

**UNIT I****Chapter 1 : Software Development Process 1-1 to 1-47****Syllabus :**

- 1.1 Software, Software Engineering as layered approach and its characteristics. Types of Software
- 1.2 Software Development Framework.
- 1.3 Software Process Framework, Process Models : Perspective Process Models, Specialized Process Models.
- 1.4 Agile software development : Agile Process and its importance, Extreme Programming, Adaptive Software Development, Scrum, Dynamic Systems Development Method (DSDM), Crystal.
- 1.5 Selection criteria for Software process model.

1.1	Software	1-1
1.1.1	Characteristics of Software.....	1-1
1.1.2	Classes of Software	1-2
1.1.3	Types of Software	1-3
1.2	Software Engineering	1-5
1.3	Software Engineering – A Layered Technology	1-6
1.4	Software Development Framework.....	1-7
1.4.1	Software Process Framework.....	1-7
1.4.1(A)	Framework Activities	1-8
1.4.1(B)	Process Iteration Activities	1-8
1.4.1(C)	Umbrella Activities.....	1-9
1.5	Process Models.....	1-9
1.6	Waterfall Model	1-10
1.6.1	Feasibility Study	1-11
1.7	Incremental Process Models	1-16
1.8	RAD Model.....	1-18
1.8.1	Method of RAD model	1-18
1.9	Evolutionary Process Models	1-20
1.9.1	Prototyping Model.....	1-20
1.9.1(A)	Methods of Prototyping Model	1-20
1.9.2	The Spiral Model	1-22
1.9.2(A)	Method of the Spiral Model.....	1-22
1.10	Concurrent Model.....	1-24
1.11	Component-Based Development.....	1-24

1.11.1	Design Principles of Component-Based Development.....	1-25
1.11.2	Component-Based Development Process.....	1-25
1.12	Formal Methods Model.....	1-26
1.13	The Unified Process Phases	1-26
1.13.1	Features of RUP.....	1-26
1.13.2	RUP Phases.....	1-27
1.13.3	Best Practices of RUP	1-28
1.13.4	Workflows	1-29
1.14	Agile Software Development	1-32
1.14.1	Agility	1-32
1.14.2	Agile Process and its Importance	1-32
1.14.3	Need of Agile Process.....	1-32
1.14.4	Difference between Prescriptive Model and Agile Model	1-33
1.15	Extreme Programming (XP).....	1-33
1.15.1	Comparison of XP Tests.....	1-39
1.15.2	Terminologies used in XP.....	1-39
1.15.3	Applications of XP	1-40
1.16	Adaptive Software Development (ASD)	1-40
1.16.1	Feature Driven Development (FDD)	1-41
1.17	Dynamic System Development Method (DSDM).....	1-42
1.18	Scrum.....	1-43
1.18.1	Characteristics of Scrum	1-43
1.18.2	Sprints.....	1-44
1.19	Crystal.....	1-44
1.20	Agile Modeling (AM)	1-45
1.21	Selection Criteria for Software Process Model.....	1-46

UNIT II**Chapter 2 : Software Requirement Engineering****2-1 to 2-44****Syllabus :**

- 2.1 Software Engineering Practices and its importance, Core Principles
- 2.2 Communication practices, Planning practices, Modeling practices, construction practices, software deployment (Statement and meaning of each principle for each practice).



2.3 Requirement Engineering : Requirement Gathering and Analysis, Types of requirements (Functional, Product, Organizational, External Requirements), Eliciting Requirements, Developing Use-cases, Building requirement models, Requirement Negotiation, Validation.

