2020/2021 First Semester

CE2005/CZ2005 Operating Systems

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Course Components

- Lectures:13 weeks, 2 hours/week
- Tutorials: 11 tutorials
  - +1 buffer week
- Labs: 4 lab sessions (experiments), 2 hours/session
- Assessment: Coursework (**100**%)
- Coursework Assessment
  - Lecture quizzes (**20**%) – 8 multiple-choice quizzes
  - Lab implementations (**20**%)
  - Lab quizzes (**20**%) – 2 multiple-choice quizzes
  - Term papers (**40**%) – 2 papers (mid-term, end-term)

Schedule (Full-Time Students)

Full-time Program

Week		Lecture Topic	Tutorial	Lab	Assessments Due
1	11/08 - 14/08	Overview of Operating Systems (OS)			
2	17/08 -21/08	Processes & Thread	1 (OS Overview)		
3	24/08 - 28/08	Process Scheduling	2 (Processes & Threads)		Lecture Quiz 1
4	31/08- 04/09	Process Synchronization	3 (Process Scheduling)	1 (Nachos Thread)	Lecture Quiz 2
5	07/09 - 11/09	Process Synchronization	4 (Process Synchronization 1)	1 (Nachos Thread)	
6	14/09 - 18/09	Deadlocks	5 (Process Synchronization 2)	2 (CPU Scheduling)	Lecture Quiz 3
7	21/09 - 25/09	Real-time OS	6 (Dealocks)	2 (CPU Scheduling)	Lecture Quiz 4
	28/09 - 02/10	Recess Week			Lab Quiz 1, Mid-Term Paper
8	05/10 - 09/10	Memory Organization	Buffer Week	3 (Process Synchronization)	
9	12/10 - 16/10	Memory Organization / Virtual Memory	7 (Memory Organization)	3 (Process Synchronization)	
10	19/10 - 23/10	Virtual Memory	8 (Virtual Memory 1)	4 (Virtual Memory)	Lecture Quiz 5
11	26/10 - 30/10	File Systems	9 (Virtual Memory 2)	4 (Virtual Memory)	Lecture Quiz 6
12	02/11 - 06/11	Input/Output (I/O) Management & Disk Scheduling	10 (File Systems)		Lecture Quiz 7
13	09/11 - 13/11	Protection and Security	11 (I/O & Disk Scheduling)		Lecture Quiz 8, Lab Quiz 2
14	26-Nov	Exam Weeks			End-Term Paper

Textbook: Operating System Concepts, by Silberschatz, Galvin and Gagne, 10th Edition, Wiley 2018

Public Holidays: 10 Aug 2020 (Monday)

- Tutorial starts from Week 2
- Lab starts from Week 4

Schedule (Part-Time Students)

Part-time Program

Week		Online Lecture (2 Hours)	Online Tutorial (6:30PM-7:30PM)	Physical Lab (7:30PM-9:30PM)	Assessments Due
1	11/08 - 14/08	Overview of Operating Systems (OS)	HOLIDAY		
2	17/08 -21/08	Processes & Thread	1 (OS Overview)		
3	24/08 - 28/08	Process Scheduling	2 (Processes & Threads)		Lecture Quiz 1
4	31/08- 04/09	Process Synchronization	3 (Process Scheduling)		Lecture Quiz 2
5	07/09 - 11/09	Process Synchronization	4 (Process Synchronization 1)	1 (Nachos Thread)	
6	14/09 - 18/09	Deadlocks	5 (Process Synchronization 2)		Lecture Quiz 3
7	21/09 - 25/09	Real-time OS	6 (Dealocks)	2 (CPU Scheduling)	Lecture Quiz 4
	28/09 - 02/10	Recess Week			Lab Quiz 1, Mid-Term Paper
8	05/10 - 09/10	Memory Organization	Buffer Week		
9	12/10 - 16/10	Memory Organization / Virtual Memory	7 (Memory Organization)	3 (Process Synchronization)	
10	19/10 - 23/10	Virtual Memory	8 (Virtual Memory 1)		Lecture Quiz 5
11	26/10 - 30/10	File Systems	9 (Virtual Memory 2)	4 (Virtual Memory)	Lecture Quiz 6
12	02/11 - 06/11	Input/Output (I/O) Management & Disk Scheduling	10 (File Systems)		Lecture Quiz 7
13	09/11 - 13/11	Protection and Security	11 (I/O & Disk Scheduling)		Lecture Quiz 8, Lab Quiz 2
14	26-Nov	Exam Weeks			End-Term Paper

