Seventh Semester:

Course Title: **Advanced Java**
Course Code: COM**471**
Semester: VII
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, **Practical: 3 Hrs**)
Evaluation: External (60) + Internal (20+20)

Course Objectives:

This course covers the ideas of Java programming beyond the basic concepts and emphasizes GUI and event-driven programming, Database Connectivity, Socket Programming, Remote Method Invocation and Servlets and JSP Technology

Course Contents:

1. Programming in Java (8 hrs)

1.1 Introduction to Java: Java Architecture, Advantages of Java, PATH and CLASSPATH variables, Compiling and Running Java Programs
1.2 Class and Object: Creating Classes, Interfaces, Creating Objects, Access Modifiers, Arrays, Packages, Inheritance
1.3 Exception Handling and Threading: Try, Catch, Finally, Throws, Creating Multithreaded Programs, Thread Life Cycle
1.4 File IO: Byte Stream Classes (FileInputStream and FileOutputStream), Character Stream Classes(FileReader and FileWriter), RandomAccessFile Class

2. User Interface Components with Swing (10 hrs)

2.1 Swing and MVC Design Patterns: Design Pattern, MVC Pattern, MVC Analysis of Swing Buttons
2.2 Layout Management: Border Layout, Grid Layout, Gridbag Layout, Group Layout, Using No Layout managers, Custom layout Managers
2.3 Text Input: Text Fields, Password Fields, Text Areas, Scroll Pane, Label and Labeling Components
2.4 Choice Components: Check Boxes, Radio Buttons, Borders, Combo Boxes, Sliders
2.5 Menus: Menu Building, Icons in Menu Items, Check box and Radio Buttons in Menu Items, Pop-up Menus, Keyboard Mnemonics and Accelerators, Enabling and Design menu Items, Toolbars, Tooltips
2.6 Dialog Boxes: Option Dialogs, Creating Dialogs, Data Exchange, File Choosers, Color Choosers
2.7 Components Organizers: Split Panes, Tabbed Panes, Desktop Panes and Internal Frames, Cascading and Tiling

2.8 Advance Swing Components: List, Trees, Tables, Progress Bars

3. Event Handling (4 hrs)

3.1 Introduction: Standard Event Handling, Using Delegated Class, Using Action Commands, Listener Interfaces, Adapter Classes

3.2 Handling Events: Action Events, Key Events, Focus Events, Window Event, Mouse Event, Item Events

4. Database Connectivity (4 hrs)

4.1 Design of JDBC: Driver Types, Typical Uses of JDBC

4.2 JDBC Configuration: Database URLS, Driver JAR Files, Starting Database, Registering Driver class, Connecting to the database

4.3 Executing SQL Statements: Managing Connections, Statements, Result Set, SQL Exceptions, Populating Database

4.4 Query Execution: Prepared Statements, Reading and Writing LOBs, SQL Escapes, Multiple Results, Scrollable Result Sets, Updateable Result Sets, Row Sets and Cached Row Sets, Transactions.

5. Network Programming (5 hrs)

5.1 Networking Basics: Transmission control Protocol(TCP), User Datagram Protocol (UDP), Ports, IP Address Network Classes in JDK

5.2 Working with URLS: Connecting to URLS, Reading Directly from URLS, Inetaddress Class

5.3 Sockets: TCP Sockets, UDP Sockets, Serving Multiple Clients, Half Close, Interruptible Sockets, Sending Email

6. Java Beans (3 hrs)

6.1 Introduction: Creating, Updating and Reading from JAR Files, Java Beans, Advantages of Java Beans, Class vs Beans, BDK and Bean Box

6.2 Java Bean: Creating a Java Bean, Creating a Bean Manifest File, Creating a Bean JAR File, Using a New Bean, Adding Controls to Beans, Giving a Bean Properties, Creating Bound Properties, Giving a Bean Methods, Giving a Bean an Icon

7. Servlets and Java Server pages (8 hrs)

7.1 Servelets: Introduction to Servlets,Life cycle of servlets, Java Servlets Development Kit, Creating, Compiling and running servlet, The servlet API (javax.servlet package), Reading the servlet Parameters, Reading Initialization parameter, The javax.servlet.http.Package, Handling HTTP Request and Response (GET / POST Request), Using Cookies, Session Tracking

7.2 Java Server Pages: Advantage of JSP technology (Comparison with ASP / Servlet), JSP Architecture, JSP Access Model, JSP Syntax Basic (Directions, Declarations, Expression, Scriplets, Comments), JSP Implicit Object, Object Scope, Synchronization Issue, Exception Handling, Session Management, Creating and Processing Forms.