2.4 Software Requirement Specification : Need of SRS, Format and its Characteristics.

2.1	Software Engineering Practice and Importance.....	2-1
2.1.1	Core Principles of SE Practice	2-2
2.2	Types of SE Practices	2-2
2.2.1	Communication Practice	2-3
2.2.2	Planning Practice	2-3
2.2.3	Modeling Practice.....	2-3
2.2.4	Construction Practice	2-4
2.2.5	Testing Practice	2-4
2.2.6	Deployment Practice	2-4
2.3	Requirements.....	2-4
2.3.1	Non-Functional Requirements.....	2-5
2.4	Requirements Engineering	2-6
2.5	Requirements Engineering Tasks.....	2-7
2.5.1	Inception.....	2-8
2.5.2	Eliciting Requirements.....	2-8
2.5.3	Elaboration (Building Requirement Models).....	2-8
2.5.4	Requirement Negotiation.....	2-9
2.5.5	Software Requirement Specification (SRS)	2-9
2.5.6	Requirements Validation	2-9
2.5.7	Requirements Management	2-10
2.6	Requirement Gathering and Analysis	2-11
2.6.1	Collaborative Requirements Gathering.....	2-11
2.6.2	Quality Function Deployment.....	2-12
2.6.3	Developing Use Case Scenarios	2-13
2.6.4	Elicitation Work Products	2-14
2.7	Software Requirement Specification (SRS)	2-14
2.7.1	Benefits (Need) of SRS	2-15
2.7.2	Characteristics of SRS	2-15

2.7.3	Components of SRS.....	2-16
2.8	Identifying the Stakeholders	2-18
2.9	Issues of Requirement Gathering	2-18
2.10	Techniques of Requirement Gathering	2-19
2.10.1	Questionnaires	2-19
2.10.2	Reviews.....	2-20
2.10.3	Interviews	2-20
2.10.4	Workflows	2-24
2.10.5	Building Prototypes	2-25
2.10.6	Structured Walkthroughs.....	2-25
2.11	Case Studies of SRS.....	2-25
2.11.1	Online Library System	2-25
2.11.2	Purchase Order System	2-29
2.11.3	Hospital Management System.....	2-31
2.11.4	Catering System.....	2-35
2.11.5	Online Contest Registration System.....	2-40
2.11.6	Employee Management System.....	2-43

UNIT III

Chapter 3 : Software Modelling and Design 3-1 to 3-49

Syllabus :

3.1	Translating Requirement model into design model : Data Modelling.	
3.2	Analysis Modeling : Elements of Analysis model.	
3.3	Design modeling : Fundamental Design Concepts (Abstraction, Information hiding, Structure, Modularity).	
3.4	Design notations : Data Flow Diagram (DFD), Structured Flowcharts, Decision Tables.	
3.5	Testing : Meaning and purpose, testing methods : Black-box and White-box.	
3.6	Test Documentation : Test Case Template, test plan, Introduction to defect report, test summary report.	
3.1	Translating Requirements Model into Design Model....	3-1
3.1.1	Types of Models	3-1
3.1.2	Analysis Modeling	3-2
3.1.2(A)	Principles of Analysis Modeling	3-2



3.1.3	Design Modeling.....	3-3	3.12.2	Test Plan Examples	3-34
3.1.3(A)	Principles of Design Modeling	3-3	3.13	Test Cases	3-39
3.2	Analysis Modeling Approaches.....	3-4	3.13.1	Test Case Examples	3-39
3.3	Data Flow Diagram (DFD)	3-5	3.14	Defect Life cycle	3-44
3.3.1	DFD Characteristics	3-5	3.14.1	Defect Report	3-45
3.3.2	DFD Notations.....	3-5	3.14.2	Benefits of Defect Report	3-47
3.3.3	Constructing DFD.....	3-6	3.15	Test Summary Report	3-49
3.4	Data Modelling	3-8	UNIT IV		
3.4.1	Data Objects	3-9	Chapter 4 : Software Project Estimation 4-1 to 4-24		
3.4.2	Data Attributes	3-9	Syllabus :		
3.4.3	Relationships.....	3-11	4.1	The Management spectrum 4P's	
3.4.4	Cardinality and Modality	3-11	4.2	Metrics for Size Estimation : Line of Code (LoC), Function Points (FP).	
3.4.5	Data Dictionary.....	3-11	4.3	Project Cost Estimation Approaches : Overview of Heuristic, Analytical and Empirical Estimation.	
3.4.6	Entity Relationship Diagram	3-11	4.4	COCOMO (Constructive Cost Model), COCOMO II.	
3.5	Fundamental Design Concepts	3-14	4.5	Risk Management : Risk Identification, Risk Assessment, Risk Containment, RMMM strategy.	
3.6	Structure Charts	3-19	4.1	The Management Spectrum – 4P's	4-1
3.6.1	Notations used in Structure Chart.....	3-19	4.1.1	The W5HH Principle.....	4-1
3.6.2	Steps to draw Structure Chart	3-19	4.2	Measures, Metrics and Indicators	4-2
3.7	Flow Charts	3-20	4.2.1	Need of Metrics	4-2
3.8	Decision Tables.....	3-21	4.2.2	Role of Software Metrics	4-2
3.8.1	Conditions and Actions.....	3-21	4.2.2(A)	The Seven Core Metrics	4-3
3.8.2	Steps for building a Decision Table	3-22	4.2.3	Types of Testing Metrics	4-6
3.8.3	Advantages of Decision Table	3-24	4.3	Metrics of Size Estimation	4-7
3.9	Introduction to Testing.....	3-24	4.3.1	LOC (Lines of Code).....	4-7
3.9.1	Bugs.....	3-25	4.3.2	Function-Points (FP)	4-8
3.9.2	Testing Principles	3-26	4.4	Metrics for Software Quality.....	4-10
3.9.3	Testing Objectives.....	3-26	4.4.1	Defect Removal Efficiency.....	4-11
3.9.4	Test Oracles.....	3-27	4.5	Software Cost Estimation Process	4-12
3.10	Testing Methods.....	3-27	4.5.1	Cost Estimation Parameters.....	4-12
3.10.1	White-box Testing (Structural Testing)	3-27	4.5.2	Pragmatic Software Cost Estimation	4-13
3.10.2	Functional (Black Box) Testing	3-28	4.6	Project Cost Estimation Approaches	4-14
3.11	Levels of Testing	3-30			
3.12	Test Plan.....	3-31			
3.12.1	Test Plan Template	3-31			



