

CONTENTS

	Pref	ace	ii
Part 1	Int	roduction to Software Engineering	1
Chapter 1	Introduction		3
	1.1	Professional software development	5
	1.2	Software engineering ethics	14
	1.3	Case studies	17
Chapter 2	Sof	tware processes	27
	2.1	Software process models	29
	2.2	Process activities	36
	2.3	Coping with change	43
	2.4	The rational unified process	50
Chapter 3	Agi	le software development	56
	3.1	Agile methods	58
	3.2	Plan-driven and agile development	62

	3.3	Extreme programming	64
	3.4	Agile project management	72
	3.5	Scaling agile methods	74
Chapter 4	Re	quirements engineering	82
	4.1	Functional and non-functional requirements	84
	4.2	The software requirements document	91
	4.3	Requirements specification	94
	4.4	Requirements engineering processes	99
	4.5	Requirements elicitation and analysis	100
	4.6	Requirements validation	110
	4.7	Requirements management	111
Chapter 5	Sys	stem modeling	118
	5.1	Context models	121
	5.2	Interaction models	124
	5.3	Structural models	129
	5.4	Behavioral models	133
	5.5	Model-driven engineering	138
Chapter 6	Arc	hitectural design	147
	6.1	Architectural design decisions	151
	6.2	Architectural views	153
	6.3	Architectural patterns	155
	6.4	Application architectures	164
Chapter 7	De	sign and implementation	176
	7.1	Object-oriented design using the UML	178
	7.2	Design patterns	189

	7.3	Implementation issues	193
	7.4	Open source development	198
Chapter 8	Sof	tware testing	205
	8.1	Development testing	210
	8.2	Test-driven development	221
	8.3	Release testing	224
	8.4	User testing	228
Chapter 9	Sof	tware evolution	234
	9.1	Evolution processes	237
	9.2	Program evolution dynamics	240
	9.3	Software maintenance	242
	9.4	Legacy system management	252
Part 2	Dep	pendability and Security	261
		pendability and Security iotechnical systems	261 263
	Soc		
	Soc 10.1	iotechnical systems	263
	Soc 10.1 10.2	iotechnical systems Complex systems	263
	Soc 10.1 10.2 10.3	iotechnical systems Complex systems Systems engineering	263 266 273
	Soc 10.1 10.2 10.3 10.4	iotechnical systems Complex systems Systems engineering System procurement	263 266 273 275
Chapter 10	Soc 10.1 10.2 10.3 10.4 10.5	iotechnical systems Complex systems Systems engineering System procurement System development	263 266 273 275 278
Chapter 10	Soc 10.1 10.2 10.3 10.4 10.5	iotechnical systems Complex systems Systems engineering System procurement System development System operation	263 266 273 275 278 281
Chapter 10	Soc 10.1 10.2 10.3 10.4 10.5 Dep	iotechnical systems Complex systems Systems engineering System procurement System development System operation pendability and security	263 266 273 275 278 281
Chapter 10	Soc 10.1 10.2 10.3 10.4 10.5 Dep 11.1 11.2	iotechnical systems Complex systems Systems engineering System procurement System development System operation pendability and security Dependability properties	263 266 273 275 278 281 289

Chapter 12	Dependability and security specification	309
	12.1 Risk-driven requirements specification	311
	12.2 Safety specification	313
	12.3 Reliability specification	320
	12.4 Security specification	329
	12.5 Formal specification	333
Chapter 13	Dependability engineering	341
	13.1 Redundancy and diversity	343
	13.2 Dependable processes	345
	13.3 Dependable system architectures	348
	13.4 Dependable programming	355
Chapter 14	Security engineering	366
	14.1 Security risk management	369
	14.2 Design for security	375
	14.3 System survivability	386
Chapter 15	Dependability and security assurance	393
	15.1 Static analysis	395
	15.2 Reliability testing	401
	15.3 Security testing	404
	15.4 Process assurance	406
	15.5 Safety and dependability cases	410
Part 3	Advanced Software Engineering	423
Chapter 16	Software reuse	425
	16.1 The reuse landscape	428
	16.2 Application frameworks	431

	16.3 Software product lines	434	
	16.4 COTS product reuse	440	
Chapter 17	Component-based software engineering	452	
	17.1 Components and component models	455	
	17.2 CBSE processes	461	
	17.3 Component composition	468	
Chapter 18	Distributed software engineering	479	
	18.1 Distributed systems issues	481	
	18.2 Client–server computing	488	
	18.3 Architectural patterns for distributed systems	490	
	18.4 Software as a service	501	
Chapter 19	Service-oriented architecture	508	
	19.1 Services as reusable components	514	
	19.2 Service engineering	518	
	19.3 Software development with services	527	
Chapter 20	Embedded software	537	
	20.1 Embedded systems design	540	
	20.2 Architectural patterns	547	
	20.3 Timing analysis	554	
	20.4 Real-time operating systems	558	
Chapter 21	Aspect-oriented software engineering	565	
	21.1 The separation of concerns	567	
	21.2 Aspects, join points and pointcuts	571	
	21.3 Software engineering with aspects	576	

Part 4	Software Management	591
Chapter 22	Project management	593
	22.1 Risk management	595
	22.2 Managing people	602
	22.3 Teamwork	607
Chapter 23	Project planning	618
	23.1 Software pricing	621
	23.2 Plan-driven development	623
	23.3 Project scheduling	626
	23.4 Agile planning	631
	23.5 Estimation techniques	633
Chapter 24	Quality management	651
	24.1 Software quality	655
	24.2 Software standards	657
	24.3 Reviews and inspections	663
	24.4 Software measurement and metrics	668
Chapter 25	Configuration management	681
	25.1 Change management	685
	25.2 Version management	690
	25.3 System building	693
	25.4 Release management	699
Chapter 26	Process improvement	705
	26.1 The process improvement process	708
	26.2 Process measurement	711

26.3 Process analysis	715
26.4 Process change	718
26.5 The CMMI process improvement framework	721
Glossary	733
Subject Index	749
Author Index	767