Course Specifications

Course Title:	PARALLEL AND DISTRIBUTED COMPUTING
Course Code:	COMP 434
Program:	BS in Computer Science
Department:	Computer Science
College:	College of Computer Science and Information Technology
Institution:	Jazan University, Jazan

Table of Contents

A. Course Identification

1. Credit hours:	**03 Hours**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level -10 / Year 04**
4. Pre-requisites for this course (if any)**:**	COMP 333
5. Co-requisites for this course (if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	44	80%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other (Self Learning)**	11	20%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	22
2	**Laboratory/Studio**	22
3	**Tutorial**	-
4	**Others** (specify) **Exams and Revision**	8
	Total	52
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others (Self Learning)**	11
	Total	11

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an overview of distributed and parallel systems. It covers a broad range of topics related to parallel and distributed computing, including parallel and distributed design, architectures, parallel and distributed programming paradigms, parallel algorithms, and scientific and other applications of parallel and distributed computing.

2. Course Main Objective

Students enrolled in this class will:

- Understand methods for scalable parallel computing
- Understand distributed systems models
- Gain experience with peer-to-peer computing
- Learn how to design and implement parallel and distributed solutions

3. Course Learning Outcomes

	CLOs	Aligned PLOs
	After the completion of the course students will be able to:	
1	**Knowledge:**	
1.1	**Define** the basic terminology, distributed Computing System. Parallel computing systems.	K1
1.2	**Explain** Parallel and distributed models, architecture and algorithm.	K2
1.3	**Describe** fundamental concepts of new trends in parallel and distributed applications.	
2	**Skills :**	
2.1	**Evaluate** appropriateness and utility of various parallel and distributed approaches	S1
2.2	**Justify** distributed, computing and parallel processing techniques can make a significant difference in latency.	S1
2.3	**Analyze** real-life problems and plan parallel and/or distributed solutions	S1
2.4	**Develop** parallel and distributed solutions.	S2
3	**Competence:**	
3.1	**Demonstrate** the ability to work in group to achieve common assignments and activities in the field of computer and data security.	C2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Distributed and parallel computing fundamentals** Concurrency, Parallelism, Distributed Systems, Peer to Peer Computing, Race Condition, Mutual exclusion.	2T+2P
2	**Parallel and distributed Models and Strategies** Hardware Parallelism, Software Parallelism, Parallel Programming –mutual exclusion, Lock Strategy (Counter issue), Flag Strategy, Fable Strategy, Read/write Strategy.	2T+2P
3	**Parallel and distributed Architecture** Process Architecture, Memory Architecture, Clock Synchronization.	2T+2P
4	**Parallel and Distributed Algorithms** Correctness Fundamentals in Parallelism, Parallel Algorithms, Peterson's Algorithm, Filter Algorithm, Bakery Algorithm.	4T+4P
5	**Correctness** Correctness and Progress, Sequential and Concurrent Execution, Linearizability.	2T+2P
6	**Locking Techniques** Spinning, Backoff Locks, CLH Locks, MSC Locks, Time-out Lock.	4T+4P
7	**Parallel and Distributed Applications** Data Structure Specification, Linked List, Internet of Thing, Blockchain, Cloud Computing	6T+6P
Total		44

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	**Define** the basic terminology, distributed Computing System. Parallel computing systems.	• Lectures/Presentations • Media Lectures	• Exam 1 • Assignment- 1 • Assignment- 2 • Final Theory Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	**Explain** Parallel and distributed models, architecture and algorithm.	• Lectures/Presentations • Media Lectures	• Exam 1 • Assignment- 1 • Assignment- 2 • Final Theory Exam
	Describe fundamental concepts of new trends in parallel and distributed applications.	• Lectures/Presentations • Media Lectures	• Final Theory Exam
2.0	**Skills**		
2.1	**Evaluate** appropriateness and utility of various parallel and distributed approaches	• Lectures /Presentations • Media Lectures • Tutorials	• Exam 2 • Assignment - 1 • Assignment – 2 • Final Theory Exam
2.2	**Justify** distributed, computing and parallel processing techniques can make a significant difference in latency.	• Lectures /Presentations • Media Lectures • Tutorials	• Exam 2 • Assignment - 1 • Assignment – 2 • Final Theory Exam
2.3	**Analyze** real-life problems and plan parallel and/or distributed solutions	• Lectures /Presentations • Media Lectures • Tutorials	• Exam 2 • Assignment -1 • Final Theory Exam
2.4	**Develop** parallel and distributed solutions.	• Lectures /Presentations • Lab Demonstration • Media Lectures • Group discussion	• Assignment - 2 • Lab Exam • Final Theory Exam
3.0	**Competence**		
3.1	**Demonstrate** the ability to work in group to achieve common assignments and activities in the field of parallel and distributed computing.	• Group Discussion	• Assignment – 2 (Group Assignment)

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exam-1	5th Week	10%
2	Assessment-1	10th Week	10%
3	Assignment - 1	8th Week	10%
4	Assignment – 2 (Group Assignment)	11th Week	10%
5	Lab Exam	14th Week	20%
6	Final Theory Exam	15th Week	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Department have an arrangement for "Academic Counseling and Support" for each student by the department. The Department Coordinator nominates faculty members for "**Student Academic Advisory Committee"** every semester. These **"Academic Advisors"** are responsible for student counseling and advising to a group of fix number of students (around10-15 students) and maintaining students' files. At the beginning of semester and at time of course registration all students take counseling from Academic Advisor according to his previous grades and coverage of pre-requisite course and follow-up.

Also students with GPA below than 2.00 are remained under deep observation and continuous meetings with respective course teachers about their performance are arranged to help and support the students. The course teacher is to be associated with this course provide a proper guidance for students who are looking to focus on their future career based on their intellectual interests, identify better opportunities related to this course and connections in their academic fields.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Herlihy, Maurice, et al. The art of multiprocessor programming. Newnes, 2020.
• **Essential References Materials**	• Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan kaufmann, 2013. • Lin, Calvin. Principles of parallel programming. Pearson Education India, 2008. • Pacheco, Peter. An introduction to parallel programming. Elsevier, 2011.
Electronic Materials	• Science Direct: Journal of Parallel and Distributed Computing-website. https://www.sciencedirect.com/journal/journal-of-parallel-and-distributed-computing • ACM (Association for Computer Machinery) web site - http://www.acm.org/ • ACM SIGART (Special Interest Group on Computer Architecture) - http://www.sigarch.org/ • IEEE Computer Society web site – http://www.computer.org/portal/web/guest/home • Open access course material online
Other Learning Materials	•

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom equipped with projector and whiteboard and sufficient seating arrangements.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Lab with software installed and individual computer terminal for each student.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Sufficiency of resources and facilities for students	Students	Course evaluation survey form
Effectiveness of teaching / learning process	Students	Course evaluation survey form
Effectiveness of teaching / learning process	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
Verifying standards of student achievement / evaluation	HoD / committee nominated by HoD	Random re-checking of evaluated answer sheets
Achievement of course learning outcomes	Course Teachers / QAU	CLO assessment template that is further verified at course coordinator and QAU level.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**DEPARTMENT COUNCIL**
Reference No.	**05**
Date	**WEDNESDAY 06-02-2019**