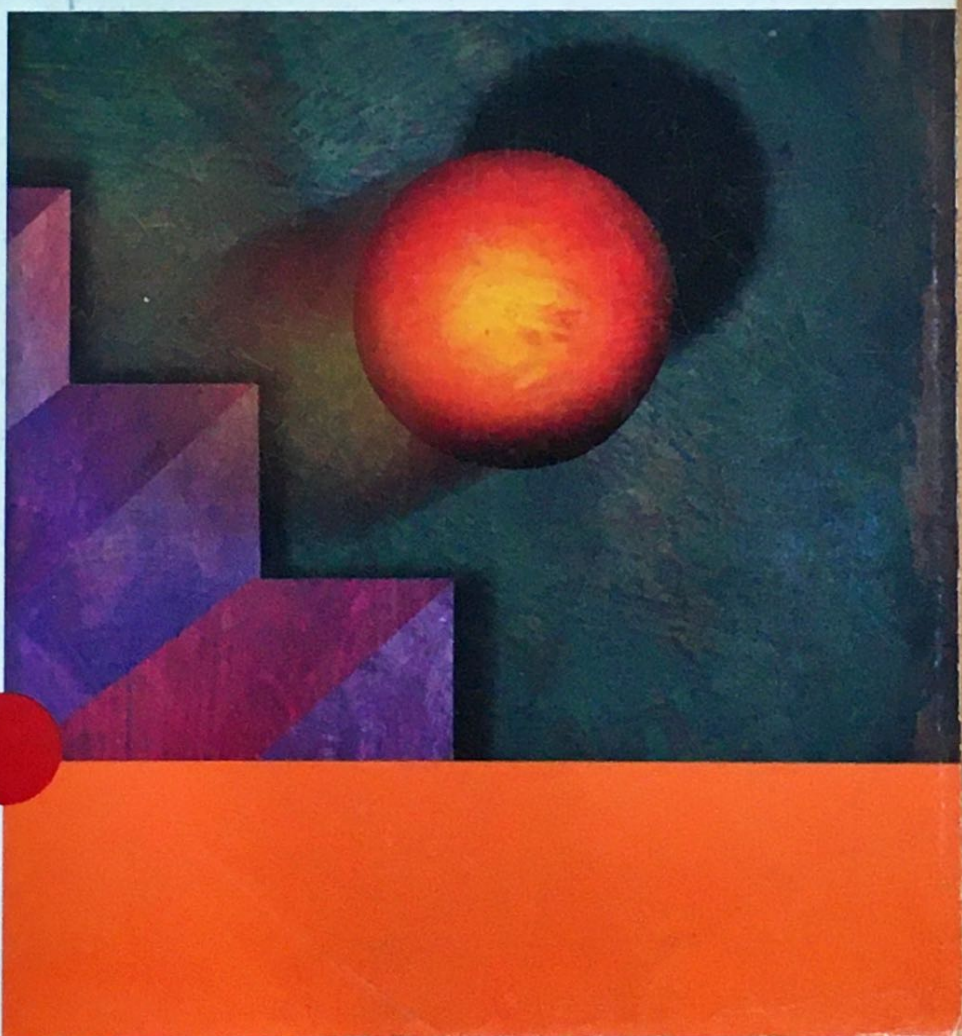
COURSE TECHNOLOGY
THOMSON LEARNING

SECOND EDITION

The Object-Oriented Approach

Concepts, System Development, and Modeling with UML

John W. Satzinger ◆ Tore U. Ørvik



The Object-Oriented Approach

Concepts, System Development, and Modeling with UML

John W. Satzinger
Southwest Missouri State University

Tore U. Ørvik
Agder University College
Norway

COURSE TECHNOLOGY
THOMSON LEARNING™

Australia • Canada • Mexico • Singapore • Spain • United Kingdom • United States

Brief Contents

Chapter 1 The Object-Oriented "Revolution" 1

Chapter 2 Is Everything an Object? 11

Chapter 3 The Importance of "Object Think" 26

Chapter 4 Basic Object-Oriented Concepts 38

Chapter 5 Models and UML Notation for the Object-Oriented Approach 50

Chapter 6 Understanding Simple Object-Oriented Requirements Models 66

Chapter 7 Understanding More Complex Requirements Models with Generalization/Specialization and Whole-Part Hierarchies 82

Chapter 8 Object-Oriented System Development Life Cycles 100

Chapter 9 An Object-Oriented Analysis Case Study of Dick's Dive 'n' Thrive 111

Chapter 10 Object-Oriented Design 139

Chapter 11 Object-Oriented Development Tools 157

Chapter 12 Java Code Examples Showing Problem Domain Classes 171

Chapter 13 Moving to Object-Oriented Development: Why and How 195

Contents

Chapter 1 The Object-Oriented "Revolution" 1

Introduction 2
What is "Object-Oriented?" 2
How Is the Object-Oriented Approach Different from the Traditional Structured Approach? 4
How Has the Object-Oriented Approach Evolved? 8
What Are the Benefits of the Object-Oriented Approach? 9
Key Terms 9
Review Questions 9
Discussion Questions 10
Exercise 10
References 10

Chapter 2 Is Everything an Object? 11

Introduction 12
Why Focus on Objects? 12
What Is an Object? 16
What Is an Object in a Computer System? 17
Types of Objects in Computer Systems 18
User Interface Objects 19
Operating Environment Objects 20
Task-Related Objects 21
Key Terms 24
Review Questions 24
Discussion Questions 25
Exercises 25
References 25

