

SINGHANIA UNIVERSITY

M.Tech (Software Engineering)

Semester – Ist

Sr.No.	Code	Name of Subject	L	P	U
1	MTSE-111	Software Process and Project Management			
2	MTSE-112	Software Requirements and Estimation			
3	MTSE-113	Data Warehousing and Mining			
4	MTSE-114	Software Quality Assurance and Testing			
5	MTSE-115	Web Technologies			
6	MTSE-116	Software Lab-1			

Semester – IInd

Sr.No.	Code	Name of Subject	L	P	U
1	MTSE-121	Information Security			
2	MTSE-122	Software Architecture and Design Pattern			
3	MTSE-123	Wireless Networks and Mobile Computing			
4	MTSE-124	Unix Network Programming			
5	MTSE-125	Neural Networks			
6	MTSE-126	Software Lab-II			

Semester – IIIrd & IVth

Sr.No.	Code	Name of Subject	L	P	U
1	MTSE-211	THESIS / PROJECT /SEMINAR			

DETAILED SYALLABUS

Semester First

SOFTWARE PROCESS AND PROJECT MANAGEMENT

UNIT I

Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

UNIT II

Process Reference Models

Capability Maturity Model (CMM), CMMi, PCMM, PSP, TSP, IDEAL, Process Definition Techniques.

UNIT III

Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

UNIT IV

Managing Software Projects

Project Management and the CMM, Project Management and CMMi, Project Management Process Framework.

UNIT V

Project Planning

Software Life Cycle Models, Project Organizations and Responsibilities, Artifacts of the Project Management Process, Cost and Scheduling estimation, Establishing Project Environment, Risk Management, Quality Assurance and Configuration Management

UNIT VI

Project Tracking and Control

Defect Tracking, Issue Tracking, Status Reports, Milestone Analysis, Defect Analysis and Prevention Methods, Process monitoring and audit, Reviews, Inspections and Walkthroughs, Seven Core Metrics, Management indicators, Quality Indicators

UNIT VII

Project Closure

Project Closure Analysis, Role of Closure Analysis in a project, Performing Closure Analysis, Closure Analysis Report

UNIT VIII

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions

Text Books

1. Managing the Software Process by Watts S. Humphrey, published by Pearson Education
2. Software Project Management, by Walker Royce, published by Pearson Education

SOFTWARE REQUIREMENTS AND ESTIMATION

UNIT I

Software Requirements: What and Why
Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management

UNIT II

Software Requirements Engineering
Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality,

UNIT III

Software Requirements Management
Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain

UNIT IV

Software Requirements Modeling

Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames

UNIT V

Software Estimation

Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation

UNIT VI

Size Estimation

Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures,

UNIT VII

Effort, Schedule and Cost Estimation

What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation

UNIT VIII

Tools for Requirements Management and Estimation

Requirements Management Tools: Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber “RM, implementing requirements management automation, Software Estimation Tools:

Desirable features in software estimation tools, IFPUG, USCTMs COCOMO II, SLIM (Software Life Cycle Management) Tools

Text Book

1. Software Requirements and Estimation by Rajesh Naik and Swapna Kishore, published by Tata Mc Graw Hill

WEB TECHNOLOGIES

UNIT I

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

UNIT II

Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script

UNIT III

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

UNIT IV

Java Beans: Introduction to Java Beans, Advantages of Java Beans, JDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB™s

UNIT V

Web Servers: Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues,

UNIT VI

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

UNIT VII

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing “
Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages “
Sharing Session and Application Data “
Memory Usage Considerations

UNIT VIII

Database Access : Database Programming using JDBC, Studying javax.sql.* package, Accessing a Database from a JSP Page, Application “
Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to

struts framework..

