

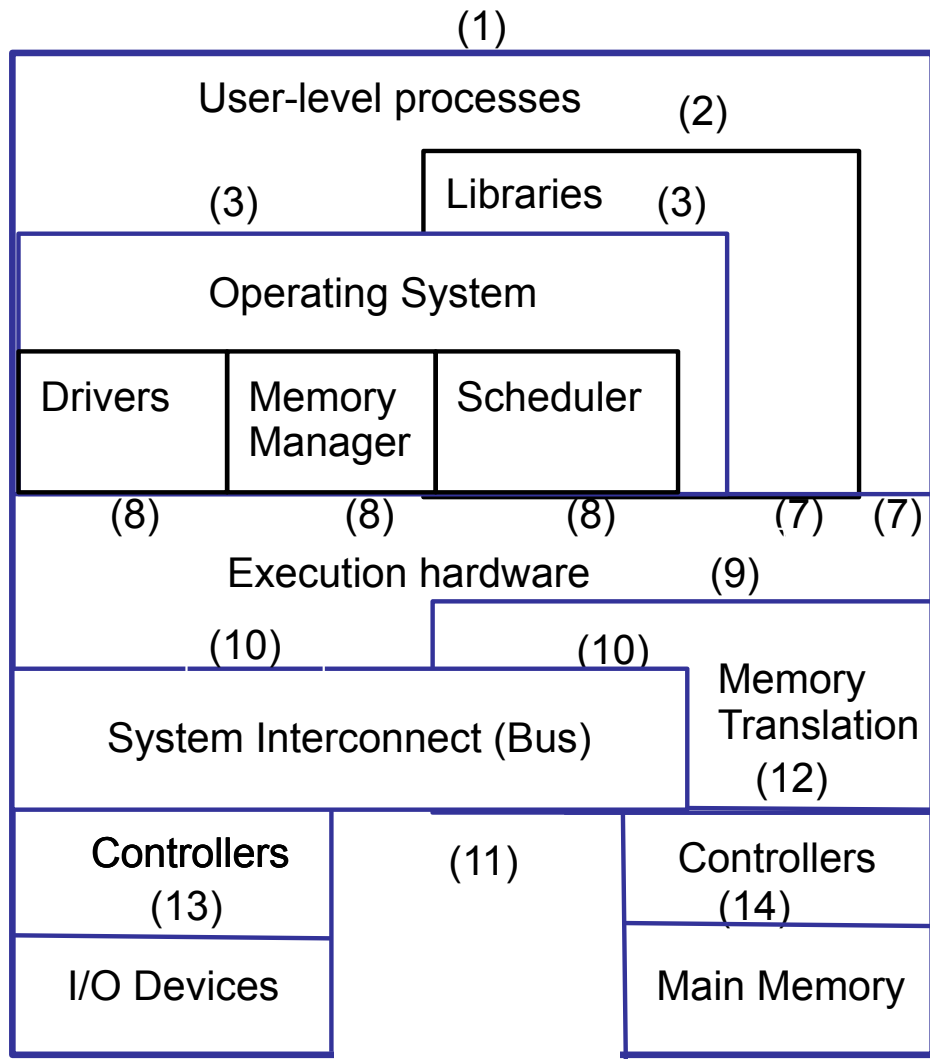
Operating Systems Course Overview

Instructor: Kartik Gopalan

Class website:

