Advanced Operating Systems

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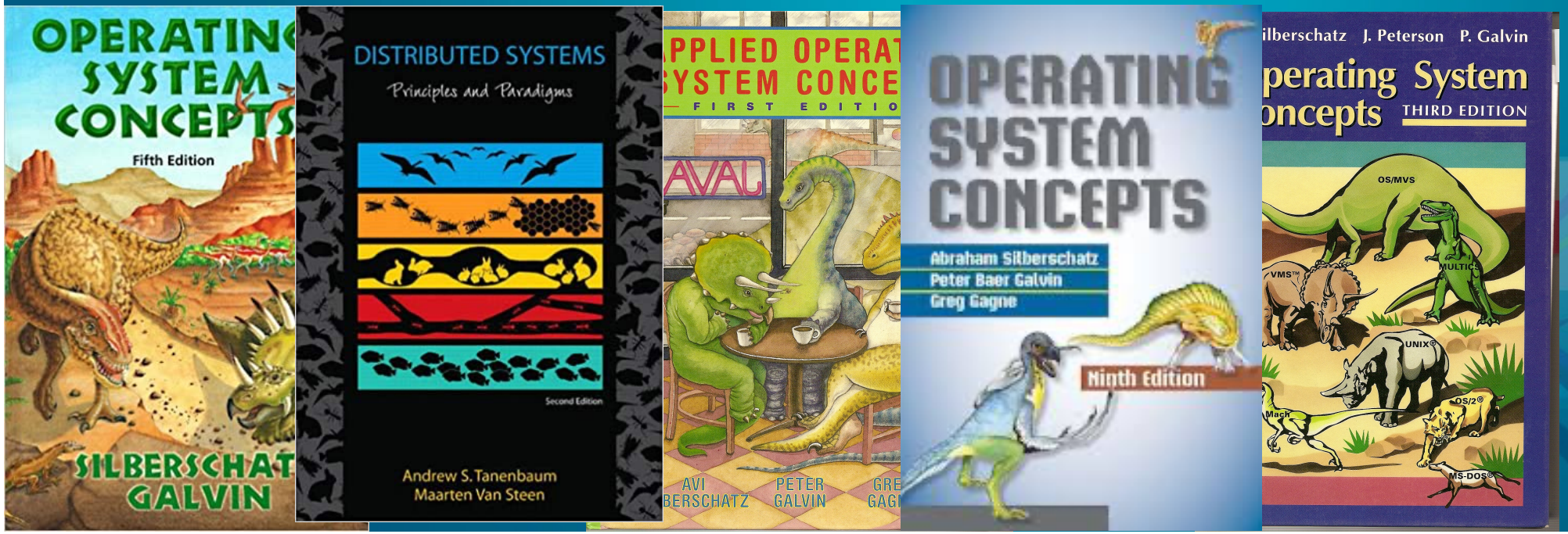
Goals of this course

- Operating systmes
  - Existed when the first computer was developed and
  - Will last until the last computer is abandoned.
- Advanced OS can cover the topics developed from 1970 to 2020.
  - However, no one can learn so many materials in such short time.



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- Advanced OS can cover the topics developed from 1970 to 2020.
  - However, no one can learn so many materials in such short time.
- The students will learn below form this course:
  - Appreciate the features in operating systems,
  - Select the best features in operating systems to meet your development or research needs, and
  - Learn the skills to develop new features in operating systems or other domains in CS.

Goals of this course

- Outstanding research results and creative products build on top of a series of skills.

- To avoid scratching the surfaces, the course is designed to teach the researach skills for system software.
  - Learning how the long last features were motivated and developed,
  - Understanding the current development, and
  - Developing new appraoches in the future.

Course Overview

- Lecture Schedule:
  - Time: Wednesday 2:20PM ~ 5:20PM
  - Room: 110 CSIE Building
- Lecturer:
  - Dr. Chi-Sheng Shih
  - Office: 523 CSIE Building
  - Email: cshih@csie.ntu.edu.tw
  - Office Hours: 9:00AM ~ 11:30AM on every Friday
- TA:
  - 周君哲

Course Website

- NTU Cool: https://cool.ntu.edu.tw/courses/3533
- Course Website will provide
  - Slides
  - Supplied materials
  - Critics/presentation submission
  - Course video recording
  - Discussion forum

Topics To Be Covered: from elephants to ants

- Distributed Operating Systems + cloud computing
  - Communication (Message passing, RPC, Shared memory, Synchronization)
  - Resource management
  - Distributed File System
  - Distributed Memory Systems
  - Docker/Container
- **Middleware for IoT**
- Embedded (Real-Time) Operating Systems
  - Scheduling algorithms for Low Power Platforms and Safety Applications
  - Architecture
- Robotic Operating Systems (ROS)
- Operating systems for multi-core/processor platforms
  - Operating systems for multi-core/processor platforms
  - Virtualization for Multi-core/processor platforms

