COURSE SYLLABUS
CSC11112 – Distributed Systems

1. GENERAL INFORMATION

Course name:	Distributed Systems
Course name (in Vietnamese):	Chuyên đề hệ thống phân tán
Course ID:	CSC11112
Knowledge block:	
Number of credits:	4
Credit hours for theory:	45
Credit hours for practice:	30
Credit hours for self-study:	90
Prerequisite:	
Prior-course:	Operating Systems
Instructors:	

2. COURSE DESCRIPTION

The course is designed to provide students an overview of distributed systems, the background knowledge related to the core components in distributed systems (distributed system concepts, events, clock, event order, synchronization and consistency…). The course also helps build foundational knowledge for in-depth study of distributed systems, helping students come up with solutions for application software on computer networks.

3. COURSE GOALS

At the end of the course, students are able to:

- Explain concepts related to distributed operating systems: clocks, events, order of events, check points, consistency, etc.

- Describe techniques for process synchronization, inter-process communication, and collision resolution

- Solve check point problem, recovery, and data consistency

ID	Description	Program LOs
G1	Independent study, collaborative team level to present a solution in a distributed system	2.2, 2.3.1
G2	Understand, explain, and apply English terms that belong to the branch of distributed systems	2.4.3, 2.4.5
G3	Explain and illustrate basic concepts, terms,... belonging to the distributed systems	1.4, 3.3
G4	Identify and classify basic problems in distributed systems	1.3.6, 1.4
G5	Understand and provide solutions to fundamental problems in distributed systems	5.1.1, 5.1.3, 5.2.1, 5.2.2, 5.3.1, 6.1.1
G6	Build some small applications in a distributed environment	5.1.3, 5.2.2, 5.3.2, 6.1.2

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1	Organize, operate and manage groups	I, T
G1.2	Participate in group discussions and debates on subject topics	U
G1.3	Analyze, synthesize and write project reports individually or in group collaboration	I, T
G2.1	Understand specialized English terms of the subject	I
G2.2	Read and understand English materials related to lectures.	I

G3.1	Explain basic concepts in distributed systems: clocks, events, order of events, check points, consistency, load balancing, system recovery, and error correction.	I, T
G3.2	Know the roles, responsibilities and professional ethics when working	I
G3.3	Know how to update new knowledge, self-study, self-development and adapt	I
G4.1	Distinguish between fundamental problems in distributed systems	I, T
G5.1	Design and build an application in a distributed system	I, T,U
G6.1	Problem analysis and problem modularization	I, T, U
G7.1	Use basic algorithms learned to solve real-world problems	I, T, U

5. TEACHING PLAN

THEORY

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)	Assessments
1	Introduction to Distributed systems	G1.2, G2.1, G3.1, G3.2, G3.3	Lecturing Q&A, Group discussion (Chapter 1)	
2	Review basic concept of LAN, WAN, TCP/IP, Socket programming	G2.1, G2.2, G4.1, G5.1	Lecturing Demonstration, Q&A	A11

3	Lamport clock, Logical clock, event ordering using BSS, SES Algorithms	G1.1, G1.3, G2.1, G3.2, G5.1, G6.1	Lecturing Demonstration, discussion	A21 A12
4	Process communitcation and synchronization. Non-token based algorithm: Lamport's algorithm, Maekawa's Algorithm, Ricart-Agrawala. Token based algorithm: Suzuki-Kasami, Singhal's Heuristic, Raymond's Algorithm.	G1.1, G1.3, G2.1, G3.2, G4.1, G5.1, G6.1	Lecturing Demonstration, discussion	A22 A13
5	Distributed File Systems, Google File System, Cluster File System	G1.2, G2.1, G4.1, G5.1, G6.1, G7.1,	Lecturing Demonstration	
6	Distributed Scheduling. Load balancing vs Load sharing. Sender-Initiated, Receiver Initiated, Symmetric, Adaptive algorithm.State transfer	G2.1, G5.2, G6.1, G7.1	Question & answer Case study and discussion	A23
7	Recovery: - Two phase commit protocol	G1.2, G1.3, G2.1, G2.2, G4.1	Lecturing Demonstration	A14

	- Three phase commit protocol - Voting protocol: static, dynamic			
8	Consensus - PBFT - Multivew PBFT, Tendermint - Proof of Work	G1.3, G2.1, G4.1, G5.1	Lecturing Q&A, discussion	
9	Distributed Shared Memory, Parallel algorithm, Central server algorithm	G2.1, G3.1, G3.2, G3.4, G4.1, G5.1,	Lecturing	
10	Security	G2.1, G3.1, G3.2, G3.4, G4.1, G5.1, G5.2,	Case study, discussion Demonstration	
11	Review	G2.1, G3.1, G3.2, G3.4, G4.1, G5.1, G5.2, G5.3, G5.4, G7.1	Lecturing Q&A, Discussion Project submitted	

LABORATORY

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)	Assessments
1	Seminar project 1		Explain and demonstrate Q&A, Group discussion	

2	Seminar Project 2		Lecturing Demonstration, Q&A	
3	Seminer Project 3		Provide instructions Demonstration, discussion	

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A1	**Assignments**			**10%**
A11	Quiz: introduction	Small quizzes in class for each topic	G1.3,	2.5%
A12	Quiz: BSS & SES	Small quizzes in class for each topic	G1.3	2.5%
A13	Quiz: Synchronization	Small quizzes in class for each topic	G1.3, G3.3	2.5%
A14	Quiz: recovery	Small quizzes in class for each topic	G1.3, G3.3	
A2	**Projects**			**30%**

A21	Project socket		G1.1, G1.3,	5%
A22	Synchronize the events using SES		G1.1, G1.3, G5.1, G7.1	10%
A23	Zace game		G1.1, G1.3, G6.1, G7.1	15%
A3	**Exams**			**60%**
A31	Midterm exam	Open book exam. Describe the understanding of different topics, analyze & program to solve problems	G3.1, G4.1, G5.1	30%
A32	Final exam	Open book exam. Describe the understanding of different topics, analyze & program to solve problems	G3.1, G4.1, G5.1	30%

7. RESOURCES

Textbooks

- Advanced Concepts in Operating Systems, 1 edition, Mukesh Singhal and Niranjan Shivaratri, McGraw-Hill, 1994

Others

- Distributed Operating System, 1 Edition, Andrew S.Tanenbaum, Prentice Hall, 1995

8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than 3 theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss on the topics. However, individual work must be done and submitted on your own.