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- Paid undergraduate research position,
 - Work on systems (Raspberry Pi or similar), wireless technology, and internet of things.
 - Supervised by ECE and CS professors
 - Contact Dr. Hong if you are interested in, subject line includes REU and class #.



CS 300

Introduction to Operating Systems

Xiaoyan Hong
Computer Science
Univ. Alabama

Access BlackBoard for course Zoom meeting info and course materials

First thing 1/3...

- The use of live and recorded class sessions, Zoom and other technology is accompanied with some special challenges related to classroom conduct and student privacy. Faculty in turn should make students aware of their expectations depending on the mode of delivery for their course.

First thing 2/3...

- UA Student Code of Conduct prohibits students from "Disruption or obstruction of teaching, research, administration, disciplinary proceedings, or other University activities, including its public-service functions, whether on or off-campus, and other authorized non-University activities that occur on University premises." Disruptive or obstructive behavior in any class meeting, in-person or online, may be referred to the Office of Student Conduct for disciplinary action.
- Please understand that without prior approval from the instructor, students may not record course content and/or post course content publicly, including on social media sites. Students who record and/or post course content without instructor approval may be referred to the Office of Student Conduct for disciplinary action.

First thing 3/3...

- Class sessions will be recorded for students enrolled to refer back to, and for the use of enrolled students unable to attend class meetings.
- Most sessions will record the shared lecture slides.
- The students are agreeing to have their video (if camera engaged) or profile image recorded. If a student is unwilling to have their profile or video image recorded, it's YOUR responsibility to keep their camera off and to not use a profile image.
- Likewise, students who un-mute their audio input during class and participate orally are agreeing to have their voices recorded. If students are not willing to have their voices recorded during class, they must keep their mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.
- All recorded lectures, presentations, and class discussions are for viewing by members of this class section only, and can not be posted in any public forum or shared with anyone not enrolled in this class. Any student violating these rules may be referred to the Office of Student Conduct for disciplinary action



CS 300

Introduction to Operating Systems

- *What is this course about
- *How will this AV course look like
- *How will this course be taught
 - Course info and syllabus, policies

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Access BlackBoard for course meeting info and course materials

Outline

- What is this course about
- How will this AV course look like
- How will this course be taught
 - Course info and syllabus, policies
- Warm up with?



Poll 2

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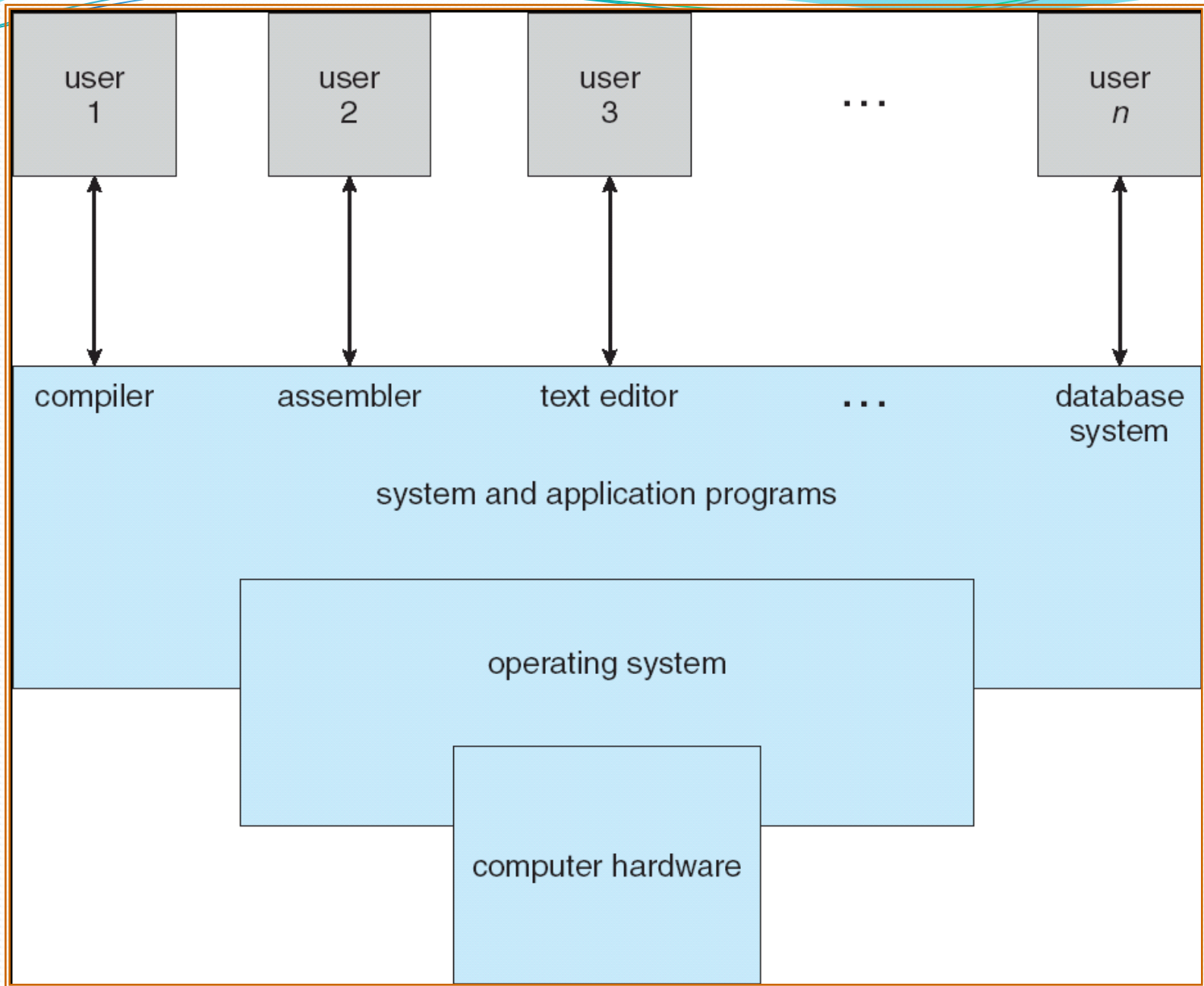
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computer hardware





