

COURSE SPECIFICATION

DISTRIBUTED PROGRAMMING WITH JAVA - 2101558

1. Course name and code: Distributed Programming with Java - 2101558

2. Total no. of credits: 3

Theoretical: 2

Practical: 1

Self-study: 5

3. Instructor's or course coordinator's name

MSc. Vo Van Hai

MSc. Nguyen Thi Hoang Khanh

MSc. Pham Thanh Hung

MSc. Tran Thi Anh Thi

MSc. Dang Thi Thu Ha

4. Learning materials

Main textbooks

[1] Schildt, H., & Coward, D, *Java: The Complete Reference*, 13th ed, McGraw-Hill, 2024. [ISBN 13: 978-1265058432] [FIT_SE_012]

Other supplemental materials

[1] Richard M Reese, *Learning Network Programming with Java*, Packt Publishing, 2015. [ISBN 13: 9781785885471] [FIT_SE_012_01]

[2] Bogdan Ciubotaru & Gabriel-Miro Muntean, *Advanced Network Programming Principles and techniques*, Springer, 2013. [ISBN 13: 978-1447160366] [FIT_SE_012_03]

[3] Nathan Marz, James Warren., *Big Data: Principles and best practices of scalable realtime data systems 1st Edition*, Manning Publications, 2015. [ISBN 13: 978-1617290343] [FIT_SE_012_02]

[4] Hibernate, <https://hibernate.org/>

[5] Java API for JSON Processing, <https://www.oracle.com/technical-resources/articles/java/json.html>

5. Specific course information

a. Objectives for the course

The course provides students with:

- The knowledge and skills to work with the Java programming language
- In-depth knowledge of object-oriented programming to develop big data applications
- Programming techniques for mapping object model to relational data model (ORM)
- Programming techniques for mapping object model to big data model (OGM)
- The knowledge of multithreaded programming, network programming and distributed programming.

b. Brief description of the content of the course

Provide students with advanced knowledge about object-oriented programming (*Thread, Network programming, RMI, JPA, JSON ...*), implementing big data applications. At the same time, improve students' programming knowledge and skills with the Java object-oriented programming language.

c. Prerequisites or co-requisites

Prerequisites: Event-Driven Programming in Java – 2101556

Co-requisites: none

d. Other requirements

- Demonstrate a serious and active learning attitude in seeking knowledge. □
- Be honest in studying and taking tests. □
- Be united and help friends and junior students in their studies.

6. Specific goals for the course

a. Course learning outcomes

Upon successful completion of this course, students should be able to:

No.	Course Learning Outcomes (CLOs)	ELOs	Bloom level
1	Implement an application using Java programming language that connects to big data.	c - PI2	3
2	Write clear report documents according to regulations (correct structure, complete content, citations, references)	d - PI1	2
3	Using efficient resources to solve problems in distributed applications	b - PI2	2
4	Present knowledge about new technologies in distributed programming in the Java environment	b - PI1	2
5	Select a solution for distributed application with specific technology	c - PI1	3
6	Apply distributed programming techniques in the Java environment	c - PI2	3

b. Mapping the course learning outcomes and the expected learning outcomes

ELOs CLOs	a	b	c	d	e	f
1			R			
2				R		
3		R				
4		R				
5			R			
6			R			

c. Mapping CLOs, teaching and learning approach

CLOs	Teaching and learning approach				
	Explicit Teaching	Discussion	Case Studies	Practice	Project-based learning (PBL)

1	X			X	X
2	X				X
3	X				X
4	X	X	X		X
5	X	X	X		X
6	X			X	X

d. Mapping CLOs and assessment methods

CLOs	Assessment methods			
	Regular tests	Midterm test	Final test	Group project
1	X	X		X
2				X
3				X
4	X			X
5	X			X
6	X		X	X