<http://oscourse.github.io>

Interfaces in a Computer System



User ISA : 7
System ISA : 8
Syscalls : 3
ABI : 3, 7
API : 2, 7

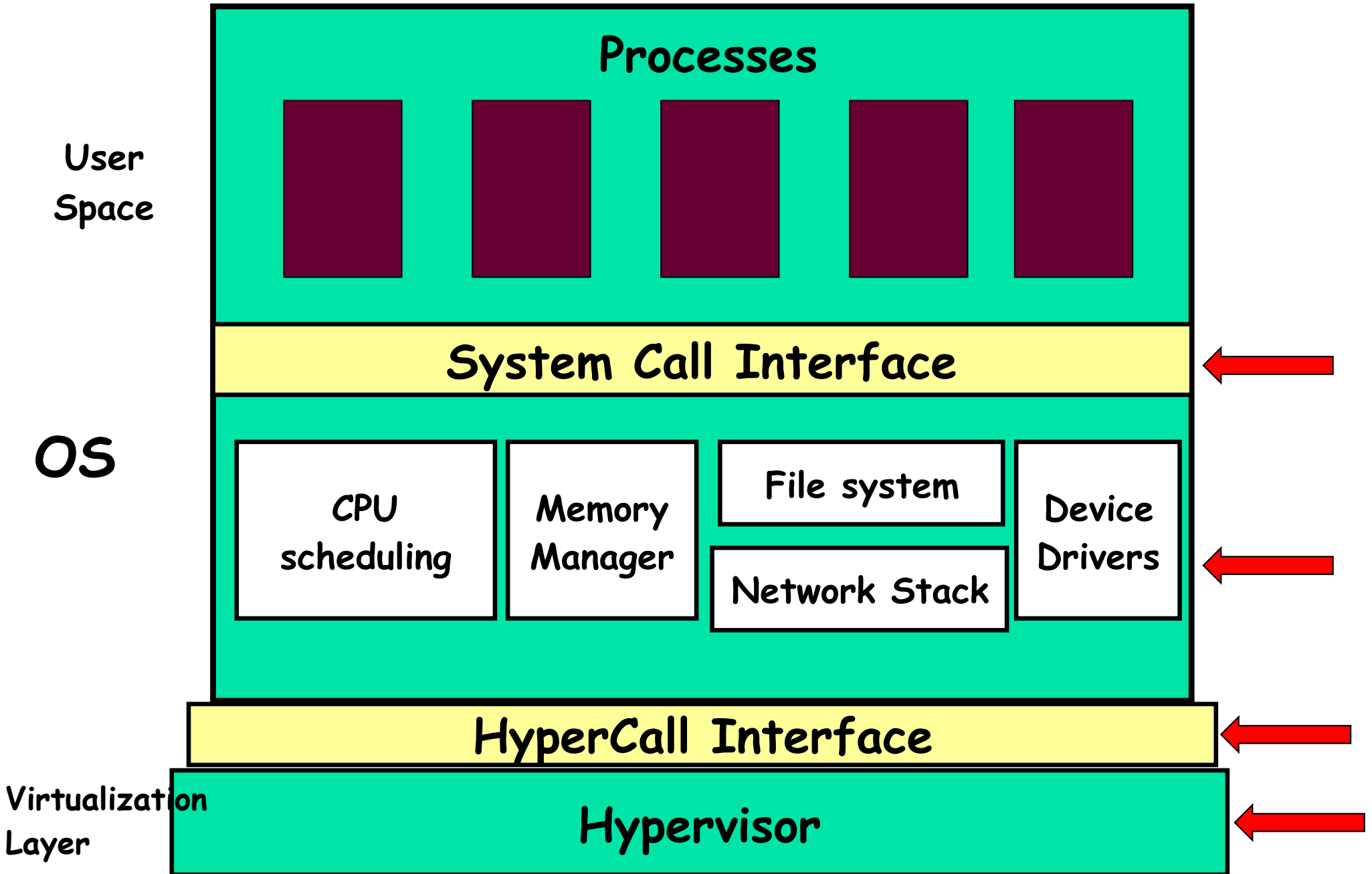
ISA = Instruction Set Architecture
ABI = Application Binary Interface
API = Application Programming Interface

What is an OS?

What is an OS?

- A bunch of software and data residing somewhere in memory.
 - But its not just *any* software.
- OS is the most privileged software in a computer.
 - *Privileged* means that OS can do special things, like write to disk, talk over the network, control memory and CPU usage, etc.
- OS manages all system resources
 - CPU, Memory, and I/O devices