Text Books

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY
Dreamtech (UNIT s 1,2 ,3)
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH (Chapters: 19, 20, 21, 22, 25, 27) (UNIT 4)
3. Java Server Pages – Hans Bergsten, SPD O’Reilly (UNITs 5,6,7,8)

DATA WAREHOUSING AND MINING

UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining,

UNIT II

Data Preprocessing:Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation,

UNIT III

Data Mining Primitives, Languages, and System Architectures:Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems,

UNIT IV

Concepts Description: Characterization and Comparison:Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

UNIT V

Mining Association Rules in Large Databases: Association Rule Mining,

Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT VI

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Backpropagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

UNIT VII

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT VIII

Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

Text Books

1. Data Mining “ Concepts and Techniques - Jlaweihan & Micheline Kamber Harcourt India.
2. Data Mining Introductory and advanced topics “Margaret H Dunham, Pearson education

SOFTWARE QUALITY ASSURANCE AND TESTING

UNIT I

Software Quality Assurance Framework and Standards
SQA Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance “ Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan “ Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma

UNIT II

Software Quality Assurance Metrics and Measurement

Software Quality Metrics: Product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs
“ Software Quality metrics methodology: Establish quality requirements, Identify Software quality metrics, Implement the software quality metrics, analyze software metrics results, validate the software quality metrics “
Software quality indicators “ Fundamentals in Measurement theory

UNIT III

Software Testing Strategy and Environment

Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing

UNIT IV

Software Testing Methodology

Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist

UNIT V

Software Testing Techniques

Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured Walkthroughs, Thread Testing, Performance Testing, White-Box Testing

UNIT VI

Software Testing Tools

Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Java Testing Tools, JMetra, JUNIT and Cactus.

UNIT VII

Testing Process

Eleven Step Testing Process: Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record

Results, Acceptance Test, Report test results, testing software installation,
Test software changes, Evaluate Test Effectiveness.

UNIT VIII Testing Specialized Systems and Applications
Testing Client/Server “ Web applications, Testing off the Shelf
Components, Testing Security, Testing a Data Warehouse

Text Books

1. Effective Methods for Software Testing, 2nd Edition
by William E. Perry , Second Edition, published by Wiley
2. Software Quality, by Mordechai Ben-Menachem/Garry S. Marliss, by
Thomson Learning publication

Second Semester

INFORMATION SECURITY

UNIT I

Security Attacks (Interruption, Interception, Modification and Fabrication),
Security Services (Confidentiality, Authentication, Integrity, Non-
repudiation, access Control and Availability) and Mechanisms, A model for
Internetwork security, Internet Standards and RFCs, Buffer overflow &
format string vulnerabilities, TCP session hijacking, ARP attacks, route table
modification, UDP hijacking, and man-in-the-middle attacks.

UNIT II

Conventional Encryption Principles, Conventional encryption algorithms,
cipher block modes of operation, location of encryption devices, key
distribution Approaches of Message Authentication, Secure Hash Functions
and HMAC,

UNIT III

Public key cryptography principles, public key cryptography algorithms,
digital signatures, digital Certificates, Certificate Authority and key
management Kerberos, X.509 Directory Authentication Service

UNIT IV

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT V

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management

UNIT VI

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET)

UNIT VII

Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3, Intruders, Viruses and related threats

UNIT VIII

Firewall Design principles, Trusted Systems, Intrusion Detection Systems

Text Books

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permech, wiley Dreamtech,

SOFTWARE ARCHITECTURE AND DESIGN PATTERN

UNIT I

Envisioning Architecture

The Architecture Business Cycle, What is Software Architecture? Designing the Architecture, Documenting the architecture, Reconstructing Software Architecture

UNIT II

Creating an Architecture

Quality Attributes, Moving from quality to Architecture, Architectural styles and patterns, UNIT Operations, Achieving qualities, designing the Architecture, Documenting the architecture, Reconstructing Software Architecture, shared information systems

UNIT III

Analyzing Software Architecture

Analyzing development qualities at the architectural level, SAAM, ATAM, CBAM, Architecture Reviews

UNIT IV

Moving from Architecture to Systems

Software Product Lines, Building systems from off the shelf components, Reuse of Architectural assets within an organization.