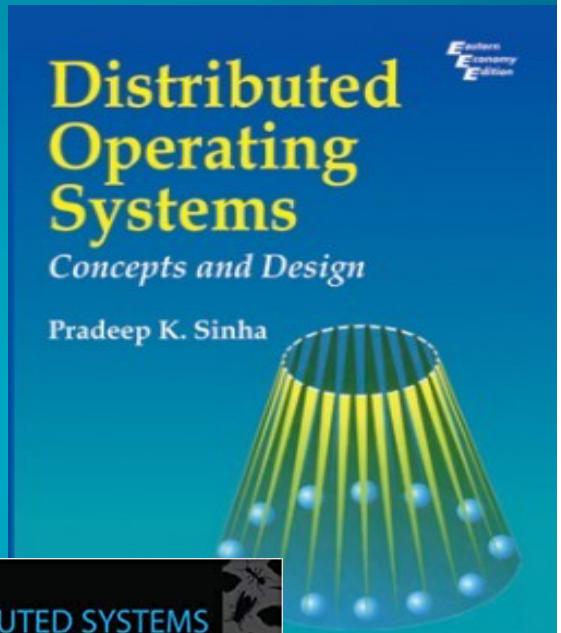
Course Schedule*

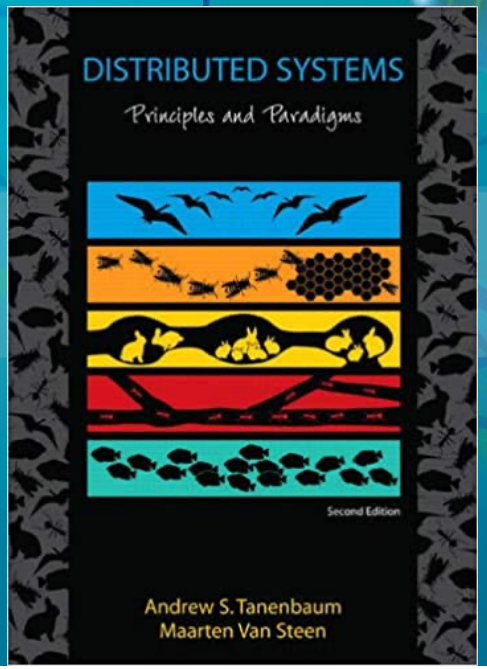
Week	Date	Topic	Discussion
1	2020-09-16	Syllabus	
2	2020-09-23	Introduction for distributed operating systems Communication for distributed systems and multicore systems	
3	2020-09-30	Distributed Shared Memory	
4	2020-10-07	Distributed Shared Memory	Sample Discussion on distributed systems
5	2020-10-14	Synchronization	Communication
6	2020-10-21	Synchronization	Distributed Shared Memory
7	2020-10-28	Distributed Process Management	Synchronization
8	2020-11-04	Distributed File Systems	Synchronization for WSN
9	2020-11-11	Distributed File Systems	Distributed Resource Management
10	2020-11-18	Mid-Term Exam	
11	2020-11-25	Middleware for IoT	Distributed Process Management
12	2020-12-02	Embedded operating systems	Google File Systems
13	2020-12-09	Real-Time operating systems	Memory-based File Systems
14	2020-12-16	Robotic Operating Systems	Middleware for IoT
15	2020-12-23	Robotic Operating Systems	Embedded OS/Android
16	2020-12-30	Virtualization for Real-time Systems	Robotic Operating Systems
17	2021-01-06	Virtualization for Real-time Systems	Real-Time Operating Systems
18	2021-01-13	Final Exam	

* Course schedule is subject to chagne.