7. Contents and plan

No.	Learning Contents	Lesson Learning Outcomes [LLO]	Hours Lecture / Practice	CLOs	Teaching and learning methods		Self-study content and instructions
					What lecture does	What students do	
1	Chapter 1: Multithreaded Programming 1.1 Overview of multithreading 1.2 Thread Concepts 1.3 Creating Tasks and Threads 1.4 Callable and Futures 1.5 Thread class and thread methods 1.6 Thread Pools 1.7 Thread Synchronization 1.8 Concurrency Utilities 1.9 Deadlocks 1.10 Thread và GUI	LLO1. Understand the purpose of multithreading LLO2. Describe Java's multithreading mechanism LLO3. Outline synchronized access to shared resources	6/3	2, 3	Explicit teaching ; Raises some situational questions; Give students instruction to do the exercises; Observe and guide students	Take notes; Discussion; Ask or answer the questions; Do exercises; Practice s; Create the lab report	[1] Schildt, H., & Coward, D, <i>Java: The Complete Reference</i> , 13th ed, McGraw-Hill, 2024. Chapter: Multithreaded

					to practice.		program ming
2	Chapter 2: Parallel Programming 2.1 Introduction 2.2 Task parallelism 2.3 Functional parallelism 2.4 Loop parallelism 2.5 Pipeline Parallelism	LLO4. Explain concurrency issues caused by multithreading LL05. Implement task parallelism	3/3	2, 3	Explicit teaching ; Give students instruction to do the exercises; Observe and guide students to practice.	Take notes; Discussion; Ask or answer the questions; Do exercises; Practice s; Create the lab report	Schildt, H., & Coward, D, <i>Java: The Complete Reference</i> , 13th ed, McGraw-Hill, 2024, Chapter: <i>The Concurrency Utilities</i>
3	Chapter 3: JSON Processing 3.1 Overview 3.2 JSON Syntax 3.3 JSON Data Types 3.4 Java API for JSON Processing 3.5 Jackson API	LLO5. Perform to process (parse, generate, transform, and query) JSON text	2/3	1	Explicit teaching ; Raises some situational questions; Give students instruction to do the exercises; Observe and guide students to practice	Take notes; Discussion; Ask or answer relevant questions; Do exercises; Practice s; Create the lab report	[5] Java API for JSON Processing, https://www.oracle.com/technical-resources/articles/java/json.html

4	Chapter 4: Big Data 4.1 Introduction to Big Data 4.2 Introduction to NoSQL 4.3 Modeling Big Data 4.4 NoSQL Query Language 4.5 Big Data Tools and Techniques 4.6 Developing Big Data Applications 4.7 CRUD Operations	LLO6. Explain the role of Big Data in modern business LLO7. Describe the primary characteristics of Big Data LLO8. Summarize the four major approaches of the NoSQL data model and how they differ from the relational model LLO9. Describe the characteristics of NoSQL databases LLO10. Understand how to work with document databases using the specific Big Data system LLO11. Develop Java application using the specific Big Data	6/6	1	Explicit teaching ; Raises some situational questions; Give students instruction to do the exercises; Observe and guide students to practice	Take notes; Ask or answer relevant questions; Do exercises; Practice s; Create the lab report	[3] Nathan Marz, James Warren. <i>Big Data: Principles and best practices of scalable realtime data systems 1st Edition, 2015</i>
5	Chapter 5: Jakarta Persistence API 5.1.Introduction to Jakarta Persistence API 5.2.Entities 5.2.1.Entity Classes 5.2.2.Persistent Fields and Properties 5.2.3.Access Type 5.2.4.Primary Keys and Entity Identity 5.2.5.Basic Data Types	LLO12. Explain the purpose of JPA LLO13. Explain the architecture of JPA LLO14. Understand Object Relational Mapping	6/6	4, 5, 6	Explicit teaching ; Raises some situational questions; Give students instruction to do the	Take notes; Ask or answer relevant questions; Do exercises; Practice s; Create	[4] Hibernate ORM, https://docs.jboss.org/hibernate/stable/orm/userguide/ht