8. RMI **(3 hrs)**

8.1 Remote Method Invocation: Introduction of RMI, Architecture of RMI, Remote Objects, Creating and Executing RMI Applications

Text Book:

1. Cay Horstmann and Grazy Cornell, Core Java Volume I-Fundamentals, Eighth Edition
1. Cay Horstmann and Grazy Cornell, Core Java Volume II-Advance Features, Eighth Edition

Reference:

2. Steven Holzner, Java 2 Pagramming-AWT, Swing, XML and Java Beans Black Book, Dreamtech Press
3. Pallvi Jain and Shadab Siddiqui, J2EE Professional Projects, Premier Press

Course Title: **Real Time Systems**

Course Code: COM**47**2
Semester: VII
Credit: **3**
Class Load: 6Hrs. per Week (Theory: 3 Hrs, **Practical: 3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:
The main objective of this course is to understand the fundamental concepts of Real time operating systems and the issues pertaining to scheduling, resource access control, and communication in the time critical system.

Course Contents:

1. **Introduction (6 hrs)**
   Digital control, High-level controls, Signal processing, Real time applications
   Jobs and processors, Hard and soft timing constraints, Hard real-time systems, Soft real-time systems, Firm real time systems, Scheduling hierarchy

1. **Parameters of Real-Time Work Load (4 hrs)**
   Processor and resources, Temporal parameters: Release times, Deadlines, and timingconstraints, Periodic task model, Precedence constraints and data dependency, Other dependencies, Functional parameters, Resource parameters of jobs and parameters of resources,

2. **Clock-Driven Scheduling (8 hrs)**
   Dynamic versus static system and Off-line versus on-line scheduling, Notations and assumptions of Clock-driven approach, Timer-driven scheduler, General structure of cyclic schedules, Cyclic executives, Effective release times and deadlines, Algorithm for constructing static schedules, Pros and cons of clock-driven scheduling

3. **Priority-Driven Scheduling of Periodic Tasks (6 hrs)**
   Fixed-priority versus dynamic-priority algorithms, Maximum schedule utilization, Optimality of the RM and DM algorithms, A schedulability test for fixed-priority tasks with short and arbitrary response times, Sufficient schedulability conditions for the RM and DM algorithms, Optimality and Non Optimality of the EDF and LST algorithms,

4. **Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems (6 hrs)**
   Sporadic and Aperiodic jobs, Deferrable servers, Sporadic servers, Constant utilization, total bandwidth, and weighted fair-queuing servers, Slack stealing in deadline-driven systems, Slack stealing in fixed-priority systems, Scheduling of sporadic jobs, Real-time performance for jobs with soft timing constraints, Two-level scheme for integrated scheduling

5. **Resources Sharing and Resource Access Control (5 hrs)**

Priority Inversion and unbounded Priority Inversion, Effects of resources contention and resource access control, Nonpreemptive critical sections, Basic priority-inheritance protocol, Basic priority-ceiling protocol, Use of priority-ceiling protocol in dynamic-priority system, Controlling accesses to multiple-unit resources, Controlling concurrent accesses to data objects, Multiprocessor priority-ceiling protocol

7. Commercial Real-time Operating System (5 hrs)

Unix as a Real-time operating system, Windows as a Real-time operating system
Extension to Unix, Host target approach, Preemption points, Fully preemptable kernel, Overview of some commercial embedded operating system, PSOS, VRTX, RT Linux, WinCE,

8. Real –Time Communication (5 hrs)

Real-time communication Model, Priority-based service disciplines for switched networks, Internet and resource reservation protocols, Real-time protocol, Communication in multi computer systems

Laboratory Works:

The practical classes should include

- POSIX compliant thread programming (pthreads) in Linux.
- Compilation and installation of a Real-time + la+ Linux kernel
- Use of RT-Linux API for injecting object modules in the *kernel space* of a Real time Linux kernel to study the behavior of a Real time kernel
- RT-UML (Rational Rose Real time etc.) for visualizing real time systems

