Warning

- You are now taking the most challenging course in the software track
- Lectures will be easy, but projects will not
Introduction

- **Schedule**
  - 10:30 – 11:45 (Mon. & Wed.)
  - Lecture room: #400126, Semiconductor Bldg.

- **Course homepage**
  - [http://csl.skku.edu/SSE3044F15/](http://csl.skku.edu/SSE3044F15/)
  - Lecture slides, announcements, exam scores, projects, etc.
  - Don’t waste your time in i-Campus

- **TA**
  - 현병훈: gusqudgns@csl.skku.edu
  - #85561 in Corporate Collaboration Center
About Me

- **Jinkyu Jeong**
  - Assistant professor @ SSE
  - Computer Systems laboratory
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  - Email: jinkyu@skku.edu
  - URL: [http://csl.skku.edu/People/Jinkyu](http://csl.skku.edu/People/Jinkyu)
  - Tel: 031-290-7692
  - Office hours: 13:00~14:00 in Thursday & Friday
  - Email contact is preferred
### System Software Track

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<td>임베디드시스템 설계</td>
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<td>기초전기회로2</td>
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<td>SoC설계</td>
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What is OS?

- Computer systems internals
Why Do We Learn OS?

- To graduate?
- To make a better OS or system
  - Functionality
  - Performance/cost
  - Reliability
  - Energy efficiency
- To make a new hardware up and running
- To design OS-aware hardware
- To understand computer systems better
- Just for fun
Prerequisites

- C programming skills
- Basic knowledge of Unix/Linux systems
- SSE2030 (Introduction to Computer Systems) or CSE2003 (System Programming) or SWE2001 (System Programming)
- ICE3003 (Computer Architecture)
Textbook

- Operating System Concepts
  - 9th Edition
  - Written by A. Silberschatz, P. B. Galvin and G. Gagne
  - Published by Wiley & Sons Inc.
  - 2014
References (1)

- Operating Systems: Internals and Design Principles (8th ed.)
  - William Stallings
  - Prentice Hall, 2014

- Modern Operating Systems (4th ed)
  - Andrew S. Tanenbaum,
  - Prentice Hall, 2014
References (2)

- **For Linux:**
  - *Understanding the Linux Kernel* (3rd ed.)
  - D. Bovet and M. Cesati,
  - O’Reilly & Associates, 2015

- **For Windows:**
  - *Windows Internals* (6th ed.)
  - Mark E. Russinovich, David A. Solomon, and Alex Ionescu,
  - Microsoft Press, 2012

- **For Solaris:**
  - *Solaris Internals*
  - Richard McDougall and Jim Mauro
  - Sun Microsystems, 2001
Course Plan

- Lectures
  - General operating system concepts
  - Case study: Linux

- Hands-on projects
  - Using Pintos instructional OS
Lecture Topics

- Operating system structure overview
- Processes and threads
- CPU Scheduling
- Synchronization
- Deadlocks
- Memory management
- Virtual memory
- I/O systems
- Storage
- Filesystems
- Machine virtualization
Pintos Projects (1)

What is Pintos?

- An instructional operating system based on Nachos
- Developed by Ben Pfaff @ Stanford University
- A real, bootable OS for 80x86 architecture
  - Run on a regular IBM-compatible PC or an x86 simulator
- Written in C with minimal assembly code
Pintos Projects (2)

- Initially, the source tree of Pintos has a skeleton
  - Do nothing but testing the functionality
- You are supposed to fill in the empty code to provide following features
  - Thread scheduling
  - User programs
  - Virtual memory management
Pintos Projects (3)

- Lab session
  - A separate class with the TA
  - Once a week (mandatory)
  - Project announcement
  - Q&A
  - Hints & helps
  - Oral tests
  - ...

- Lab time?
### Project Schedule

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Duration</th>
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<tr>
<td>Project 0 (Warming-up)</td>
<td>1 week</td>
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<tr>
<td>Project 1 (Threads)</td>
<td>2 weeks</td>
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<tr>
<td>Project 1 Oral test</td>
<td>1 week</td>
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<tr>
<td>Project 2 (User programs)</td>
<td>4 weeks</td>
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<tr>
<td>Project 2 Oral test</td>
<td>1 week</td>
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<tr>
<td>Project 3 (Virtual memory)</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Project 3 Oral test</td>
<td>1 week</td>
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- The schedule is subject to change
Class Policies (1)

- **Grading policy (subject to change)**
  - Class attendance: 10%
  - Exams: 35% (mid-term & final)
  - Projects: 55%

- **Class attendance policy**
  - If you miss any one of the exams, you will fail this course
  - No lateness is allowed
  - Up to four absences will be tolerated
Class Policies (2)

- **Cheating policy**
  - **What is cheating?**
    - Copying another student’s solution (or one from the Internet) and submitting it as your own
    - Allowing another student to copy your solution
  - **What is NOT cheating?**
    - Helping others use systems or tools
    - Helping others with high-level design issues
    - Helping others debug their code
  - **Penalty for cheating:**
    - Severe penalty on the grade and report to dept. chair
  - **Ask helps to your TA if you experience any difficulty**
Keys to Success

- Read textbook exhaustively
- Think, think, think
- Begin your project assignments as early as possible
Questions?