	5.2.6.Element Collections 5.2.7.Entity Associations 5.2.8.Inheritance Relationship Mapping Strategies 5.3.CRUD Operations 5.4.Query Language (JPQL) 5.5.Criteria API 5.6.Entity Managers and Persistence Contexts 5.7.JPA Exceptions 5.8.Performance Issues	LLO15. Understand Object Grid Mapping LLO16. Develop Java application with ORM LLO17. Develop Java application with OGM			exercise s; Observe and guide students to practice	the lab report	ml_singl e/Hibern ate_Use r_Guide .html [4] Hibernat e OGM, https://docs.jboss.org/hibernate/stable/ogm/reference/en-US/html_single/
6	Chapter 6: Network Programming 6.1.Introduction 6.2.Networking Classes and Interfaces 6.2.1.URL Class 6.2.2.URLConnection class 6.2.3.HttpURLConnection class 6.2.4.InetAddress Class 6.3.Client/Server Architecture 6.4.Sockets 6.4.1.UDP sockets 6.4.2.TCP sockets 6.5.Client/Server Development 6.5.1.Client–Server Application 6.5.2.Multi-threaded Server Applications 6.5.3.Unicast, Multicast, and Broadcast Communications 6.6.NIO Support for Networking	LLO18. Comprehend socket-based communication in Java LLO19. Understand client/server computing LLO20. Implement Java networking programs using stream sockets LLO21. Develop servers for multiple clients LLO22. Develop Java application that communicate with the server LLO23. Implement Java networking	7/9	4, 5, 6	Explicit teaching ; Raises some situational question s; Give students instructi on to do the exercise s; Observe and guide students to practice	Take notes; Discussi on; Ask or answer relevant question s; Do exercise s; Practice s; Create the lab report	[1] Richard M Reese. <i>Learnin g Network Progra mming with Java</i> , Packt Publishi ng, 2015, 168-277 [2] Bogdan Ciubotar u & Gabriel-Miro Muntea n.

	6.7.Security 6.8.Java Remote Method Invocation 6.8.1.RMI Introduction 6.8.2.RMI Architecture 6.8.3.Application Implementation	programs using datagram sockets LLO24. Understand how RMI works LLO25. Learn the process of developing RMI applications LLO26. Know the differences between RMI and socket-level programming LLO27. Develop three-tier applications using RMI LLO28. Use callbacks to develop interactive applications					<i>Advanced Network Programming Principles and techniques, Springe, 2013, Chapter 7</i>
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8. Assessment

a. Description of the assessment methods used based on the Course's Learning Outcomes

(CLOs)	When data collected	Assessment Methods	Assessment Tools	Target of students achieving CLOs (%)
1	Group project (Presentation)	Continuous	Rubrics	65
	Mid-term (Practical exam)	Summative	Rubrics	65
2	Group project (Presentation)	Summative	Rubrics	65
3	Group project (Presentation)	Summative	Rubrics	65
4	Group project (Presentation)	Continuous	Rubrics	65
	Regular test (Writing test)	Summative	Rubrics	65
5	Group project (Presentation)	Continuous	Rubrics	65
	Regular test (Writing test)	Summative	Rubrics	65

6	Group project (<i>Presentation</i>)	Continuous	Rubrics	65
	Regular test (<i>Practical test</i>)	Continuous	Rubrics	65
	Final-term (<i>Practical exam</i>)	Summative	Rubrics	65

b. Assessments weighting

Assessment Methods		Weight %
Theory	Continuous (<i>Writing test</i>)	20
	Summative (<i>Practical exam</i>)	30
	Summative (<i>Practical exam</i>)	50
Practice	Continuous (<i>Practical test</i>)	33.33%
	Continuous (<i>Presentation</i>)	33.33%
	Continuous (<i>Practical test</i>)	33.33%

c. Assessment Scale: Credit System

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