CS3283: DISTRIBUTED SYSTEMS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Distributed Systems

Subject Code
CS - Computer Science
Course Number
3283

Academic Unit
Computer Science (CS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
CS3103 Operating Systems or equivalent and CS3201 Computer Networks or equivalent

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
This course aims to explain the rationales of distributed computing, the architectures of different modern distributed computing systems, and to provide fundamental knowledge on the key issues in distributed system designs including

inter-process communication, multi-threading, data coordination, consistency management and distributed concurrency control, distributed replications and deadlock resolution

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify the basic architectures of distributed systems, the problems in providing distributed transparency, and the rationales and trade-offs of different types of transparencies.		x	x	
2	Create program and evaluate the problems in inter-process communications.			x	
3	Analyse and evaluate the basic algorithms for distributed systems such as time synchronization, name management, process and data coordination.		x		
4	Analyse and evaluate the performance characteristics of different algorithms for transaction management and distributed deadlock resolution.			x	
5	Develop the ability to investigate the trends and problems of current distributed systems using examples and case studies.				

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain the keys concepts in the design of distributed systems.	1, 3, 4	Lecture: 3 hours/week
2	Programming assignment	To reinforce what is learned from the lecture, students are given a programming assignment to create a program and evaluate the problems in inter-process communications.	2	

3	Presentation and class discussion	Class participation and knowledge sharing is an important part of the learning process. Students will be grouped to present their studies on a selected topic on modern distributed systems. This activity helps develop their ability to investigate the trends and problems of modern distributed systems.	1, 3, 4	Tutorial: 8 hours/semester
4	Mid-term quiz and class discussion	Students will be encouraged to discuss the key concepts in the design of distributed systems.	1, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Presentation and report	1, 4, 5	10	-	Yes
2	Programming assignment	2	8	-	Yes
3	Mid-term quiz and class participation	1, 3, 4	12	-	No

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

Presentation and report

Criterion

ABILITY to EXPLAIN the trend of modern distributed systems

Excellent (A+, A, A-)

High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Programming assignment

Criterion
ABILITY to APPLY the techniques to create and evaluate the problems in inter-process communication

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Mid-term quiz and class participation

Criterion
ABILITY to EXPLAIN the key concepts in distributed systems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Distributed systems architectures; Transparency requirements and issues; Inter-process Communications (IPC); Distributed Services and Naming Services; Consistency maintaining; Distributed synchronization; Distributed coordination; Concurrency Control, Network Security, Distributed Deadlock, Replications and Distributed Transaction Atomicity, Mobile and Pervasive Computing, Peer-to-peer Computing.

Syllabus

Architectures and paradigms of distributed systems will be presented during the lectures, with discussions on the following issues and the related techniques/algorithms:

- Basic issues of concepts of distributed system: characteristics, transparency, system modeling.
- Inter-networking and communications: characteristics of various networks, RPC and interprocess communications using Java.
- Distributed services and naming services: distributed file and name services and architecture, directory services and domain name services.
- Time and global states: clock synchronization, logical clock, vector clock, ordering, time synchronization, Critian algorithm, network time protocol, Lamport algorithms, global states and consistency cut.
- Distributed transaction management: transaction properties, distributed deadlock detection, distributed cocnurrency control, replication, durability and atomicity.

Reading List

Compulsory Readings

	Title
1	Coulouris G., Dollimore J. and Kindberg T. (2011). Distributed System, Concepts and Design. . Addison Wesley, 5th edition.

Additional Readings

	Title
1	Tanenbaum, Andrew S. and Van Steen, Maarten (2002). Distributed System, Principles and Paradigms.