Text Book:

- Real-Time Systems, Jane W. S. Liu, Third Edition, Pearson Education Asia.
- Real time systems Design and Analysis, Wiley India Pvt Limited, 2006

Reference:

- Third Edition, Terry Quatrani, "Visual Modeling with Rational Rose and UML", Pearson Education Asia, Nov 2002
- The Linux Kernel Module Programming Guide, Peter Jay Salzman, Michael Burian, Ori Pomerantz , 2001

Course Title: **Data Mining & Data Warehousing**
Course Code: COM**47**3
Semester: VII
Credit: **3**
Class Load: **6** Hrs. per Week (Theory: 3 Hrs, **Practical: 3 Hrs**)
Evaluation: External(60) + Internal(20+20)

Course Objectives:

The objective of the course is to make understand the data mining and data warehousing principles and then provide the various techniques for knowledge discovery in large corporate databases.

Course Contents:

1. **Introduction** **(4 hrs)**
   Introduction to data mining, Classification of data-mining systems, Data-mining major issues and challenges, KDD and DBMS vs Data-mining, Data-mining techniques, Data-mining applications.

1. **Data-warehousing** **(5 hrs)**
   Data-warehousing, Multi-dimensional data model, data-warehousing architecture, data-warehousing implementation, Data cubes

2. **Data Processing & Data Mining(12 hrs)**
   Data Cleaning, Integration, Transformation and Reduction, Discretization and Concept Hierarchy generation, Data-mining primitives, Knowledge to be mined, data-mining query language, Mining class comparison, Association Rules, Discovering Association Rule, single Dimensional Boolean Association Rule, Multilevel Association Rule, Multidimensional Association rule, Algorithms for association rules.

3. **Classification and Prediction(12 hrs)**
   Decision trees, Tree construction principle, Tree construction Algorithm, Tree construction with presorting, Pruning techniques, Integration of pruning and construction. Bayesian Belief network, Neural Net, Learning in Neural Net. Unsupervised learning, Data mining using neural net, Genetic algorithm, Rough sets, Support vector machines, Case-based, Fuzzy set; Prediction based on linear and nonlinear regression, Classifier accuracy.

4. **Cluster Analysis** **(6 hrs)**
   Types of data in cluster analysis, Major clustering methods, partitioning methods, Hierarchical methods, Density based methods, Grid based methods, Model based clustering methods.

5. **Mining Complex Data Types** **(6 hrs)**
   Mining spatial databases, Multimedia database, Time-series and Sequence data, Web mining, and Text mining.

Laboratory Works:
The practical classes should include**all the topics mentioned above.**

Text Book:

- Han Jiawei, M. Kamber, "Data Mining Concepts and Techniques" Academic Press, Harcourt India Private Limited, 2010

Reference:

- Pujari A. K., "Data Mining Techniques" University Press (India) Limited, Hyderabad, India, 2011.
- Adriaans Pieter, D. Zantige, " Data Mining", Pearson Education Asia Pte. Ltd, 2009

Course Title: **Project**
Course Code: COM**47**4
Semester: VII
Credit: **3**
Class Load: **6** Hrs. per Week (**Practical:** 6 **Hrs**)
Evaluation: Supervisor (50) + Internal (20) + HoD and External (30), at the mid of project work by supervisor, HoD/internal/external

Course Objectives:
The objective of this project work is to provide the students to plan and complete an individual engineering design project in the area of electronics under the supervision of Instructors.

Suggested Materials:

Relevant texts,Manuals, Computer Journals and Proceeding, Internet.

Procedures:

The project course involves working on a proposed design project under direct supervision of faculty members of FoST. Same project could be supervised by instructors of departments other than computer. The selected project shall be electronic hardware based or electronics computer based but it should be relevant, as possible, to the local industries environment and may in fact, be selected in consultation with the industries.

The project must be started at the beginning of seventh semester. But the evaluation will be made on eight semesters.