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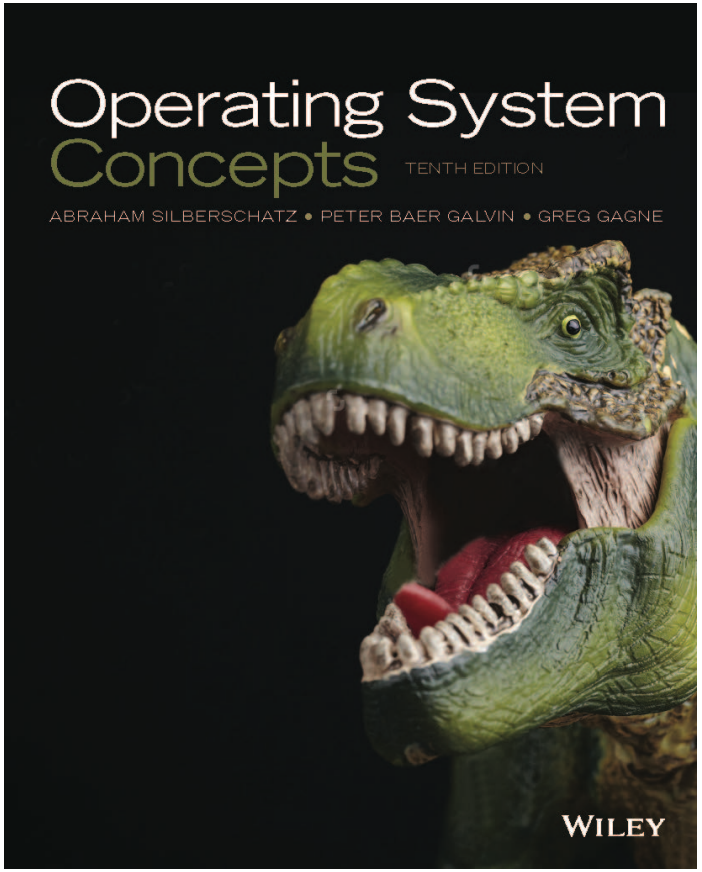
Public Holidays: 10 Aug 2020 (Monday)

- Tutorial starts from Week 2
- Lab starts from Week 5

Lectures

- Textbook – The *Dinosaur* Book



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10th Edition, Wiley 2018

Textbook vs. Slides

Tutorials

- Starts in Week 2
- Attendance is important
- All tutorial questions are available in NTULearn
- Answers will be released twice in the semester
  - At the end of Week 7 for tutorials 1 to 5
  - At the end of Week 13 for tutorials 6 to 11
- Necessary to attempt questions before tutorial
- Some questions are from the previous exams
- Feedback channel is always open

Labs

- Starts from Week 4
  - Using **Software Lab 1** (N4-01a-02), **Software Lab 3** (N4-B1c-14) and **SPL** (N4-B1b-11); **remote access available**

- 4 lab experiments, 1 per lab session
  1. **NachOS** threads – Introduction to multi-threading
  2. CPU scheduling – Implementation of Round-Robin scheduling
  3. Process synchronization – Importance and techniques
  4. Virtual memory – Implementation of TLB and page replacement

- Lab manuals, briefing slides and other supplementary documents are available in NTULearn
  - **For each experiment, first review the briefing slides and read the lab manual**

Assessments

- Lecture Quizzes (20%)
  - LAMS sequences with multiple-choice quizzes
  - Unlimited retries allowed for the quizzes
  - Must be completed by the following deadlines
    - Quiz 1: OS intro., processes/threads – 26th Aug.
    - Quiz 2: Process scheduling – 02nd Sep.
    - Quiz 3: Process synchronization – 16th Sep.
    - Quiz 4: Deadlocks – 23rd Sep.
    - Quiz 5: Memory Organization – 21st Oct.
    - Quiz 6: Virtual Memory – 28th Oct.
    - Quiz 7: File Management – 04th Nov.
    - Quiz 8: I/O Management – 11th Nov.

Assessments

- Lab Assessments
  - Lab Implementation (20%)
    - Correct implementation and output generation for each lab experiment – 5% for each lab
    - TA or Lab Supervisor will compile/execute your code and evaluate your implementation and output files
    - Deadline is 1 week after your corresponding lab session
    - **Remember to leave your implementation and all generated outputs in your folder, and DO NOT modify the folder structure, folder names or file names in anyway**
  - Lab Multiple-Choice Quizzes (20%)
    - Quiz 1: On Lab 1 and Lab 2 topics – 1st Oct., 9:30AM-10AM
    - Quiz 2: On Lab 3 and Lab 4 topics – 12th Nov., 9:30AM-10AM

Assessments

- Term Papers
  - Mid-term (20%) – 1st Oct., 10:30AM-11:30AM
    - Covering topics in Weeks 1 through 6
      - OS Introduction, processes and threads, CPU scheduling, process synchronization, deadlocks
  - End-term (20%) – 26th Nov., 9AM-10AM
    - Covering topics in Weeks 8 through 12
      - Memory organization, virtual memory, file management, I/O management

Learning Outcomes

- Identify the functions and services provided by an operating system
- Understand the basic concepts and mechanisms of operating system design and implementations
- Explain the interactions between different components of an operating system