Introduction to the Operating Systems Course

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Operating Systems course

Operating Systems (01JEZBV)
(6 credits, 60 hours)

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www: https://www.skenz.it/ss

(link to courses, CV, publications, theses)

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Material

❖ Slides, information, programs, tutorials, previous exam texts, labs assignments and solutions, can be found at the address:

<div align="center">

https://www.skenz.it/os

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❖ Slides:

  ➢ u = unit

  ➢ s = section

  ➢ e = exercise

Mailing list and Communications

❖ Mailing list:

- ➢ os@skenz.it
- ➢ all course students have been subscribed to the mailing list
  - ▪ if you write to os@skenz.it all read what you write
- ➢ use it to **communicate with your colleagues** and **solve problems together**
- ➢ **to ask questions that may interest your colleagues**
  - ▪ e.g., problems on solving exercises, question about Linux commands, about the exam

❖ Main communications will be send by email **both** through the "portale della didattica" and the mailing list

Introduction

❖ Organization

  ➢ Schedule

  ▪ Lesson/Practice: 3 blocks of 1.5 hours

  ● not always used, see https://www.skenz.it/os for the updated calendar

  ▪ Laboratory: 1 block of 1.5 hours

  ➢ There is no formal distinction between teaching and practice hours

  ▪ Theory is introduced, and examples and exercises can be illustrated in the same block

  ➢ Laboratory (**really important complement to theory**)

  ▪ Practice with Linux operating system

  ▪ Application of the theoretical aspects on Linux

  ▪ Script programming (bash)

Introduction

❖ Topics

➢ Introduction to Operating Systems

➢ Processes (concept, control, signals, IPC, etc.)

➢ Thread (concept, Pthread library, etc.)

➢ Synchronization (s/w, h/w, semaphores, etc.)

➢ Deadlock

➢ Linux environment

▪ Commands and system administration

▪ Shell (UNIX/Linux command interpreter)

▪ Scripting languages (bash)

Introduction

❖ Topics

➢ Linux useful in many aspects of working life (systems engineers, web servers, scripting, data analysis, machine learning, ...)

➢ *Preparing for Google Technical Internship Interviews*

  ▪ *...*

  ▪ *Operating systems*

    ● *You should understand processes, threads, concurrency issues, locks, mutexes, semaphores, monitors and how they all work. Understand deadlock, livelock and how to avoid them. Know what resources a process needs and a thread needs. Understand how context switching works, how it's initiated by the operating system and underlying hardware. Know a little about scheduling. The world is rapidly moving towards multi-core, so know the fundamentals of "modern" concurrency constructs*

Textbooks

❖ Textbooks

> Theoretical aspects

- A. Silberschatz, P. Baer, and G. Gagne, Operating System Concepts, Ninth Edition, John Wiley & Sons Inc., 919 pages, 2012, ISBN 978-1-118-06333-0

Alternative
(+ concise,
+ technical)

- Andrew S. Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall, 1076 pages, 2009, ISBN 978-0-136-00663-3

> UNIX/Linux environment

- W. R. Stevens, and S. A. Rago, Advanced programming in the UNIX Environment, Third Edition, Addison-Wesley Publishing Company, 927 pages, 2013, ISBN 978-0-321-63773-4

In addition to the **slides**, most answers can be found on the **Internet**

Exam rules

❖ **Exam rules**

➢ There are no intermediate tests, exemption, or alternative projects

➢ The access to the examinations rules are defined and described in the "Manifesto degli Studi" of the current academic year on any subsequent amendments thereof

➢ It is essential to book to be admitted at an exam

Exam rules

❖ Examination

➢ Written test lasting **100** minutes

➢ There is no oral, or possibility of oral

➢ During the test is permitted

- The use of **2 sheets** ("approved forms") provided by the teacher (commands, bash) in original (not handwritten)

- **No other material is allowed** (no notes, no textbooks, no computers, no cell phones, etc.).

➢ The test includes **6 questions**

- **3/4** questions/theoretical exercises

- **2/3** questions/exercises on C and Linux (programs, commands, scripts)

➢ You can withdraw during the test

Exam rules

❖ Evaluation of the examination
  ➢ Each exercise has a weight equal to **6** points
    ▪ 6x6 = 36 ...

Example of theory question

➢ Show **the process generation tree and the output lines** produced by the execution of this program:

```
#include …
int main (){
  int i, j=-1;
  for (i=0;i<3;i++){
    printf ("i=%d\n", i);
    if (!fork()){
      for (j=2;j>0;j--){
        fork();
        execlp ("echo", "i", "j", (char *) 0);
      }
    }
  }
}
```

Example of practice question

➢ Implement a **bash** script that takes two arguments, **n** and **f**. The script has to append in file **f** the content of the first **n** regular files (analyzed in alphabetical order) in the user home directory tree. The script will also append at the end of the content of each file, its basename. The script must produce a warning message on the console if it finds less than **n** files.