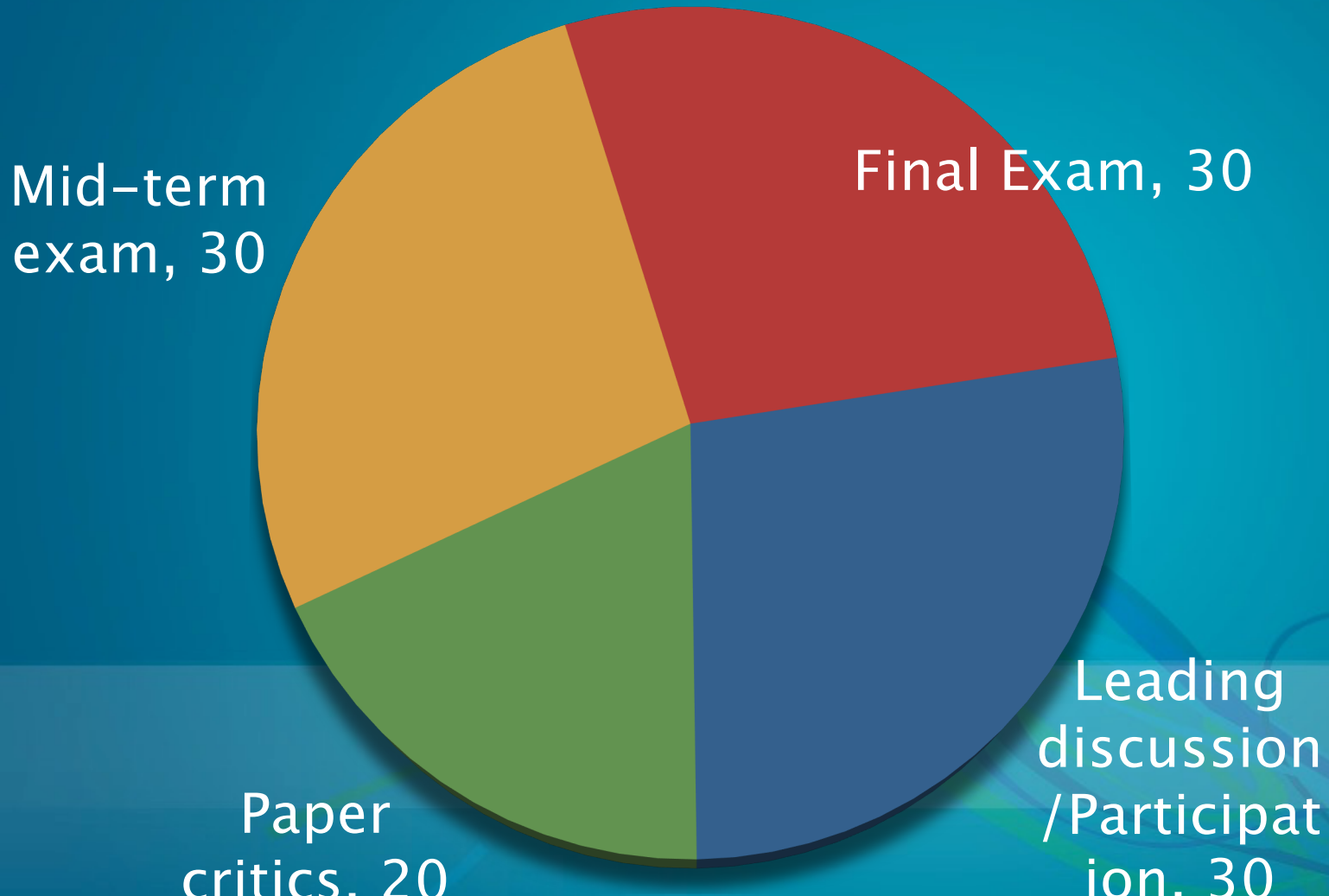
Recommended Textbooks

- Pradeep K. Sinha, Distributed Operating Systems Concepts and Designs, IEEE Press, NY, 1997.
- Tanenbaum, Distributed systems: principles and paradigms
- Khan, Practical Linux Programming: device drivers, embedded systems, and the internet.
- P.J. Felbelman, A PhD Is Not Enough!: A Guide to Survival in Science.
- Listed reading materials including book chapters and latest papers on the website.





Grades


Mid-term exam, 30
Final Exam, 30
Paper critics, 20
Leading discussion /Participat ion, 30

Leading Discussion

- In-class Participation and Leading Discussion: 30 points
  - Participation:
    - Participate the discussion in the class.
    - Tell us your name whenever you speak.
    - Maximum 5 points for each discussion.
  - Leading Discussion (10 points at most): one student can volunteer to lead the discussion once only.

Leading Discussions

- 10 to 12 leading discussions from the students.
  - The discussion leader receives up to 10 points.
- In every week, starting on Oct. 14, 2020
  - One leading discussion and each discussion lasts for 15 to 30 minutes.
  - The goals of the discussion are:
    - To know the pros and cons of the paper and
    - To figure out the future research direction.
  - All students are required to read the paper and participate the discussions.
  - The leaders should prepare five minutes presentation for the background, leader's viewpoints, and discussion agenda.
- It is **NOT** leader's responsibility to get the students to know the paper.
- The paper list will be provided no later than September 30, 2020.

Paper Critics

- Critical thinking is a fundamental capabilities for researchers.
- You will read research papers and criticize the motivation, methods, and results.
- Paper critics mean to question or learn from the paper and is a summary or abstract of the paper.

Paper Critics

- Paper critics: 20 points
  - The reading list will be provided no later than September 30, 2020.
  - You can start to submit paper critics weekly on Oct. 14, 2020.
    - One critics only every week.
  - Two highest graded critics will be selected: 10 points for each.
- The critics will be graded after submission.

Mid-Term and Final Exam

- Mid-term and final exams are both written exams.
  - Take home or open books, depending on number of students in the class.
    - Take-home: less than 20 students.
    - Open books in the class: otherwise.

Student Responsibilities

- Unlike undergraduate classes, I expect graduate students to over achieve and to work with initiative.
- Students are responsible for
  - getting their work done on time,
  - working independently,
  - researching the literature, and
  - attending class and participating in class discussions.