4.7	COCOMO Model	4-14	5.1.2(A)	Types of WBS.....	5-3
4.7.1	COCOMO II Model	4-16	5.2	Project Tracking	5-4
4.8	Software Risks	4-16	5.2.1	Time-line Charts	5-4
4.8.1	Types of Risks.....	4-17	5.2.2	Gantt Chart.....	5-6
4.8.2	Seven Principles of Risk Management	4-18	5.2.3	Earned Value Analysis (EVA).....	5-8
4.9	Risk Management Process.....	4-18	5.3	Activity Network.....	5-9
4.9.1	Risk Identification	4-19	5.3.1	Scheduling Techniques : PERT/CPM Chart	5-9
4.9.2	Risk Identification Methods.....	4-20	5.3.2	Difference between PERT and CPM	5-10
4.9.3	Risk Assessment.....	4-20	5.3.3	Use of PERT and CPM Chart	5-11
4.9.4	Risk Planning	4-20	5.3.4	PERT	5-11
4.9.4(A)	Risk Strategies.....	4-21	5.3.5	Critical Path Method (CPM).....	5-13
4.9.5	Risk Monitoring and Control	4-21	5.3.6	Solved PERT/CPM Network Diagrams	5-15
4.10	Risk Projection (Estimation)	4-22	5.4	Quality.....	5-22
4.10.1	Risk Table	4-22	5.4.1	Quality Perceptions	5-23
4.11	Risk Refinement.....	4-23	5.4.2	Quality Challenges	5-23
4.12	RMMM Strategy.....	4-23	5.4.3	Software Quality Management (Control) vs. Software Quality Assurance	5-23
			5.5	Software Quality Assurance (SQA).....	5-24

UNIT V

Chapter 5 : Software Quality Assurance and Security

5-1 to 5-43

Syllabus :

- 5.1 Project Scheduling: Basic Principles, Work breakdown structure, Activity network and CPM, scheduling Techniques.
- 5.2 Project Tracking: Timeline charts, Earned Value Analysis, Gantt Charts.
- 5.3 Software Quality Management vs. Software Quality Assurance. Phases of Software Quality Assurance: planning, activities, audit and review.
- 5.4 Quality Evaluation Standards: Six sigma, ISO for software, CMMI levels, Process areas.
- 5.5 Software security, Introduction to DevOps, Secure Software Engineering.

5.1	Project Scheduling	5-1	5.13.2	Secure Software Engineering	5-42
5.1.1	Basic Principles of Project Scheduling	5-2			
5.1.2	Work Breakdown Structure (WBS)	5-2			