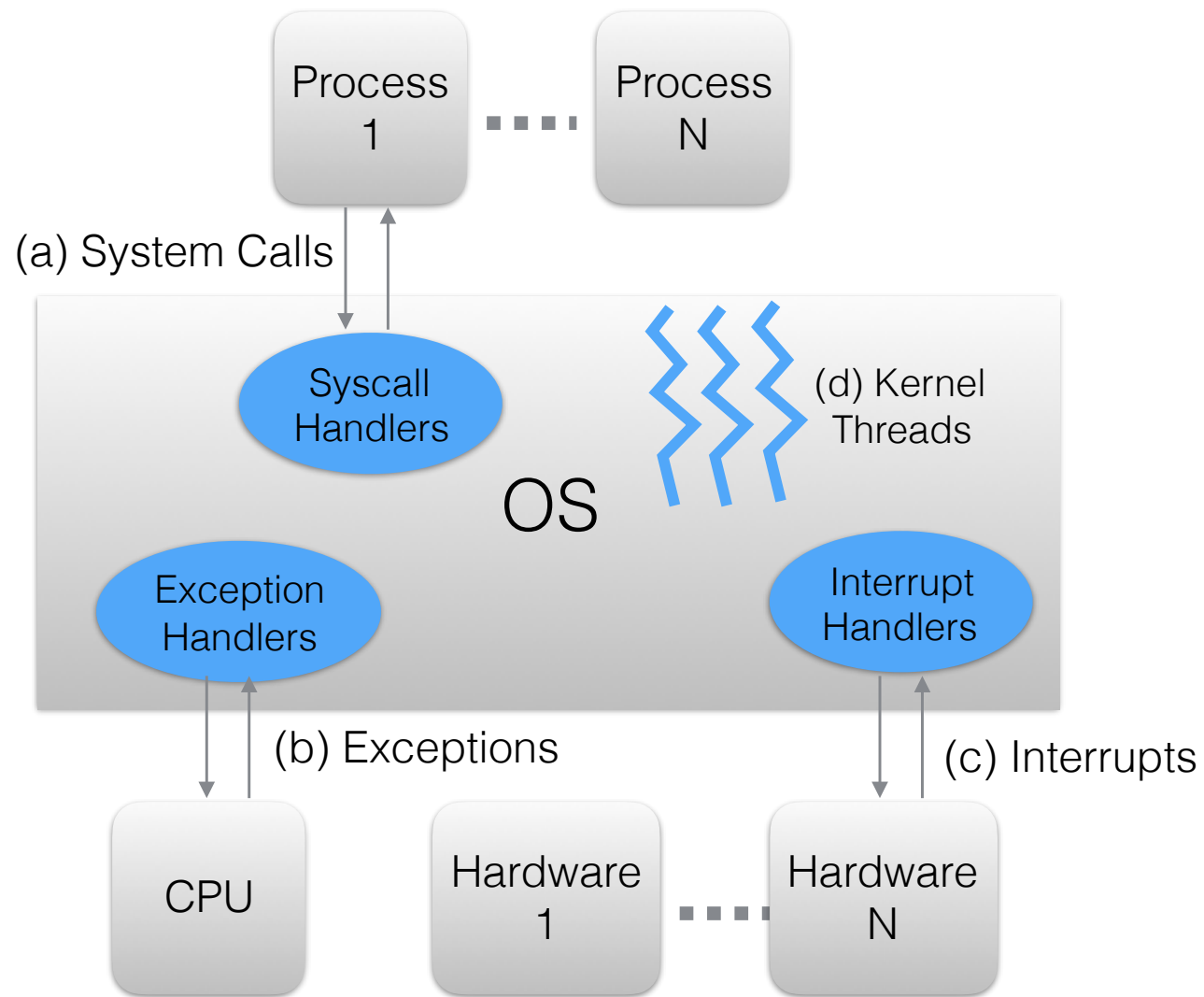
Layers of Software



But when does the OS “run”?

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Four ways to invoke OS code



Three major tasks of OS

1. Virtualization
2. Concurrency
3. Persistence

Virtualization

- Making a physical resource look like something else (virtual).
- Why virtualize?
 - To make the computer easier to use and program.
- Examples
 - Make one physical CPU look like multiple virtual CPUs
 - One or more virtual CPUs per process
 - Make physical memory (RAM) and look like multiple virtual memory spaces
 - One or more virtual memory spaces per process
 - Make physical disk look like a file system
 - Physical disk = raw bytes.
 - File system = user's view of data on disk.

