

## Operating Systems (E761060)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**                      **Study time 180 h**

**Course offerings and teaching methods in academic year 2023-2024**

A (semester 2)	Dutch	Gent	lecture seminar
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**Lecturers in academic year 2023-2024**

Van Den Breen, Wim	TW05	lecturer-in-charge
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**Offered in the following programmes in 2023-2024**

	<b>crdts</b>	<b>offering</b>
<a href="#">Bachelor of Science in Engineering Technology(main subject Information Engineering Technology)</a>	6	A
<a href="#">Linking Course Master of Science in Information Engineering Technology</a>	6	A
<a href="#">Preparatory Course Master of Science in Information Engineering Technology</a>	6	A

**Teaching languages**

Dutch

**Keywords**

Architecture of operating systems, proces and memory management, concurrency, processor scheduling, I/O management. Unix, scripting languages, system programming

**Position of the course**

The course is made out of two parts: architecture of modern operating systems and the Linux operating system (system programming and the scripting language bash)

- Architecture of operating systemsStudy of the architecture and of the basic principles of modern operating systems. Acquire experience in order to better understand how to manage computer systems.
- study of the Linux operating system.
- Getting acquainted with how the Linux operating system is internally structured and how it functions. Using the bash scripting language students will learn to perform the most important management tasks.

**Contents**

Architecture of Operating Systems:

- Basis principles of computer architecture: interrupts, kernel mode and user modus, the memory hierarchy, caching
- Process Management: symmetric and asymmetric multiprocessing, multitasking, process states and transitions, process control information, process identification and processor state information, process creation and switching, kernel-level and user-level threads, process scheduling
- Concurrency: mutual exclusion, process synchronisation, semaphores, sequencers and event counters, monitors, deadlocks
- Memory management: addressing and adress translation, paging and segmentation, virtual memory, pagefaults

Linux

- Scripting for system administration (basic bash commands, variables and parameters, expressions, conditional and iterative loops, input and output, processing large log files)
- System programming (universal I/O interaction, memory layout of processes, virtual memory management, process creation and termination, child processes, thread creation and termination, using pipes, using semaphores)

**Initial competences**

Strict prerequisites: none

Advisory initial competences: Knowing the basic technologies of computer technology. Being able to write error-free programs in C/C++, making using of pointers

### **Final competences**

- 1 Understand how the concept a of process implements multitasking, and how it is supported by an 1 operating system.
- 2 Assess whether or not an application should use multiple threads, and, if so, which model should be 1 followed.
- 3 Understand which alternatives an operating system has to perform its scheduling tasks.
- 4 Master various techniques to treat concurrency problems.
- 5 Apply semaphores correctly for mutual exclusion and process synchronization.
- 6 Understanding how both an operating system and an application can handle deadlocks
- 7 Understand memory management models, and the techniques they use.
- 8 Understand and configure the inner workings of the Linux operating system.
- 9 Master the Linux and UNIX programming interface

### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Seminar, Lecture

### **Extra information on the teaching methods**

architecture and linux: lecture

Linux system programming and the scripting language bash: lecture + practical PC room classes

### **Learning materials and price**

course in dutch (ca. 5 euro). Additional presentation material (slides), used during lectures, is available on Ufora. Exercises and their solutions are posted on the electronic learning environment.

### **References**

- Deitel, Harvey M., Deitel, Paul J. en Choffnes, David R., Operating Systems, Prentice Hall, 2004, ISBN 978-013182827-8.
- O'Gorman, John, Operating System with Linux, Palgrave, 2001, ISBN 978-033380288- 5.
- Silberschatz, Abraham, Galvin, Peter Baer en Gagne, Greg, Operating System Concepts Essentials, Wiley, 2013, ISBN 978-1118804926.
- Kerrisk, Michael, The Linux Programming Interface, No Starch Press, 2010, ISBN 978-1593272203

### **Course content-related study coaching**

An appointment with the lecturer can always be made

### **Assessment moments**

end-of-term assessment

### **Examination methods in case of periodic assessment during the first examination period**

Skills test, Written assessment with open-ended questions

### **Examination methods in case of periodic assessment during the second examination period**

Skills test, Written assessment with open-ended questions

### **Possibilities of retake in case of permanent assessment**

not applicable

### **Calculation of the examination mark**

45% written examination

55% % examination with exercises on computer