Evaluation:
There are three stages in evaluation, they are:

First Stages: 10% of the mark shall be based on the followings:
1 Project Proposal
1 Project plan
2 Budgeting

Second Stage: 60% of total mark shall be based on the following:

a.Work Performed (80 %)
1. System Design
2. Thoroughness
3. Understanding of methods used in the project
4. Amount of work performed
5. Level of achievement
6. Ability to work with others
7. Ability to identify problems
8. Project planning skills.

b. Documentation (20%)

1. Report organization
2. Writing style
3. Completeness of the report
4. Readability
5. Organization and analysis of data and results

Third Stage (30%):

An oral defense of the project work to be conducted on the last week of final semester term. The defense will be evaluated by external examiner (external to the department or from industries). The oral defense will carry 30% of total marks.

Elective (Any One)
Course Title: **Software Project Management**
Course Code: COM**4**75A

Course Title: Network Security
Course Code: **COM475B**

Course Title: **System Administration**
Course Title: **COM475C**

Semester: V**II**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Title: **Software Project Management**
Course Code: COM**475A**
Semester:VII
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Tutorial: **3 Hrs**)
Evaluation: External (60) + Internal (20+20)

Course Objectives:

The course in software project management discusses the software engineering approach to modern software development process (Unified Process) to the student familiar with this course. The project enables the students to develop computer package for independent practical use.

Course Contents:

1.Introduction to Software Project Management (2 hrs)
1.1 Introduction
1.2 Software project versus other project
1.3 Steps of Software Project Management
1.4 Problems with software projects
1.5 System and Project

2. Software Management Practice and Software Economics (7 hrs**)**
1.1 Conventional Software Management Theory and Practice
10.1 Software economics and cost estimation
10.2 Improving software economics
10.3 Software process
10.4 Team effectiveness and software environment

1.1 Quality target
10.1 Principles of conventional software engineering
10.2 Principles of modern software management
10.3 Iterative process

3. Software Process Primitives and Process Management Framework (9hrs)
1.1 Software process life-cycle phases.
11.1 Various elements of the software process (Management, Engineering and Pragmatic).
11.2 Technical and management perspective of software architecture.
11.3 Software process workflow and iteration workflow.
11.4 Status monitoring - software process checkpoints and milestones.

4. Techniques of Planning, Controlling and Automating Software Process (7hrs)
1.1 Iterative process planning
- 12.1.1 Process work breakdown structure
- 12.1.2 Planning guidelines
- 12.1.3 Cost and schedule estimation process
- 12.1.4 Iteration planning process

12.2 Project organization and responsibilities
12.3 Process automation - tools and environment
12.4 Project control and process automation
12.5 Process customization

5. Modern Approach to Software Project and Economics (2hrs)
1.1 Elements of modern software projects and management principles
13.1 Next-generation software economics and cost models
13.2 Modern process transition - paradigm shifts

6. Project (18 hrs)
The project should be based on the subjects studied earlier and the students should develop a complete package

Case Study:
Here case study will be completed by the students according to Unit 6 : "Project" in the above syllabus. This will be evaluated as internal works.

Text Book:

1. Royce, W. (2000). *Software project management - A unified framework*. New Delhi: Addison-Wesley, ISBN: 81-7808-013-3.
1. Bob Hughes and Mike Cotterell, *Software Project Management* (Second Edition), Published by McGraw-Hill Publishing Company ; ISBN: 007-709505-**7**

Course Title: **Network Security**
Course Code: **COM475B**

Semester: V**II**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:
In this age of universal electronic connectivity, viruses and hackers, electronic eavesdropping, and electronic fraud, security is paramount. This course provides a practical survey of the principles and practice of network security.

Course Contents:

1 Introduction (6hrs)
- 1.1 Computer Security Concepts
- 1.2 The OSI Security Architecture
- 1.3 Security Attacks
- 1.4 Security Services
- 1.5 Security Mechanisms
- 1.6 A Model for Network Security

2 Key Management and Distribution (6hrs)
- 2.1 Symmetric Key Distribution Using Symmetric Encryption
- 2.2 Symmetric Key Distribution Using Asymmetric Encryption
- 2.3 Distribution of Public Keys
- 2.4 X.509 Certicates
- 2.5 Public Key Infrastructure

3 User Authentication Protocols (6hrs)
- 3.1 Remote User Authentication Principles
- 3.2 Remote User Authentication Using Symmetric Encryption
- 3.3 Kerberos
- 3.4 Remote User Authentication Using Asymmetric Encryption
- 3.5 Federated Identity Management