Concurrency

- Juggling many tasks together
- Examples
 - One physical CPU runs many processes
 - One process runs many threads
 - One OS juggles process execution, system calls, interrupts, exceptions, CPU scheduling, memory management, etc.
- There's a LOT of concurrency in modern computer systems.
- And its the source of most of the system complexity.

Persistence

- Storing data “forever”
 - On hard disks, SSDs, CDs, floppy disks, tapes, phono discs, paper!
- But its not enough to just store raw bytes
- Users want to
 - Organize data (via file systems)
 - Share data (via network or cloud)
 - Access data easily
 - ...and recover data when lost.
 - Protect data from being stolen.

History of OS

- 1950s and 1960s: Early operating systems were simple batch processing systems
 - Users provided their own “OS” as libraries.
- 1960s and 1970s: Multi-programming on mainframes
 - Concurrency, memory protection, Kernel mode, system calls, hardware privilege levels, trap handling
 - Earliest Multics hardware and OS on IBM mainframes
 - Which led to the first UNIX OS which pioneered file systems, shell, pipes, and the C language.
- 1980s: Personal computing era
 - MacOS, IBM PC and its DOS, Windows, and so forth.
 - Unfortunately, many lessons from earlier multi-programming era were forgotten and had to be re-learned (painfully).
- 1980s also saw the fragmentation of UNIX
 - Each big company had its own version (IBM, Apple, HP, SUN, SGI, NCR, AT&T....)
 - LOT of legal wrangling over IP and copyrights
- 1990s: Then came BSD and Linux
 - Open source.
 - Led the way to modern OSes and cloud platforms
- 1990s also saw wider adoption of threads and parallelism
- 2000 and beyond: Mobile device OS and hypervisors
 - Android, iOS
 - VMWare ESX, Xen, Linux/KVM etc.

Class Logistics

Coverage of Topics

- Processes and Threads
- Concurrency
- Memory Management
- File and Storage Systems
- Input/Output
- Security
- Virtualization
- Basics of Programming in the Linux Kernel
- Other topics as appropriate

Course Material

- Lecture slides and papers posted on the class website
- Andrew Tanenbaum, Modern Operating Systems, 3rd or 4th edition
- Website will also have office hours, test dates, assignments, test samples etc.

Accounts you need

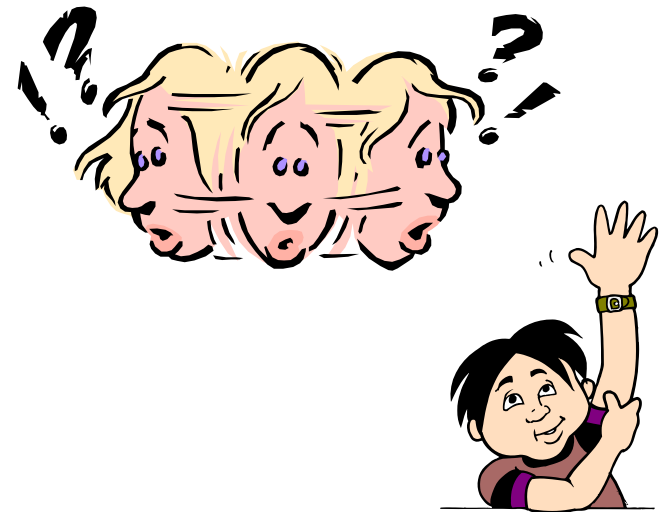
- CS LDAP Account
 - To log into machines in G-7, Q-22, and `remote.cs.binghamton.edu`
- A VM to work on
 - Details to follow.
- BU Email account
 - `<yourid>@binghamton.edu`
 - For communicating with me and TA
 - For receiving announcements
- Access to blackboard
 - For submitting your assignments and getting grades
 - <http://mycourses.binghamton.edu>

Students with disabilities

- Please contact me, preferably, within the first two weeks of class.
- Please contact the SSD office for any accommodations.
 - Bring me their letter listing the accommodations required.
- Don't hesitate to tell me if some aspect of the class is not working for you.
 - We will promptly work with you and SSD to fix it.

To ask or not to ask?

