Syllabus

Course Description

Course Title	Operating Systems and Networking
Course Code	42435
Course Title Additional	
Scientific-Disciplinary Sector	INFO-01/A
Language	English
Degree Course	Bachelor in Electronic and Information Engineering
Other Degree Courses (Loaned)	
Lecturers	dr. Abdul Haleem Butt, AbdulHaleem.Butt@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/54504
Teaching Assistant	
Semester	Second semester
Course Year/s	2
CP	6
Teaching Hours	40
Lab Hours	20
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	· Operating Systems Structures · Processes, Threads and Concurrency · CPU Scheduling and Synchronization · Memory and Mass-Storage · I/O, File Systems · Networks and Distributed Systems
Course Topics	The goal of this module is to provide students with a solid understanding of operating systems, their core components, and their principal functionalities. Students should develop a strong grasp of scheduling algorithms, process management and

	synchronization techniques, memory management strategies, and the fundamentals of networking and distributed systems building the conceptual and practical foundation needed to understand how operating systems manage hardware resources, coordinate concurrent execution, and communicate over networks. Topics Covered 1-Operating Systems Structures Architecture, design approaches, OS services, and system calls. 2- Processes, Threads and Concurrency Process concept and states, process control blocks, threads, and multithreading. 3- CPU Scheduling and Synchronization Scheduling algorithms and synchronization mechanisms for coordinating concurrent processes. 4- Memory and Mass Storage Techniques for memory allocation and management, and management of mass storage devices. 5- I/O, File Systems I/O subsystems, device management, and file system concepts. 6- Networks and Distributed Systems Fundamentals of networking and distributed system concepts.
Keywords	Operating Systems, CPU and Memory, I/O, C programming
Recommended Prerequisites	For the entire module, knowledge and skills in C programming fundamentals, basic computer architecture, number systems, data structures, and basics mathematics are recommended.
Propaedeutic Courses	
Teaching Format	The course includes 40 hours frontal lectures and 20 hours lab sessions.
Mandatory Attendance	Attendance is not compulsory; non-attending students may contact the lecturer at the start of the course to get support on the modalities of the independent study
Specific Educational Objectives and Learning Outcomes	Knowledge and Understanding – Know the fundamental principles of programming. – Know the innovative aspects of the last generation of operating systems.

	Applying knowledge and understanding – Ability to develop programs to interact with microcontrollers and the operating systems of modern computers. Ability to make judgments – Be able to work autonomously according to the own level of knowledge and understanding. Communication skills – Be able to use one of the three languages English, Italian and German, and be able to use technical terms and communication appropriately. Learning skills – Have developed learning capabilities to pursue further studies with a high degree of autonomy. – Be able to follow the fast technological evolution and to learn cutting edge IT technologies and innovative aspects of last generation information systems
Specific Educational Objectives and Learning Outcomes (additional info.)	The goal of this course is to provide students with a solid understanding of operating systems, their core components and their main functions. Students will learn the fundamental principles and techniques used by modern operating systems, including process and thread management, CPU scheduling algorithms, process synchronization, and memory management. On completing the course, students will understand how an operating system manages hardware resources and coordinates the execution of concurrent programs.
Assessment	Assessment includes programming assignments aimed at implementing operating system functionalities or simulating system behavior, as well as a written exam designed to evaluate the understanding of fundamental concepts and in-depth knowledge of operating systems. The exam features open-ended questions that cover both theoretical topics and practical lab exercises. Non-attending students are expected to contact the lecturer at the beginning of the course to arrange an appropriate plan for

	independent study.
Evaluation Criteria	The grade is based entirely on a written exam, which consists of two parts: a written part (counting 2/3 of the exam) assessing conceptual understanding, problem-solving skills, and the ability to explain key principles, and a practical part (counting 1/3 of the exam) evaluating hands-on proficiency in applying the concepts through code. The practical part is assessed based on the correctness of the solution, the structure and readability of the code, and the ability to explain the implementation. Working students or those who do not attend the labs can present or solve a sub-set of the lab exercises during the final exam. A passing grade in both parts is required to pass the module.
Required Readings	– Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, and Riccardo Melen.Sistemi operativi. Concetti ed esempi. Ediz. Mylab. Con Contenuto digitale peraccesso online. Pearson, 10th edition, February 2019. ISBN 978-88-919-0455-3. – C tutorial at https://www.w3schools.com/c/
Supplementary Readings	Oracle VM VirtualBox - Downloads | Oracle Technology Network | Oracle Operating Systems: Three Easy Pieces bgnet_usl_bw_1.pdf
Further Information	Ubuntu (https://ubuntu.com): the operating system used in all lab sessions Oracle VirtualBox (https://www.virtualbox.org): to run Ubuntu in a virtual machine GCC, the GNU C compiler (https://gcc.gnu.org): to compile the lab programs Standard Linux tools (htop, strace and others), installed during the first lab Wireshark (https://www.wireshark.org): to analyse network traffic
Sustainable Development Goals (SDGs)	Quality education