FIRST SEMESTER 2020-2021
Course Handout (Part II)

In addition to part-I (General handout for all courses appended to the timetable) this portion gives further specific details regarding the course:

COURSE NO	:	**CS G623**
COURSE TITLE	:	**ADVANCED OPERATING SYSTEMS**
Instructor In-charge	:	**Avinash Gautam** [**avinash@pilani.bits-pilani.ac.in**]

1. COURSE OBJECTIVE
To introduce the design and implementation issues of distributed operating systems

2. PRE-REQUISITES
It is assumed that the students have done a basic course on operating systems and computer networks. Also the students should have good programming experience in C/C++/Java languages.

3. SCOPE
Distributed Operating Systems work in an environment where we have independent machines (both hardware and software) connected with each other over a network. A Distributed OS makes a Distributed System a virtual uni-processor system. The distributed OS to be studied in this course is microkernel based. It's just that the user level processes that are separated from the kernel can run on remote machines. Also, the OS has some sort of idea what machines are hooked up, and can make decisions about where to run things based on the relative speed of the machines.

4. BOOKS

Text Book

[T1] M. Singhal & N. Shivaratri, "Advanced Concepts in Operating Systems: Distributed, Database and Multiprocessor Operating Systems", Tata McGraw Hill, 2001.

Reference Books

[R1]   Distributed Systems Principles and Paradigms 2/E by A. S. Tanenbaum, PHI
[R2]   Distributed Operating Systems – The Logical Design by A. Goscinski, AW
[R3]   Distributed Systems-Concepts and Design by G. Coulouris, AW

5. PLAN OF STUDY

Lec#	Lecture Session	Learning Outcome	REFS (Text)
1	Overview of Advanced Operating System	Design approaches, Motivation, Types of Advanced OS.	T1. Ch 1, R1. Ch 1
2-3	Architecture and Models for Communication	Architectural Issues, Communication Networks, and Communication Primitives. Need for a model, Message Passing for IPC, Shared Variables, Relationship among models	T1. Chap 4, <Class Notes>
4-7	Time in distributed systems	Limitations of DS, logical clock, vector clock, physical clock synchronization, causal ordering of messages, global state, cuts of distributed computation	T1. Ch 5, R1. Ch 6, <Class Notes>

7-10	Distributed Mutual Exclusion	Lamport, Recart-agrawala, and Maekawa's algorithms; Suzuki-kasami broadcast algorithm, and Raymond's tree based algorithm	T1. Ch 6, <Class Notes>
11-14	Global State Collection and Distributed Deadlock Detection	Termination Detection, Resource and Communication deadlock, Strategies to handle deadlock, Deadlock Detection Algorithms	T1. Ch 7, <Class Notes>
15-18	Agreement Protocols	System model, Classification of agreement problems, Solutions to Byzantine agreement problems	T1. Ch 8
19-20	Coordination Algorithms	Leader Election, Synchronizers	<Class Notes>
21-24	Graph Algorithms	Routing Algorithms, Graph Traversal and Coloring	<Class Notes>
25-27	Distributed Scheduling	Issues in Load Distribution, Components of a load distribution algorithm, Load Distribution Algorithms, Case studies: V-System, Sprite, and Condor	T1. Ch 11
28-30	Fault Tolerance	Commit Protocols, Voting Protocols, Failure Resilient Processes	T1. Ch 13, <Class Notes>
31-33	Distributed Transactions	Concurrency control and serializability, atomic commit protocols and recovery	<Class Notes>
34-37	Group Communication	Multicasting in Distributed Systems	<Class Notes>

EVALUATION SCHEME

Component & Nature	Duration	Weightage	Date and Time	Nature of component
Test-1	30 Min	15%	10th Sep to 20th Sep	@TBA
Test-2	30 Min	15%	9th Oct to 20th Oct	@TBA
Test-3	30 Min	15%	10th Nov to 20th Nov	@TBA
First Term Paper Presentation	30 Min	10%	@TBA	Open Book
Second Term Paper Presentation	30 Min	10%	@TBA	Open Book
Comprehensive Exam	3 hrs	35%	Refer to the Time-Table	Open Book

@To be announced later

NOTICES

All notices related to the course will be posted on Nalanda.

MAKE-UP

- **For make-up in Test-1, Test-2, Test-3, and Term paper presentations:** makeup will be given only in case of hospitalization (student will have to provide evidence for that).
- **For comprehensive examination make-up**: contact AUGSD/AGSRD.

CHAMBER CONSULTATION HOUR: send an email to the IC and seek time for consultation.

Instructor-in-charge, CS G623