber Optics Communication:
   GPON (Gigabit capable Passive Optical Network), SONET/SDH and comparison with other available standards, SAN (Storage Area Networks) and Fiber Channel, DWDM, and CWDM.

6. Wireless Networks:
   Overview of GSM & CDMA, 3G mobile technologies, UMTS, EDGE, WiFi, WiMax.
Reference Books:

2. Tanenbaum: Computer Networks: PHI
5. Fred Halsall: Data Communication Computer Networks, And Open Systems: Addison Wesley
7. William Stallings: ISDN And BISDN
8. William Stallings: High Speed Networks
9. Computer Networks And Internet: Comer
10. Johnson: Fast Ethernet
514412 D : Open Elective (Self Study)**

Teaching Scheme
Lectures: 3hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

** Open Elective - Institute will Interact with Industry to offer a need based topic.
–BOS Information Technology will declare the list of subjects which can be taken under open elective.

514412 D : Service Oriented Architecture (Open Elective)

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. SOA Fundamentals :
Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misconceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

2. SOA Planning and Analysis :
Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA)

3. SOA Design and implementation :
Service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance

4. Managing SOA Environment :
Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle
Reference Books:

514413 : Laboratory Practice – II

Teaching Scheme
Practicals: 6 Hrs/week

Examination Scheme
Term Work: 50 Marks
Total Credits : 03

Experiments/Assignments based on 514409, 514411 and 514412 and/or small project. The lab in charge should frame minimum of five assignments.

514414 : Seminar – II

Teaching Scheme
Practicals: 4 Hrs/week/student

Examination Scheme
Term Work: 50 Marks
Total Credits : 02

The students will deliver a talk on their experience during the semester referring to at least two research papers and will deliver a seminar on topic of current interest in Information technology, computer science, and Engineering field. The student is expected to review and study at least four research papers from IEEE transactions based on the theory subjects.

514415 : Seminar – III

Teaching Scheme
Practicals: 4 Hrs/week/student

Examination Scheme
Term Work: 50 Marks
Total Credits : 02

The Student will deliver a seminar based on the survey made in selection of the topic for project. This will include presentation on papers referred in the topic selected for dissertation.

514416 : Project Stage – I

Teaching Scheme
Practicals: 6 Hrs/week

Examination Scheme
Term Work: 50 Marks
Total Credits : 06

Contents. Research and development projects based on problems of practical and theoretical interest. First part of a two semester long project activity. Problem definition, background research, development of overall project plan (detailed design, milestones, etc.) and meeting the research and development targets set up for the first part. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories. It is expected that the student will submit at least one paper in journal or conference before submission of project stage II.
514416 : Project stage – II

**Teaching Scheme**
Practicals: 12 Hrs/week

**Examination Scheme**
Term Work: 150 Marks
Oral Marks: 50
Total Credits: 12

**Contents.** Second part of the two semester project. The primary objective is to meet the milestones formed in the overall project plan. Evaluation will be held periodically, and will be based on written reports, oral presentations and demonstration of results. The project will culminate in the production of a thesis by each individual student. Final evaluation will be according to the M.E., project evaluation guidelines.