



DEPARTMENT OF  
**SOFTWARE TECHNOLOGY**

## **CSOPESY**

### **Introduction to Operating Systems**

Type of Course	:	Foundation Course
Pre-requisites	:	CSARCH2 (Introduction to Computer Organization and Architecture 2) - Hard
Pre-requisite to	:	STDISCM (Distributed Computing) - Hard
Term / Academic Year	:	Term 3, AY 2024-2025
Class Schedule / Instructor	:	Neil Patrick Del Gallego, Ph.D. (He/Him) Jonathan Mantua (He/Him) Ren Tristan Dela Cruz (He/Him) Emerico Aguilar, Ph.D. (He/ Him)
		See official class schedules.
Consultation Hours	:	By appointment. Please observe the consultation hours and policies of your assigned instructor.
Course Site/Repository	:	AnimoSpace

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### **Course Description**

This is an introductory course to operating system design and implementation. The first part discusses I/O, display interfaces, and process scheduling. Topics in this section include I/O polling, multi-window consoles, processes and threads, context switching, cooperative multitasking, and scheduling. The second part addresses the problem of memory management. Topics in this section include swapping, segmentation, paging, page replacement, and thrashing. Other topics include process and thread synchronization, file system interfaces, and deadlocks.

### **Learning Outcomes (LO)**

At the end of the course, the student is expected to be able to do the following:

<b>Expected Lasallian Graduate Attributes</b>	<b>Learning Outcomes</b>
Critical and Creative Thinker, Effective Communicator	<b>LO1.</b> Understand the importance of operating systems.
Critical and Creative Thinker	<b>LO2.</b> Make a comparative analysis of different CPU scheduling and memory management techniques and algorithms.
Critical and Creative Thinker, Effective Communicator, Reflective Lifelong Learner, Service-Driven Citizen	<b>LO3.</b> Simulate process and resource management techniques/algorithms to manage computer systems.

## Major Course Outputs (MCO)

As evidence of attaining the above learning outcomes, the student must submit the following during the indicated dates of the term.

Learning Outcome	Required Output	Due Date
LO1, LO2, LO3	<b>MCO1.</b> Command line interface & Multi-tasking OS	Week 8 and Week 13
	<b>MCO2.</b> Marquee console	Week 5
	<b>MCO3.</b> Midterms + final exam	Week 7/8 and finals week

The major course outputs are a mix of collaborative work and individual efforts. In collaborative work, every student is expected to contribute to achieving their group's goal and will be graded accordingly. All group members are also expected to keep track of their own work contributions and should be ready to discuss these with the professor whenever the need arises.

## Rubrics for MCO Assessment

See project specifications.

## Other Requirements and Assessments

The course has the following requirements on top of the major course output described above:

1. Class Activities – Various exercises will be administered throughout the term.
2. Exams – A midterm exam and a comprehensive final examination will assess the student's understanding of the various theories and concepts about operating systems.

## Grading System

To pass this course, one must accumulate at least 60 points through the course requirements shown below.

Assessment Task	Maximum Points
Seatworks/Homeworks	15
Midterm Exam	20
Final Exam	20
Multi-tasking OS + Marquee console	45
<b>TOTAL POINTS</b>	<b>100</b>

Raw %	GPA
< 60	0.0
≥ 60	1.0
≥ 66	1.5
≥ 72	2.0
≥ 78	2.5
≥ 83	3.0
≥ 89	3.5
≥ 94	4.0

