هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Concurrent Programming
Course Code:	COMP-418
Program:	BS in Computer Science
Department:	Computer Science
College:	College of Computer Science and Information Technology
Institution:	Jazan University, Jazan
Version:	04
Last Revision Date:	**SUNDAY 09-12-2018**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3 Hours)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	☐Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level - 8 / Year 4)					
4. Course general Description:					
Concurrent programming with processes and threads, monitors and synchronization, and volatile variables. Traditional building blocks of concurrency, data-parallel collections using parallel and concurrent collections together. Concurrent programming with reactive extensions, software transactional memory, and working with actors.					
5. Pre-requirements for this course (if any):					
COMP 214					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
The overall aim of this course is to provide the necessary knowledge in programming models, concepts, techniques, synchronization and communication mechanisms, and environments used in concurrent programming with threads and processes, i.e. in multithreaded, parallel and distributed programming.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	26	50%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	26	50%
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	26
2.	**Laboratory/Studio**	26
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	8
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Demonstrate** knowledge of the issues and problems that arise in writing correct concurrent programs.	K1	• Lectures/Presentations Media Lectures	• Exam-1 Final Theory Exam
1.2	**Identify** the problems of synchronization typical of concurrent programs, such as race conditions and mutual exclusion.	K2	• Lectures/Presentations • Media Lectures Lab Demonstration	• Exam-1 • Assignment • Mini Project Final Theory Exam
...				
2.0	**Skills**			
2.1	**Apply** common patterns, such as locking's, semaphores, and message-passing synchronization for solving concurrent program problems.	S1	• Lectures /Presentations • Media Lectures • Tutorials Lab Demonstration	• Assignment • Mini Project • Lab Exam Final Theory Exam
2.2	**Apply** practical knowledge of the	S2	• Lectures /Presentations • Media Lectures	• Assignment • Mini Project

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	programming constructs and techniques offered by modern concurrent programming languages.		• Tutorials Lab Demonstration	• Lab Exam Final Theory Exam
2.3	**Evaluate** the correctness, clarity, and efficiency of different solutions to concurrent programming problems.	S3	• Lectures /Presentations • Media Lectures • Tutorials Lab Demonstration	• Mini Project Lab Exam
2.4	**Judge** whether a program, a library, or a data structure is safe for usage in a concurrent setting.	S4	• Lectures /Presentations • Media Lectures • Tutorials Lab Demonstration	• Mini Project Lab Exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Demonstrate** the ability to work in group to develop software application using concurrent programming approach.	C2	• Group Discussion • Team Work Demo Presentation	• Assignment • Mini Project Lab Exam
...				

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction** Concurrent programming, A brief overview of traditional concurrency, Modern concurrency paradigms	4T+4P
2.	**Concurrency on the JVM and the Java Memory Model** Processes and threads, Monitors and synchronization, Volatile variables, The Java Memory Model	4T+4P
3.	**Traditional Building Blocks of Concurrency** The Executor and Execution Context objects, Atomic primitives, Lazy values, Concurrent collections, Custom concurrent data structures	4T+4P

4.	**Data-Parallel Collections** Scala collections in a nutshell, using parallel collections, Caveats with parallel collections, using parallel and concurrent collections together, Implementing custom parallel collections	4T+4P
5.	**Concurrent Programming with Reactive Extensions** Creating Observable objects, Composing Observable objects, Rx schedulers, Subjects and top-down reactive programming	4T+4P
6.	**Software Transactional Memory** The trouble with atomic variables, Using Software Transactional Memory, Composing transactions, Retrying transactions, Transactional collections	4T+4P
7.	**Actors** Working with actors, Communication between actors	2T+2P
Total		**52**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Exam-1	7th Week	10%
2.	Assignments	5th, 9th Week	10%
3.	Mini Project	13th Week	20%
4.	Lab Exam	14th Week	20%
5.	Final Theory Exam	15th Week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Learning Concurrent Programming in Scala, Aleksandar Prokopec, 2nd Edition, 2017, Packt Publishing Ltd., ISBN-13: 9781786466891
Supportive References	• Concurrent Programming: Algorithms, Principles and Foundations, Michel Raynal, 2011, Springer, ISBN-13: 9783642320262 • Foundations of Multithreaded, Parallel, and Distributed Programming, Gregory R. Andrews, 1st
Electronic Materials	• A Brief Scala tutorial, http://www.scala-lang.org/sites/default/files/linuxsoft_archives/docu/files/ScalaTutorial.pdf;

	• Scala by Example, http://www.scala-lang.org/sites/default/files/linuxsoft_archives/docu/files/ScalaByExample.pdf
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom equipped with projector and whiteboard and sufficient seating arrangements. Lab with software installed and individual computer terminal for each student.
Technology equipment (projector, smart board, software)	Whiteboards and projectors for classroom and lab Following software for lab work: • Scala IDE / NetBeans
Other equipment (depending on the nature of the specialty)	**None**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	CRC / QAU / HoD	Course reports / result analysis
Effectiveness of Students assessment	CRC / QAU / HoD	Course reports / result analysis
Quality of learning resources	Track leaders / CRC	Review meetings and star rating with suggestions for further modification and improvements
The extent to which CLOs have been achieved	HoD / committee nominated by HoD	Random re-checking of evaluated answer sheets
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**04**
DATE	**SUNDAY 09-12-2018**