- Instructor and TAs are not a psychics!
 - If you don't ask, then we won't know that you need help.
- Please let us know if...
 - You are lost
 - You don't understand something
 - You don't have the background
 - Class can be improved in certain ways
- Ask for help early
 - Don't wait till the last minute
- Feel free to give feedback
 - Especially in the middle of the semester
 - Direct feedback is always welcome.



Asking Questions

- Make Google your friend!
 - Can't beat the response time!
- Email me and TAs
 - oscourse@binghamton.edu
- Stop by during office hours
 - After class or by appointment

Stressed?

- Keep the perspective
- If you are overwhelmed with this course, talk to us.
- If you are depressed or panicking for any other reason.
 - Seek professional counseling.
 - <http://counseling.binghamton.edu/>

Academic Integrity

•Means

- Do your own work. Don't do others' work.
- Don't ask/give solutions, including code.
- Don't get code from the Internet.
- Protect your code

•Moss: A tool for detecting software plagiarism will be used.

•Please read the policies on course web page

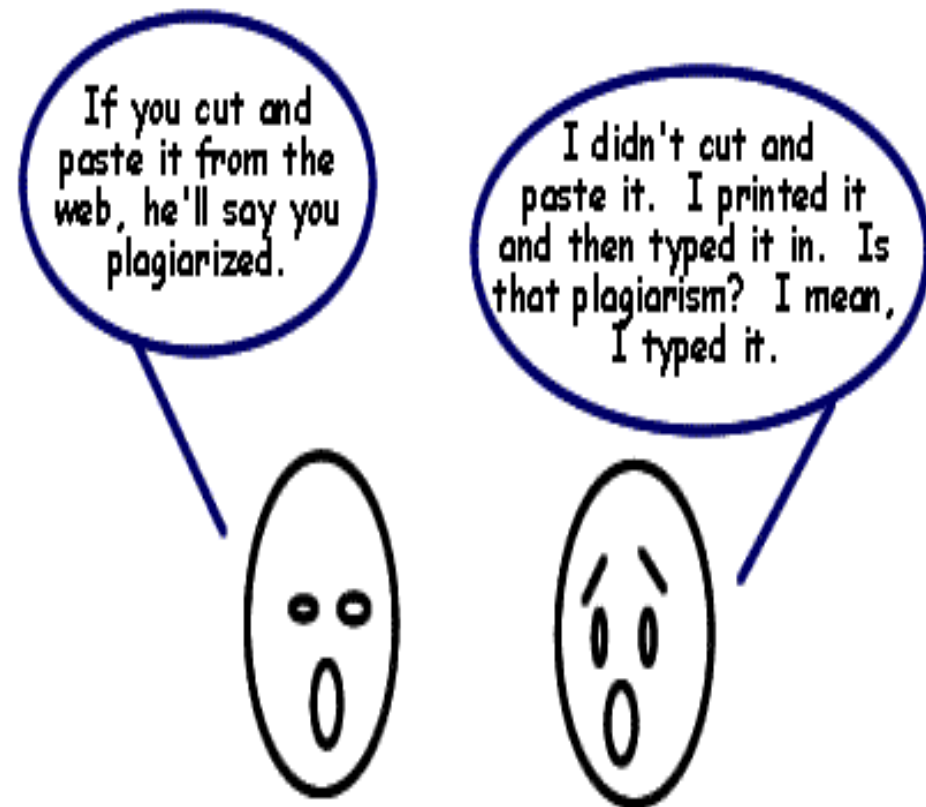
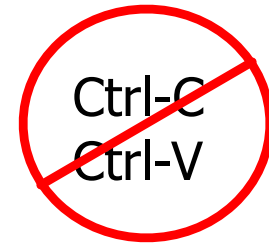
•<http://oscourse.github.io/policies.html>

•Dishonesty →

- You can get an F grade
- Be referred to the Dean's office

•Its better to submit your own imperfect own than to submit a perfect copied one.

- You get partial grades for incomplete work.
- But you'll get F for copied work.



http://library.kcc.hawaii.edu/main/instruction_info/plagiarism1.html

Missed Exams/Assignments

- Generally, no makeup exams/assignments.
 - Except for medical emergencies or jury duty when accompanied with valid documentation.
- Please plan your other commitments (travel, interviews, etc) around deadlines.

Have a great semester!