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Course Name: Principles of Computer Systems Design

Course Number: ECE499/599

Course Credits: 4

**Class Meeting Times**

*Lecture: Monday & Wednesday 4:00-5:50 pm, Milam Hall (MLM) 202*

**Prerequisite and/or Corequisite**

*Digital design; introduction to programming or data structures/algorithms. ECE 375, CS 271, CS 274 or instructor approval.*

# Catalog Course Description

*The design of hardware and software in computer systems ranging from personal devices to large-scale distributed, networked computers is an increasingly complex undertaking and requires understanding not only of individual sub-systems, such as the micro-processor, but also the interactions among sub-systems. This class provides a broad introduction to the main principles and abstractions for engineering computer systems, and in-depth studies of their use on computer systems across a variety of designs, be it an operating system, a client/server application, a database server, or a fault-tolerant disk cluster. Design/programming assignments and a project will be assigned in this class. These entail an exploration of a topic related to the design of a computer system through implementation of a prototype. The assignments and project will require significant software programming using the Python high-level language.*

# Course Content

| ***Week*** | ***Topic*** | ***Assessment (optional)*** |
| --- | --- | --- |
| *1* | *Class overview; systems and complexity, fundamental abstractions* | *Quiz* |
| *2* | *Naming introduction; naming and layers; file system case study* | *Quiz* |
| *3* | *Client-service modularity; network file system case study* | *Quiz* |
| *4* | *Virtualization abstractions; virtual links, virtual memory* | *Quiz* |
| *5* | *Processor virtualization; threads* | *Midterm exam* |
| *6* | *Designing for performance* | *Quiz* |
| *7* | *Network properties and layers; Ethernet, Internet case studies* | *Quiz* |
| *8* | *Fault tolerance* | *Quiz* |
| *9* | *Redundancy; atomicity with journals* | *Quiz* |
| *10* | *Atomicity with logs; locks* | *Quiz* |
| *Finals* |  | *Final exam* |

# Course Specific Measurable Student Learning Outcomes

* *Students will be able to analyze and assess key modules of modern computer system designs by applying core principles learned in this class, building on a variety of case studies. Students will also be able to design a practical storage file system with increasing complexity from an in-memory local file system to a distributed client/server architecture.*
* *Students in the graduate-level course will additionally learn how to design a fault-tolerant storage system and to quantitatively analyze its performance in a class project.*
* *Students’ learning will be assessed through quizzes, homework programming assignments, a midterm and a final exam.*
* *Students in the graduate-level course will additionally be assessed through a class project.*

# Evaluation of Student Performance

|  |  |  |
| --- | --- | --- |
| ***Assignment*** | ***Total Points*** | ***Percentage of Final Grade*** |
| *Canvas quizzes (10)* | *100 each* | *2%* |
| *Homework assignments and design project for graduate course only (4)* | *100 each* | *38%*  *Note: the relative weight of each design assignment is calculated based on the relative amount of time allotted for each assignment* |
| *Midterm Exam* | *100* | *40%* |
| *Final Exam* | *100* | *20%* |
|  |  | *100%* |

*Letter grades will be assigned based on the distribution curve of final numeric grades of the class.*

# Learning Resources

* *Required textbook:*
  + *Title: “Principles of Computer System Design”*
  + *Author: Jerome E. Saltzer and M. Frans Kaashoek*
  + *Publication date and edition: Morgan Kaufmann, first edition, 2009*
  + *ISBN number: 9180123749574*

# Course Statements

**Academic Calendar**

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: <https://registrar.oregonstate.edu/osu-academic-calendar>

**Statement Regarding Students with Disabilities**

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu/). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations."

**Student Conduct Expectations link**: <https://beav.es/codeofconduct>

**Student Bill of Rights**

OSU has twelve established student rights. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: [https://asosu.oregonstate.edu/advocacy/rights](https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fasosu.oregonstate.edu%2Fadvocacy%2Frights&data=04%7C01%7Cmeilianty.gunawan%40oregonstate.edu%7C7dcbe43a7f474303984108d9d13aec20%7Cce6d05e13c5e4d6287a84c4a2713c113%7C0%7C0%7C637770873255816508%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=Ws9zCHbxEKCPT4I4s9A8nivAehvFWhTRz7I6dpQEA9w%3D&reserved=0)

**Reach Out for Success**

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [oregonstate.edu/ReachOut](https://counseling.oregonstate.edu/reach-out-success). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)

**Student Evaluation of Courses**

During Fall, Winter, and Spring term the online Student Learning Experience surveys open to students the Wednesday of week 9 and close the Sunday before Finals Week. Students will receive notification, instructions and the link through their ONID email. They may also log into the system via MyOregonState or directly at [beaves.es/Student-Learning-Survey](https://beav.es/Student-Learning-Survey). Survey results are extremely important and are used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to “sign” their comments, agreeing to relinquish anonymity of written comments) and are not available to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.