4 Transport-Level Security (7hrs)
- 4.1 Web Security Issues
- 4.2 Secure Sockets Layer (SSL)
- 4.3 Transport Layer Security (TLS)
- 4.4 HTTPS
- 4.5 Secure Shell (SSH)

5 Wireless Network Security (8hrs)
- 5.1 IEEE 802.11 Wireless LAN Overview

1.1 IEEE 802.11i Wireless LAN Security
1.2 Wireless Application Protocol Overview
1.3 Wireless Transport Layer Security
1.4 WAP End-to-End Security

6 Electronic Mail Security (**4hrs)**

1.5 Pretty Good Privacy (PGP)
1.6 S/MIME
1.7 DomainKeys Identified Mail (DKIM)

7 IP Security **(8 hrs)**

1.8 IP Security Overview
1.9 IP Security Policy
1.10 Encapsulating Security Payload
1.11 Combining Security Associations
1.12 Internet Key Exchange
1.13 Cryptographic Suites

Text Book:

- Cryptography and Network Security: Principles and Practice, 5/E,**William Stallings,** ISBN-10:0136097049,Prentice Hall, India Limited

Course Title: **System Administration**
Course Title: **COM475C**

Semester: V**II**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:

The main objective of the course is to introduce concepts of System Administration. The general objectives are,

1. To learn about system administration
2. Touse different tools and techniques for system administration
3. Toidentify and access file system, storage and network management services
4. To learn about the system kernels, security essentials and system monitoring

Course Contents:

1. Introduction (6 hrs)

Linux workstation installation, Linux server installation, Post-install system configuration, Scripting installation of custom setups using kickstart, Linux boot process, Sysvinit concepts and configuration, Managing startup of system daemons, Controlling startup of services in xinetd / inetd

2. User Management (4 hrs)

Creation, modification, and deletion of users and groups, creating group directories, Password aging under Linux, The Linux login process and login authentication, Regulating access to the root account via su and sudo.

3.File System and Storage (4 hrs)

Path Names: Absolute and Relative Paths, File Types, File Attributes, Access Control Lists, Creation, modification, and deletion of partitions and file systems, Management of RAID devices under Linux, Disk space regulation using quotas, Backing up and restoring Linux filesystems,

4. Process and Network Service Management (12 hrs)

Scheduling jobs using cron, anacron, and at, Management of processes running on the system, Usage of process accounting and implementation of process limits, Configuration and analysis of system logs, System performance analysis, Configuring network interfaces, Setup of DNS and DHCP clients, Diagnosing network setup issues, Configuring NFS clients, Basic installation and configuration of common network services: telnet and SSH servers file sharing via NFS, SMB, HTTP, FTP, and TFTP e-mail services via SMTP, POP, and IMAP ISC DHCP services

5 . Working with Kernels (9 hrs)

Configuration of optimized Linux kernels, Compiling and installing custom Linux kernels, Using third-party patches with Linux kernels, Updating userland to support new kernels, Concepts for troubleshooting Linux, Analysis of system logs to identify problems, Use of systems-level debugging aids in troubleshooting, Usage of the Linux rescue environment

6. Security (5 hrs)

Securing freshly installed Linux systems, Protecting files and the file system,User authentication,Keeping Linux systems up-to-date, Configuration of Linux firewalls

7. Managing System Resources (5 hrs)

Monitoring and Controlling Processes, Managing CPU Resources, Managing Memory, Monitoring Disk Space Usages, Managing Network Performances

Laboratory Works:

Student should have practical session for configuring and using above mentioned topics in Linux However, nature of Linux Platform can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Text Book:

- **Æleen Frisch**, *Essential System Administration*, O'Reilly

References:

- Fedora System Administrator's Guide
- Red Hat Enterprise Linux System Administrator's Guide
- **Evi Nemeth, Garth Snyder, Trent R. Hein**, *Linux Administration Handbook*, Addison-Wesley Professional
- **Evi Nemeth, Garth Snyder, Trent R. Hein , Ben Whaley** *Unix and Linux System Administration Handbook,* Prentice Halls
- **Ronald McCarty,** *Ubuntu Linux System Administration*