



THE UNIVERSITY of EDINBURGH
informatics

Operating Systems (INFR10079) 2020/2021 Semester 2

Course Overview

Antonio Barbalace: abarbala@inf.ed.ac.uk

Tom Spink: tspink@inf.ed.ac.uk

Michel Steuwer: mstewer@inf.ed.ac.uk

Luo Mai: lmair@inf.ed.ac.uk

Antonio Barbalace #1



- Education

- BS Computer Engineering University of Padova, Italy
- MS Computer Engineering University of Padova, Italy
- PhD in Industrial Engineering University of Padova, Italy



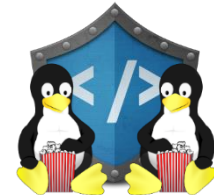
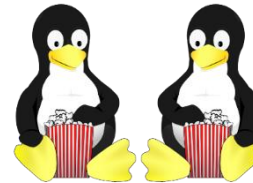
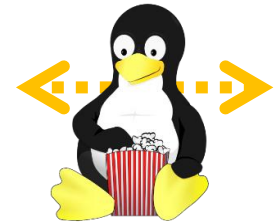
- Experience

- **Research Staff Member** National Research Council (CNR), Italy
- **Visiting Researcher** Instituto Superior Técnico (IST) Lisboa, Portugal
- **Postdoc** in Computer Engineering, Virginia Tech, VA
- **Research Assistant Professor** in Computer Engineering, Virginia Tech, VA
- **Principal Research Scientist and Manager** Huawei Research, Germany
- **Assistant Professor** in Computer Science, Stevens Institute of Technology, NJ
- **Senior Lecturer** in the School of Informatics, The University of Edinburgh, UK

Antonio Barbalace #2



- Research Interests
 - Systems
 - Software
 - System software
 - » Hypervisor
 - » **Operating Systems**
 - » Runtime Libraries
 - » Compiler
 - Computer architecture
 - Networking
 - Storage
 - **Scheduling**
 - **Throughput, fair**
 - **Real-time**



Tom Spink

- ...

Michel Steuwer

- ...

Luo Mai

- ...

How to Get The Most Out of the Course

- Read ahead and use **Learn/Piazza** to ask questions
- Attend and ask questions during the live **Review Sessions**
- Do the coursework well, schedule smartly!
- Exam questions are a mix of simple conceptual and challenging applied ones
- If you are struggling, **ask earlier rather than later**
- If you don't understand – **ask!**

Course Aims

- Understanding the *concepts* that underlie OS
- *Purpose, structure and functions* of OS
- Illustration of *key OS aspects* by example

Course Outcomes

- **By the end of the course** you should be able to
 - Describe, contrast and compare differing structures for OSES
 - Understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files
- **During the** practical exercise and associated self-study, you will
 - Become familiar (if not already) with the C/C++ languages, gcc compiler, and Makefiles
 - Understand the high-level structure of the OS kernel both in concept and source code
 - Acquire a detailed understanding of at least three aspects of the OS kernel

Course Structure

- Introduction: overview of OS
- Basic OS structure and functions
- Process management, scheduling, concurrency
 - Processes and threads implementations
 - Scheduling: CPU utilization and task scheduling
 - Concurrency: mutual exclusion, synchronization, deadlock, starvation, etc.
- Memory management
 - Physical memory, early paging and segmentation techniques
 - Modern virtual memory concepts and techniques
 - Paging policies
- Storage Management
 - Low level I/O functions, high level I/O functions and filesystems
- Other topics, e.g., virtualization

Course Schedule (Tentative)

- Overview
- Introduction
- OS Structure
- Device Drivers
- **Introduction to CW1**
- Processes and Threads (2)
- Scheduling
- **Introduction to CW2**
- Memory and Virtual Memory (3)
- **Introduction to CW3**
- **Review Session 1 – live!**
- Disks
- File Systems
- **Introduction to CW4**
- Synchronization, Semaphore/Mutexes, Monitors (3)
- Deadlock
- Virtual Machines
- **Reviews Session 2 – live!**

Administrative Details #1

- Instructors
 - Antonio Barbalace (**Lectures**)
 - IF-1.12
 - abarbala@inf.ed.ac.uk
 - Tom Spink (**Coursework**)
 - IF-1.46
 - tspink@inf.ed.ac.uk
- Support Instructors
 - Michel Steuwer
 - IF-2.04B
 - mstewer@inf.ed.ac.uk
 - Luo Mai
 - IF-2.03
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Administrative Details #2

- Teaching Assistants (TAs)
 - Dimitra Giantsidi s1879801@sms.ed.ac.uk
 - Resul Tugay s1822053@sms.ed.ac.uk
 - Kimberley Stonehouse s1615906@sms.ed.ac.uk
 - Karim Manaouil k.manaouil@sms.ed.ac.uk
- Communication
 - Instructors/TAs
 - Course mailing list: os-students@inf.ed.ac.uk
 - Q&A via Piazza

Administrative Details #3

- When and Where: (Semester 2)
 - Tuesday 10:00-10:50 @ **online** (review session live)
 - Thursdays 10:00-10:50 @ **online** (review session live)
- Course descriptor
 - <http://www.drps.ed.ac.uk/20-21/dpt/cxinfr10079.htm>
- Course webpage
 - <http://course.inf.ed.ac.uk/os>
 - Schedule w/ lecture slides, assignments, TA contact info, past exam papers, examinable material, etc.

Live! Review Sessions

- **2 Review Session**
- Face 2 face @ School, and live-streamed
- Currently, scheduled on
 - 2nd of March 2021, 10:00-10:50
 - Informatics Forum, G.07 (**max cap 20pax**)
 - 1st of April 2021, 10:00-10:50
 - Appleton Tower, Lecture Theatre 5 (**max cap 29pax**)
- Check out how to attend based on current regulations
 - If you cannot attend, **do ask question online**

Assessment

- Exam: **50%** and Practical exercise: **50%**
- **4 practical exercises** (Coursework, **CW**)
 - **Part 1:** Device Driver
 - Due: 4pm on Thurs, 4th of February (12% of practical)
 - **Part 2:** Scheduler
 - Due 4pm on Thurs, 25th of February (12% of practical)
 - **Part 3:** Memory Manager
 - Due 4pm on Thurs, 11th of March (13% of practical)
 - **Part 4:** File System
 - Due 4pm on Thurs, 25th of March (13% of practical)
 - Check *Learn* -> *Course Material* -> *Coursework Specification*
- **Exam**
 - Past exam papers: <http://www.exampapers.ed.ac.uk>

Textbooks

- **Main Textbook:** A. Silberschatz, P. Galvin and G. Gagne, "Operating System Concepts", 10th Edition, John Wiley, 2018
- Most of the other major OS texts are also suitable
- You are expected to read/know Silberschatz 10th edition
- Slides are a supplement not a replacement for the book
- If in doubt, read the book!
- **Notes**
 - We will **not cover** anything about Java
 - We will **mostly focus** on Linux/UNIX

Acknowledgments

Slides from many sources (ab)used in this course

Mike O'Boyle, Myungjin Lee, Ed Lazowska, Abraham Silberschatz allowed use of teaching slides for this course