Object-Oriented Programming and Data Analysis using Java

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Abstract: Object-oriented programming and data analysis using Java describes primary elements of object-oriented approach in problem solving using Java programming language. The use of class diagrams and benefits of object-oriented approach in the introductory chapter is very good to give preliminary knowledge to readers on object-oriented programming elements. Then, examples of Java code are used to explain the concept of the primary elements in object-oriented programming including object, class, constructor, inheritance, and polymorphism. Essentially, the inheritance topic is discussed in detail to promote code sharing and code reusability. The use of the primary elements in object oriented approach are also demonstrated in advanced applications of data structure, file processing, and data analysis. The target audience of this book include diploma and bachelor degree students in Computer Science and Information Technology.This book can also be used by artificial intelligence and data mining researchers who would like to experience Java implementation in data analysis experiments.

Keywords: Object-oriented, preliminary, knowledge, implementation

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Preface

This book introduces object-oriented programming and data analysis using examples in Java programming language. The use of examples with object-oriented approach simplifies and reinforces the learning process. Each chapter presents examples to describe the concept and elements of object oriented approach including class, object, constructor, inheritance, polymorphism, and methods implementation. Essentially the output for the code in the examples are shown to facilitate program tracing and understanding. The code in the examples were written in Java using Eclipse Integrated Development Environment (IDE). Most chapters are equipped with case studies with complete solutions. The case studies were designed to support the essential topics discussed in the respective chapters.

The Intended Audience

This book aims to deliver essential elements in object-oriented programming to undergraduate students in computer science course and its related disciplines. The objectives of the book are to:

- introduce fundamental of object-oriented approach in problem solving.
- demonstrate how object-oriented elements can be implemented using Java programming language.
- introduce object-oriented implementation of data analysis using Java.

The Content

This book consists of 6 chapters. Chapter 1 attempts to introduce the object-oriented approach. Chapter 2 introduces fundamental elements in Java. Chapter 3 covers topics on testing. Chapter 4 discusses implementation of object-oriented elements in Java. Chapter 5 discusses advanced topics in Java. Finally, Chapter 6 introduces data analysis using Java.

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Each chapter includes

- Learning outcomes to alert readers with the content.
- Examples to demonstrate how the concept of object-oriented can be implemented in Java programming.

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Chapter 1
Object-Oriented Approach

Learning Outcomes:

After you have read this chapter, you should be able to

- **understand the meaning of object**
- **know the difference between an object and a class**
- **understand how objects communicate**
- **know the relationship between a message sent and a method call**
- **know the concepts of object orientation**
- **know the advantages of object-oriented approach**

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Chapter 2
Fundamentals of Data Types and Object-Oriented Programming

Learning Outcomes:

After you have read this chapter, you should be able to

- **understand how objects work in Java**
- **learn to write programs in Java using object-oriented manners**
- **learn to write programs using functions and classes**

Chapter 3
Object-Oriented Testing in Java

Learning Outcomes:

After you have read this chapter, you should be able to

- **Differentiate between a test case and a test plan**
- **Distinguish between a Black Box testing and a White Box testing**
- **Apply debugging and testing in Java programming environment**
- **Write a test plan for each written program**

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Chapter 4
Object-Oriented Elements

Learning Outcomes:

After you have read this chapter, you should be able to

- **implement constructor in a program**
- **apply inheritance to promote code reusability**
- **implement method overriding in inheritance application**
- **understand the use of polymorphism and dynamic binding in a program**
- **apply exception handling in a program**

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Chapter 5
Advanced Topics in Java

Learning Outcomes

After you have read this chapter, you should be able to

- **understand scope of variables declaration in Java code**
- **differentiate between pass by value and pass by reference**
- **implement data structure of linked list using object-oriented approach**
- **produce a program to write data to a file**
- **produce a program to read data from a file**
- **understand multithreading concept**

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Chapter 6
Data Analysis using Java

Learning Objectives

After you have read this chapter, you should be able to

- **know the different type of data file loading and reading**
- **know the text processing and text analysis using OpenNLP**
- **know the classification and clustering using JavaML**
- **know the different of data visualization graphs using JFreeChart**

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