

CONTENTS

Preface	(xv)
About the Author	(xvii)

Chapter 1

Introduction to Software Engineering

1.1	Introduction	1
1.2	Basics of Software Engineering	2
1.3	Principles of Software Engineering	2
1.4	Software Characteristics	3
1.5	Software Applications	4
1.6	Objectives of Software Engineering	5
1.7	Phases of Software Engineering	5
1.8	Summary	7

Chapter 2

Software Process and Life Cycle Models

2.1	Introduction	9
2.2	Software Process, Project and Product	10
2.3	Process Assessment	12
2.4	Software Process Capability Maturity Model	13
2.5	Software Development Life Cycle Models	15
2.5.1	Waterfall Model	16
2.5.2	Spiral Model	17
2.5.3	Incremental Model	18
2.6	Summary	19

Chapter 3

Software Life-Cycle Model-2

3.1	Introduction	21
3.2	Prototyping Model	22
3.3	Object- Oriented Model	23
3.4	Agile Model	24
3.5	Rapid Application Development Model	25
3.6	Iterative Enhancement Model	26
3.7	V-Model	28
3.8	Summary	29

Chapter 4

Software Requirements

4.1	Introduction	30
4.2	Functional Requirements	31
4.3	Non-Functional Requirements	31
4.4	User Requirements	34
4.5	System Requirements	35
4.6	Software Requirements Document	35
4.7	Summary	37

Chapter 5

Software Requirement Engineering Process

5.1	Introduction	38
5.2	Feasibility Study	39
5.3	Requirements Elicitation and Analysis	39
	5.3.1 Stakeholders	40
	5.3.2 Requirement Elicitation and Analysis Process	40
5.4	Requirements Validation	43
5.5	Software Prototyping	42
5.6	Requirements Management	45
	5.6.1 Requirements Management Planning	45
	5.6.2 Requirement Change Management	46
5.7	Summary	47

Chapter 6

Software Reliability

6.1	Introduction	49
6.2	Software Reliability	50
6.3	Software Reliability Metrics	50
6.4	Programming for Reliability	52
	6.4.1 Fault Avoidance	52
	6.4.2 Fault Tolerance	55
6.5	Software Reuse	55
6.6	Summary	57

Chapter 7

Software Design

7.1	Introduction	59
7.2	Basics of Software Design	60
7.2.1	Design Process	61
7.3	Data Design	62
7.4	Architectural Design	63
7.5	Component-Level Design	65
7.6	User Interface Design	66
7.6.1	User Interface Rules	66
7.6.2	User Interface Design Process	67
7.7	Fundamental Design Concepts	68
7.7.1	Module	69
7.7.2	Modularization	69
7.8	Design Techniques	70
7.9	Summary	70

Chapter 8

Object Oriented Design

8.1	Introduction	72
8.2	Object and Object Classes	73
8.3	Relationships	75
8.4	Object Oriented Design Process	76
8.4.1	Activities in Object Oriented Design Process	76
8.5	Object Identification	77
8.6	Design Models	78
8.6.1	Sequence Model	79
8.6.2	State Machine Model	81
8.7	Summary	82

Chapter 9

Software Implementation

9.1	Introduction	84
9.2	Structured Coding Techniques	85
9.2.1	Single-Entry, Single-Exit Constructs	85
9.3	Coding Styles	86
9.4	Coding Methodology	86
9.5	Code Verification Techniques	87

(viii) | Contents

9.6	Coding Tools	88
9.7	Code Documentation	90
9.8	Coding Standards and Guidelines	92
9.9	Summary	93

Chapter 10

Software Maintenance

10.1	Introduction	94
10.2	Software Re-Engineering	95
10.3	Change Management	97
10.3.1	Elements of Change Management	97
10.3.2	Objectives of Change Management	98
10.3.3	Issues of Change Management	99
10.4	Configuration Management	99
10.4.1	Tasks of Configuration Management	99
10.5	Software Maintenance Tools and Techniques	102
10.6	Summary	103

Chapter 11

Software Testing Strategies

11.1	Introduction	104
11.2	A Strategic Approach to Software Testing	105
11.3	Testing Strategies for Convention Software	105
11.4	Black-Box Testing	107
11.5	White Box Testing	109
11.6	Validation Testing	113
11.6.1	Validation Test Criteria	113
11.6.2	Configuration Review	113
11.6.3	Alpha and Beta Testing	113
11.7	System Testing	114
11.7.1	Recovery Testing	114
11.7.2	Security Testing	115
11.7.3	Stress Testing	115
11.7.4	Performance Testing	115
11.8	Debugging	115
11.8.1	The Debugging Process	116
11.8.2	Debugging approach	117
11.9	Summary	118

Chapter 12

Software Metrics

12.1	Introduction	119
12.2	Software Quality Metrics	120
12.3	Metrics for Analysis Models	121
12.3.1	Function – Based Metrics	121
12.3.2	Metrics for Specification Quality	122
12.4	Metrics for Design Model	122
12.4.1	Architectural Design Metrics	122
12.4.2	Metrics for Object-Oriented Design	123
12.5	Metrics for Source Code	123
12.6	Metrics for Testing	124
12.6.1	Halstead Metrics Applied to Testing	125
12.6.2	Metrics for Object-Oriented Testing	125
12.7	Metrics for Software Maintenance	125
12.7.1	Fix Backlog and Backlog Management Index	126
12.7.2	Fix Response Time and Fix Responsiveness	126
12.7.3	Percent Delinquent Fixes	127
12.7.4	Fix Quality	127
12.8	Summary	128