Chapter 3 The Importance of "Object Think" 26

Introduction 27
The Need to Change Your Thinking 27
Techniques for Changing Your Thinking 28
"Object Think" for Some Familiar Objects in Computers 29

"Object Think" for Problem Domain Objects 33
Key Terms 35
Review Questions 35
Discussion Question 36
Exercises 36
References 37

Chapter 4 Basic Object-Oriented Concepts 38

Introduction 39
A Class Versus an Object 39
Attributes of a Class 40
Object Relationships 41
Methods or Operations of a Class 43
Encapsulation of Attributes and Methods 44
Messages and Message Sending 44
Polymorphism 45
Inheritance and Generalization/Specialization Hierarchies 46
Key Terms 47
Review Questions 47
Discussion Question 48
Exercises 48

Chapter 5 Models and UML Notation for the Object-Oriented Approach 50

Introduction 51
System Development and Models 51
Use Cases, Scenarios, and the Use Case Diagram 53
The Class Diagram 55
Generalization/Specialization Hierarchies 56
Object Relationships 57
Processing Specifications 59
Packages 60
Time-Dependent Behavior Models 60
Object Interaction Models 61
Requirements, System Capability, and Run-Time Behavior 63

Key Terms 63
Review Questions 63
Discussion Question 64
Exercises 64
References 65

Chapter 6 Understanding Simple Object-Oriented Requirements Models 66

Introduction 67
A System with a Single Class of Objects 67
A Single Class with a Custom Method 70
Two Classes with a Message 73
Comparison of the Class Diagram with a Data Flow Diagram 79
Review Questions 80
Discussion Question 81
Exercises 81

Chapter 7 Understanding More Complex Requirements Models with Generalization/Specialization and Whole-Part Hierarchies 82

Introduction 83
A System with a Generalization/Specialization Hierarchy 83
A Generalization/Specialization Hierarchy Associated with Another Class 87
Inheritance from a Class That Is Not Abstract 90
Generalization/Specialization with Multiple Inheritance 92
Whole-Part Relationships 94
A More Complex Whole-Part Hierarchy 95
Key Term 98
Review Questions 98
Discussion Question 99
Exercises 99

Chapter 8 Object-Oriented System Development Life Cycles 100

Introduction 101
An Overview of System Development Life Cycles 101
What Is a System Development Methodology? 104

The Need for Object-Oriented System Development Methodologies 105
What Is Object-Oriented Analysis? 106
What Is Object-Oriented Design? 108
What Is Object-Oriented Implementation? 108
Key Terms 109
Review Questions 109
Exercise and Discussion Question 110
References 110

Chapter 9 An Object-Oriented Analysis Case Study of Dick's Dive 'n' Thrive 111

Introduction 112
An Overview of the Object-Oriented Analysis Process 112
Dick's Dive 'n' Thrive 113
Identifying Use Cases and Building the Use Case Diagram 113
Developing Initial Scenarios and Initial Classes 115
Procedure for Building the Class Diagram 115
Finding Initial Problem Domain Classes 115
First Cut Scenarios for the Main Use Case 116
Refining Scenarios and Classes 119
Identifying Generalization/Specialization Hierarchies 119
Identifying Whole-Part Hierarchies 124
Identifying and Specifying Attributes 126
Identifying Additional Relationships 127
Second-Cut Scenarios 130
Identifying Methods 132
Identifying Time-Dependent Behavior 134
Moving on with the Development Process 136
Finalizing the Analysis Documentation 136
Review Questions 136
Discussion Questions 137
Exercises 137

Chapter 10 Object-Oriented Design 139
Introduction 140
What Is Object-Oriented Design? 140
Three-Tier Design Architecture 141
Designing for the Operating Environment 144
Designing the User Interface 145
Interface Design Enhancements to Scenarios and Sequence Diagrams 150
The Interface and the Overall System Structure 151
Key Terms 155
Review Questions 155
Discussion Questions 156
Exercise 156

Chapter 11 Object-Oriented Development Tools 157
Introduction 158
Object-Oriented Programming Languages 158
Java 159
Visual Basic 159
The C# Language 160
The C++ Language 160
The Smalltalk Language 160
Object-Oriented COBOL 161
Selecting a Language for Object-Oriented Information System Development 161
Object-Oriented Database Management 162
Problems with Relational Databases 162
Handling Persistent Objects 163
The Relational Approach to Persistent Objects 163
Object-Oriented Extensions to Relational Databases 164
Object-Oriented Databases 164
Selecting a DBMS for Object-Oriented Information System Development 165
CASE Tools for Object-Oriented Development 165
Selecting Object-Oriented ICASE Tools 166

Integrated Development Environments (IDE) 167
Beyond the Basic Categories 168
The Future of OO Tools 168
Key Terms 169
Review Questions 169
Discussion Question 169
Exercises 170

Chapter 12 Java Code Examples Showing Problem Domain Classes 171

Introduction 172
Java Program Syntax 172
Class Structure 174
Sending Messages in Driver Programs 176
Implementing Inheritance and Polymorphism 179
Implementing Association Relationships 184
Key Terms 192
Review Questions 193
Discussion Questions 193
Exercises 194

Chapter 13 Moving to Object-Oriented Development: Why and How 195

Introduction 196
The Benefits of Object-Oriented Development 196
Productivity 197
Maintainability and Quality 197
Extendibility 198
Problems with the Object-Oriented Approach 199
Changing to the Object-Oriented Approach 200
Preparing for Your Own Change to Object-Oriented Development 201
Review Questions 202
Discussion Questions 203
References 203

Index 205