Why Study Operating Systems? (I)

- 1993 Windows NT 3.16 million SLOC
- 2001 Windows XP 40 million SLOC
- Red Hat Linux 7.1 30 million SLOC
- Linux kernel 2.6.0 6.0 million SLOC
- Sun Solaris 7.5 million SLOC
- Mac OS X 10.4 86 million SLOC
- **Source lines of code (SLOC)**
- OSes have to solve many very hard problems

Why Study Operating Systems? (II)

- OSes have to solve many very hard problems!
- In 300, we study key problems and their solutions
 - they are held to very high standards
 - performance, scalability, correctness, extensibility
 - concepts from other courses apply in OS
 - Solutions also help to other courses
 - Many software programming tasks.

Why Study Operating Systems? (III)

- A few of you may involve in developing part of OS
- But all of you will patch your OS
- And many of you will ...
 - set up, configure and manage computer systems
 - write programs that exploit OS features
 - work with complex, distributed, and parallel software
 - work with abstracted services and resources



What this course is about

- First/introductory course on operating systems.
- Understand the essential concepts and algorithms in the design and implementation of modern multiprogramming operating systems.

Outline

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Zoom notes

- AV (Interactive Audio/Video), synchronous, remote
- Using Zoom Meeting for lectures, office hours, and other assistances
 - Screen sharing, poll, annotation, break room
- Lecture and class discussions are recorded, will be saved and uploaded to Panopto in Blackboard in separate audio and video files
- Quizzes and exams use Zoom Meeting and may use additional tools
- Class room will be on 10 minutes before start time
- Join with your UA email, waiting room will let you in
- You are muted at beginning, but video on.
- Feel free to ask questions when classes are in progress
 - Chat, or speak out (unmute yourself, or turn on video)
 - Try to have Q/A pause slides
- Setting of Zoom may change through the semester depending on situations



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Outline

- What is this course about
- How will this AV course look like
- How will this course be taught
 - Course info and syllabus, policies
- Q &A on Zoom Meeting, or other



Course Info

- **Course Pages: Black Board (BB)**
 - Schedules and materials
 - reading, lectures, exercises, solutions,...
 - project assignments and submissions
 - grading
- **Classes:** Tu/Thu, 9:30- 10:45pm, Zoom meeting (See BB for meeting #).
- **Office hours (zoom meeting): (TBD)**
 -
- **Instructor:** Xiaoyan Hong, Email: *xhong at ua domain*
- **TA:** Beichen Yang, office hour: **TBD**, Email: byang12@crimson...
- **Syllabus**
 - <https://oiraweb.ua.edu/apis/docs/api/v1/renderDocument/id/5f36f67bba3776e3d2dbd202?contextId=20204044639>

Text Book:

Operating Systems Concepts, 10th Edition,

Abraham Silberschatz, Peter B. Galvin, Greg Gagne ,
WILEY.