## Teaching Methods/Strategies

- Lectures
- Reading Assignments
- Projects
- Exercises
- Exams

## Learning Plan

LO	Topics and Readings	Week / Date	Activities
LO1 LO2 LO3	<b>Course Orientation</b> Syllabus; Requirements; Class Policies  <b>Introduction to Operating Systems</b> What is an OS? An overview of a command line-based operating system Operating systems structure	1 - 3	Lecture, Programming
	<b>I/O and Display Interfaces</b> The operating system lifecycle Designing a single-window console Immediate-mode vs retained-mode Keyboard polling and interrupts Concepts of I/O and CPU cycles Supporting multiple consoles Writing a marquee-based console	4 - 5	Lecture, Programming
	<b>Processes and Scheduling</b> Representation of processes and resources Designing CPU instructions Process lists and CPU scheduling Processes and threads	6 - 8	Lecture, programming
	<b>Memory Management</b> Emulating contiguous memory spaces Demand paging Virtual memory Simulating malloc/dealloc functions Tracking process memory Process components – emulating stack and heap	9 - 11	Lecture, programming
	<b>Cooperating and pre-emptive multitasking, process synchronization</b> The critical section problem. Resource allocations and synchronization. E.g., Multiple processes accessing a single file. Designing synchronization constructs. E.g. implementing mutexes, semaphores	12 - 13	Lecture, programming
	<b>ADDITIONAL TOPICS</b>  <b>File Systems</b> Designing file system interfaces Designing multi-level directories Disk space and partition emulation Designing a file searcher and indexing process Designing user-level permissions. E.g. user account systems  <b>Deadlocks</b> Prevention, avoidance, detection Mutual exclusion, hold and wait, no pre-emption, circular wait Resource allocation graphs, banker's algorithm Handling deadlocks – prevention, avoidance, detection and recovery	-	Lecture, programming
<b>FINAL EXAM – Finals Week</b>			

## References

- Silberschatz, A., Galvin, P. B., & Gagne, G. (2014). Operating Systems Concepts (10th ed.). John-Wiley and Sons. **[MAIN REFERENCE]**
- OS Dev Wiki: [https://wiki.osdev.org/Expanded\\_Main\\_Page](https://wiki.osdev.org/Expanded_Main_Page)
- The Linux Kernel Source Tree: <https://github.com/torvalds/linux/tree/master>

## General Policies

- All University policies on cheating, among others, will be enforced. Refer to the Student Handbook for the details of these policies.
- Aside from these policies, standard course policies as enumerated below will also be enforced. Additional class policies may be provided by the instructors handling the course.
- Late submissions will not be accepted.
- Missed class activities (e.g., cases, exercises, short quizzes) cannot be made up.
- The student who was absent in the previous meeting/s is expected to catch up on the missed discussion himself/herself (by asking his/her peers what he/she had missed).
- Comply with Section 4.15 Policy on Academic Honesty of the DLSU Student Handbook. ([Link](#))

## Privacy Policies regarding Synchronous Classes

- As we will be conducting classes online, please note that online synchronous sessions may be recorded for future reference and shall be stored in AnimoSpace or a DLSU Google Drive account of the faculty.
- Your name, profile photo, chat text, audio, and video data that may contain education related information will be processed during the sessions.
- The meeting hyperlink or session information shall not be shared to those not intended to participate in the sessions.
- Personal recording of the session via means other than those authorized by the University shall not be done to respect the rights of every individual participating in the session.
- The recording of the session shall not be reshared and/or reposted in another medium or platform to prevent unauthorized disclosure and processing of personal data.
- Discussions and Conversations of a personal nature not related or relevant to the ongoing session shall be discouraged so as to prevent unintentional and/or unauthorized disclosure of personal data.

## Academic Honesty

Honesty policy applies. Please take note that you are NOT allowed to borrow and/or copy-and-paste – in full or in part – any existing related program code or solutions from the internet or other sources (such as printed materials like books, or source codes by other people that are not online). You should develop your own codes and solutions from scratch by yourselves.

The student handbook states that (Sec. 5.2.4.2):

*“Faculty members have the right to demand the presentation of a student’s ID, to give a grade of 0.0, and to deny admission to class of any student caught cheating under Sec. 5.3.1.1 to Sec. 5.3.1.1.6. The student should immediately be informed of his/her grade and barred from further attending his/her classes.”*

The student handbook also states that (Sec. 10.3):

*A student caught cheating, as defined in Sec. 5.3.1.1., shall be penalized with a grade of 0.0 in the requirement or in the course, at the discretion of the faculty member, without prejudice to an administrative sanction. In cases of alleged cheating, the faculty member should report the incident to the Student Discipline Formation Office (SDFO).*

## Intellectual Property Policy Clause

The information and data contained in the online learning modules, such as the content, audio/visual materials, or artwork are considered the intellectual property of the author and shall be treated in accordance with the IP Policies of DLSU. They are considered confidential information and intended only for the person/s or entities to which they are addressed. They are not allowed to be disclosed, distributed, lifted, or in any way reproduced without the written consent of the author/owner of the intellectual property.

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