UNIT V

Patterns

What is pattern? Pattern categories, Pattern Description, Patterns and Software Architecture, Pattern Systems, Classification, Selection

UNIT VI

Design Patterns Catalog

Creational Pattern, Structural Pattern, Behavioral Patterns, Pattern Community, Designing a document editor

UNIT VII

Case Studies

Key word in Context, The World Wide Web - a case study in interoperability, Instrumentation software, cruise control, three vignettes in mixed styles, CORBA - a case study on Industry Standard computing infrastructure, Flight Simulation “ a case study in architecture for integration, Celsius Tech “ a case study in product line development,

Text Books

- 1 Software Architecture in Practice, 2nd Edition by Len Bass, Paul Clements, Rick Kazman, published by Pearson Edition
2. Design Patterns, by Erich Gamma, Pearson Education

WIRELESS NETWORKS AND MOBILE COMPUTING

UNIT I

Introduction to Network Technologies and Cellular Communications:

HIPERLAN: Protocol architecture, physical layer, Channel access control sub-layer, MAC sub-layer, Information bases and networking

WLAN: Infrared vs. radio transmission, Infrastructure and ad hoc networks,

IEEE 802.11. Bluetooth.: User scenarios, Physical layer, MAC layer, Networking, Security, Link management
GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.
Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture

UNIT II

(Wireless) Medium Access Control:

Motivation for a specialized

MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT III

Mobile Network Layer:

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT IV

Mobile Transport Layer:

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT V

Database Issues:

Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

UNIT VI

Data Dissemination:

Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT VII

Mobile Ad hoc Networks (MANETs):

Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT VIII

Protocols and Tools:

Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Text Books

1. Jochen Schiller, "Mobile Communications", Pearson Education. (Chapters 4, 7,

9, 10, 11), second edition, 2004.

2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile

Computing", Wiley, 2002, ISBN 0471419028.(Chapters 11, 15, 17, 26 and 27)

UNIX NETWORK PROGRAMMING

UNIT I

Review of Unix Utilities and Shell Programming-File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities,

Working with the Bourne shell-What is a shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT II

Unix Files: Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, creat, read, write, close, lseek, stat, fstat, ioctl, umask, dup, dup2.

The standard I/O (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets), formatted I/O, stream errors, streams and file descriptors, file and directory maintenance (chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd), Directory handling system calls (opendir, readdir, closedir, rewinddir, seekdir, telldir)

UNIT III

Unix Process, Threads and Signals: What is process, process structure, starting new process, waiting for a process, zombie process, process control, process identifiers, system call interface for process management-fork, vfork, exit, wait, waitpid, exec, system, Threads-Thread creation, waiting for a thread to terminate, thread synchronization, condition variables, canceling a thread, threads vs. processes, Signals- Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

UNIT IV

Interprocess Communication Overview: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, file and record locking, other Unix locking techniques, pipes, FIFOs, streams and messages, namespaces, introduction to three types of IPC (system-V)-message queues, semaphores and shared memory.

UNIT V

Message Queues-Unix system-V messages, Unix kernel support for messages, Unix APIs for messages, client/server example.

UNIT VI

Semaphores-Unix system-V semaphores, Unix kernel support for semaphores, Unix APIs for semaphores, file locking with semaphores. Shared Memory-Unix system-V shared memory, Unix kernel support for shared memory, Unix APIs for shared memory, semaphore and shared memory example.

UNIT VII

Sockets: Berkeley sockets, socket system calls for connection oriented protocol and connectionless protocol, example-client/server program, advanced socket system calls, socket options.

UNIT VIII

Remote Procedure Calls-RPC Model, transparency issues, sun RPC

Text Books

1. Unix Network Programming, W.R.Stevens Pearson/PHI.
2. Unix Concepts and Applications, 3rd Edition, Sumitabha Das, TMH.

NEURAL NETWORKS

UNIT I

Introduction - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

UNIT II

Learning Process – Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process,

UNIT III

Single layer perceptrons – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron – convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment (p. no – 117 – 155)

UNIT IV

Multilayer Perceptron – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection, (p. no – 156 – 201)

UNIT V

Back Propagation - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning. (p. no – 202 – 234)

UNIT VI

Self Organization Maps – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive pattern classification (p. no – 443 – 469, 9.1 – 9.8)

UNIT VII

Neuro Dynamics – Dynamical systems, stability of equilibrium states, attractors, neurodynamical models , manipulation of attractors as a recurrent network paradigm (p. no – 664 – 680, 14.1 – 14.6)

UNIT VIII

Hopfield Models “ Hopfield models, computer experiment I (p. noâ€™s
680-
701, 14.7 “14.8)

Text Book

1. Neural networks A comprehensive foundations, Simon Hhaykin, Pearson
Education 2nd
edition 2004