General Resources (slides, review questions):

<https://www.os-book.com/OS10/index.html>



course outline

- Operating Systems overview
- Process management
 - Processes and threads
 - CPU scheduling
- Process synchronization
 - Problems, tools, examples, deadlock, etc.
- Memory management
 - Main memory and virtual memory
- Storage management
 - Mass storage and I/O systems
- File system
 - Interface, implementation and internals
- Case Studies
- Note: some security and protection topics are touched in the above contents
- Other topics if time permits



Course requirements

- **Prerequisites:** CS200, CS201.
 - Computer organization, architecture (Assembly Language)
 - Data structures, algorithms
 - C languages
 - Unix/Linux for projects
 - *You are responsible for acquiring the needed knowledge during the semester, if you enrolled the class with overwriting, and you feel the lack of the prerequisites hinders your progress.*

Learning outcomes

- After successfully completing this course, students will
- • Students understand the fundamental concepts, the framework, and major components of operating systems.
- • Students analyze the major components of operating systems.
- • Students understand and evaluate multiple common algorithms in process management, memory management and storage management.
- • Students develop programming skills in process management and memory management.
- • Students develop solutions solving core process and memory management problems.
- • Students become familiar with modern operating systems and the evolution of operating



Course Evaluation and Grading Policy

- 20%, 8 quizzes (close format)
- 30%, 4 projects
- 30%, 2 midterm exams (close format)
- 20%, final exam (close format)
- Close format: Closed book/notes/cheat sheets/other unnecessary electronics (e.g, if you use a laptop, then don't use phones, watches, pads, etc.), only Zoom is allowed.
- Two lowest scores of quizzes will be dropped.
- One lowest score of the problems in each exam will be dropped
- Note, Recommended Exercises (RE) will be given to help you practice on the covered materials and self-learning evaluation. They will not be graded, but the efforts will be reflected in the quizzes and exams.



Course Evaluation and Grading Policy (cont'd)

- Grading results will post to Blackboard.
- If you have questions regarding a grading, you **MUST** report to the instructor within **TWO** weeks after the date the grade is posted to the class in written or in Blackboard Learn. It is your responsibility to know your grades in-time.
- All individual projects, quizzes and exams are to be done individually.
- For the programming projects, it is expected that you have written **EVERY LINE OF CODE** that you submit (with the exception of code given out in class).



Tentative Course Evaluation Schedule and Methods

- Quizzes: almost every week, in class, via zoom polls
- The mid-term exams: during class times, remote monitoring via video, timed problem blocks.
- Final to be given during their regularly scheduled times in the exam week
- Q &A

How to succeed in this course

- Hard work!
 - The materials are broad in the topics covered, heavy in the key concepts/principle/algorithms,
 - OSes diverge a lot from different vendors.
- Learning strategies
 - Pre-lecture reading, pick the most important things in lecturing
 - Practice and practice: RE/quizzes/projects and exams to enhance understanding
 - Ask questions and use office hours
 - Read the uncovered sections



Course Policies

- **Attendance policy:** Each student is expected to attend all classes. The instructor reserves the right to check attendance and monitor class participation.
- **Policy on Missed Exams & Missed Coursework:**
 - If, due to illness or other serious reasons, you must miss a class, then it is your responsibility to make up any missed course materials and course work.
 - No late turn-in of project assignments is accepted for credit. You should start your assignments early to avoid potential last minute issues that cause late turn-in.
 - Missed exams see the makeup policy.
 - If long-term excusable reason occurred, contact teacher as early as possible.
- **Makeup policy:** You are not allowed to make up an exam unless you have an excusable reason (show necessary documentations) and it is your responsibility to notify the instructor as early as possible.

Other course policies:

<https://oiraweb.ua.edu/apis/docs/api/v1/renderDocument/id/5f36f67bba3776e3d2dbd202?contextId=20204044639>

- Notification of Changes
- Statement on Academic Misconduct
- Statement On Disability Accommodations
- Severe weather protocol
- Pregnant Student Accommodations
- Religious Observances
- Uact Statement
- Statement on COVID-19

Academic honesty

- No academic misconduct
- If a student (team) is suspected of academic dishonesty, he/she (they) will be turned into the proper university personnel. For more information, reference the Code of Student Conduct
- Encourage you to study with peers, and to discuss your course related questions with them.
- But must complete your work by yourself if it is individual
 - do not copy another student's work, do not turn in solutions from off the web
 - do not copy from existing materials
- If you need help, ask the instructor
- All individual projects, quizzes and exams are to be done individually.
- For the programming projects, it is expected that you have written EVERY LINE OF CODE that you submit (with the exception of code given out in class).

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Q &A Pause

Warm up

Be able to manually work with Binary numbers!

00011001 in binary is 25 in decimal, or 19 in hex

47 in decimal is 00101111, or 2F in hex

AC in hex is 10101100 in binary and 172 in decimal

- Binary operation:
 - Add, subtract, multiply and divide
- For self-study:
 - Familiar with C (array and index to array)
 - Read chapter 1.