Chapter 13

Quality Management

13.1	Introduction	129
13.2	Quality Concepts	130
13.3	Software Quality Assurance	131
13.4	Software Reviews	133
13.5	Formal Technical Reviews (FTR)	134
13.6	The ISO 9000 Quality Standards	135
13.7	Summary	137

Chapter 14

Software Project Management

14.1	Introduction	138
14.2	Project Planning	139
14.3	Project Scheduling	139
14.4	Project Staffing	142
14.5	People Capability Maturity Model (P-CMM)	144
14.6	Summary	147

Chapter 15

Agile Programming

15.1	Introduction	148
15.2	Flavors of Agile Development	149
15.3	Agile Manifesto	154
15.4	Refactoring Techniques	156
15.5	Limitations of the Agile Process	158
15.6	Summary	161
15.7	Glossary	162
15.8	Case Study	162

Chapter 16

Extreme Programming

16.1	Introduction	164
16.2	XP Equation	165
16.3	XP Values	168
16.4	Assuming Sufficiency	172
16.4.1	Sufficient Time and Resources	173
16.4.2	Constant Change of Cost	174
16.4.3	Developer Effectiveness	174
16.4.4	Freedom to Experiment	175
16.5	Summary	176
16.6	Glossary	176
16.7	Case Study	177

Chapter 17

Extreme Programming Practices

17.1	Introduction	179
17.2	Coding Practices	180
17.2.1	Simple Code and Design	181
17.2.2	Refactor Rigorously	182
17.2.3	Develop Coding Standards	182
17.2.4	Develop Common Vocabulary	183
17.3	Developer Practices	184
17.3.1	Adopt Test-Driven Development	185
17.3.2	Practice Pair Programming	186

17.3.3	Adopt Collective Ownership	187
17.3.4	Integrate Continually	187
17.4	Business Practices	188
17.4.1	Add a Customer to the Team	188
17.4.2	Play the Planning Game	190
17.4.3	Release Regularly	190
17.4.4	Work at a Sustainable Pace	191
17.5	Summary	192

Chapter 18

XP Events

18.1	Introduction	194
18.2	Iteration Planning	195
18.2.1	Stories and Tasks	195
18.2.2	Estimates and Schedules	197
18.2.3	First Iteration	198
18.3	Iteration Development	199
18.4	Releasing	201
18.5	Summary	202
18.6	Glossary	203

Chapter 19

Extreme Programming Artifacts

19.1	Introduction	204
19.2	Story Cards	205
19.2.1	Exploration Phase	206
19.2.2	Commitment Phase	207
19.2.3	Steering Phase	207
19.3	Task Cards	208
19.3.1	Exploration Phase	209
19.3.2	Commitment Phase	209
19.3.3	Steering Phase	210
19.4	Bullpens	211
19.5	Summary	213
19.6	Glossary	213
19.7	Case Study	214

Chapter 20

Roles in Extreme Programming

20.1	Introduction	216
20.2	Customer's Roles	217
20.2.1	Customer Rights	218
20.2.2	Customer Responsibilities	218
20.3	Developer's Roles	219
20.3.1	Developer Rights	221
20.3.2	Developer Responsibilities	221
20.4	Supplementary Roles	222
20.4.1	Tracker	222
20.4.2	Coach	223
20.5	Summary	224
20.6	Glossary	224

Chapter 21

Coding XP Style

21.1	Introduction	225
21.2	Balance Functionality with Simplicity	226
21.3	Implement Only the Needed Features	228
21.4	Eliminate Repetition	230
21.5	Summary	231
21.6	Glossary	232

Chapter 22

Adopting XP

22.1	Introduction	233
22.2	Before Commencing XP	234
22.2.1	XP Prerequisites	234
22.2.2	Applying XP in a Phase-based Organization	237
22.3	Eliminating Fear and Working Together	237
22.4	Starting Feedback	238
22.5	Including Managers and Customers	239
22.6	Summary	240
22.7	Glossary	241
22.8	Case Study	241

Chapter 23**Agile Modeling with XP**

23.1	Introduction	243
23.2	Agile Modeling - Principles	244
	23.2.1 Core Principles of AM	245
	23.2.2 Supplementary Principles of AM	247
23.3	Comparing XP and Agile Modeling	248
23.4	Scrum Methodology	250
	23.4.1 The Roles of Scrum	251
	23.4.2 Advantages of Scrum	252
23.5	Summary	253
23.6	Glossary	254

Chapter 24**Dynamic Systems Development Methodology (DSDM)**

24.1	Introduction	255
24.2	Overview of DSDM	256
24.3	The Principles of DSDM	257
24.4	Phases of DSDM	259
24.5	Core Techniques used in DSDM	261
24.6	Summary	263
24.7	Glossary	264
24.8	Case Study	264

Chapter 25**XP Tools**

25.1	Introduction	267
25.2	Java and XP	268
25.3	Tools and Philosophies	269
25.4	Open Source Toolkit	271
25.5	Summary	274
25.6	Glossary	275