Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Operating Systems
Code der Lehrveranstaltung	76270
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	NN
Sprache	Englisch; Italienisch
Studiengang	Bachelor in Informatik
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Alessandro Artale, Alessandro.Artale@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/3026 dr. Abdul Haleem Butt, AbdulHaleem.Butt@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/54504
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1
KP	9
Vorlesungsstunden	50
Laboratoriumsstunden	40
Stunden für individuelles Studium	135
Vorgesehene Sprechzeiten	27
Inhaltsangabe	Module 1: Operating Systems and Networking • Operating Systems Structures • Processes, Threads and Concurrency

	• CPU Scheduling and Synchronization • Memory and Mass-Storage • I/O, File Systems • Networks and Distributed Systems Module 2: Programming in C • Data types, variables, operators, control structures, functions, dat structures: arrays and pointers • Dynamic memory allocation and correct memory management, dynamic data structures (e.g. linked lists, stacks, and queues), • Debugging, file handling, multi-processing (i.e. fork/exec/etc.), and multi-threading
Themen der Lehrveranstaltung	This course belongs to the type "Attività formative di base" and the subject area is "Informatica". The goal of the module M1: Operating Systems and Networking, of this modular course, is to provide students with a solid understanding of operating systems and their core components and functionalities, scheduling algorithms, process management and synchronization, as well as memory management techniques, computer Networking principles and the TCP/IP model, and distributed file system principles. The second module, Programming in C, is devoted to teach the fundamentals of programming in C, and algorithmic techniques implementing some of the functionalities of Operating Systems.
Stichwörter	Operating Systems, CPU and Memory, I/O, Computer Networks, C programming
Empfohlene Voraussetzungen	We recommend the following courses as a prerequisite: - Introduction to Programming; - Computer Systems Architecture.
Propädeutische Lehrveranstaltungen	
Unterrichtsform	The course includes frontal lectures and lab sessions.
Anwesenheitspflicht	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.
Spezifische Bildungsziele	Knowledge and Understanding

und erwartete Lernergebnisse	- D1.2 Know in details the fundamental principles of programming. - D1.3 Have a solid knowledge of the most important data structures and programming techniques. - D1.9 Know the principles of computer networks - D1.20 Know the innovative aspects of the last generation of operating systems. Applying knowledge and understanding - D2.2 Be able to develop small and medium size programs using different programming languages and paradigms. - D2.3 Be able to solve problems using programming methodologies. - D2.4 Ability to develop programs to interact with microcontrollers and the operating systems of modern computers. Make judgements - D3.1 Be able to collect and interpret useful data and to judge information systems and their applicability. - D3.2 Be able to work autonomously according to the own level of knowledge and understanding. Communication skills - D4.1 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 - D5.1 Have developed learning capabilities to pursue further studies with a high degree of autonomy. - D5.3 Be able to follow the fast technological evolution and to learn cutting edge IT technologies and innovative aspects of last generation information systems.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	Assessment for module M1, is based on 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. Assessment for module M2 includes programming assignments to be done in front of a Laptop aimed at implementing either the management of the various data structures used in the C Language or operating system functionalities.
Bewertungskriterien	The final grade is a weighted average of the grades obtained in the two modules: Operating Systems and Networking (70%) and Programming in C (30%). The Operating Systems and Networking module is assessed through a single written exam, divided into two parts: Part 1: Theory (70%of the module grade). Written questions on the concepts delivered during the lectures. This part assesses conceptual understanding, problem-solving skills, and the ability to explain key principles. Part 2: Lab (30% of the module grade). Written questions and exercises on the topics covered in the lab sessions, in which students write, complete or explain programming code. This part assesses the practical understanding of the theory concepts, and is evaluated based on the correctness of the solution, the structure and readability of the code, and the ability to explain the implementation. Attending students can cover the practical Lab part during the semester by participating in Lab sessions and submitting exercises. The Programming in C module is assessed via a programming activity to be done during the exam in front of a Laptop. The program is assessed based on the clarity of the program, the correct output generated when running the program, the kind of data structures used and the way they are accessed. A passing grade in both parts is required to pass the module. All grades reflect both correctness and, to a lesser extent, clarity of answers. Attending and non-attending students are assessed in the same way.

Pflichtliteratur	• Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, and Riccardo Melen. Sistemi operativi. Concetti ed esempi. Ediz. Mylab. Con Contenuto digitale per accesso online. Pearson, 10th edition, February 2019. ISBN 978-88-919-0455-3. • C tutorial at https://www.w3schools.com/c/
Weiterführende Literatur	• Dennis Ritchie and Brian W. Kernighan. The C Programming Language. • Andrew Tanenbaum and Herbert Bos. Modern Operating Systems. Pearson, Boston, 4th edition, March 2014. ISBN 978-0-13-359162-0.
Weitere Informationen	The following software will be used during the course: - Ubuntu (https://ubuntu.com) - C compiler (https://gcc.gnu.org) - Oracle VirtualBox (https://www.virtualbox.org) - Visual Studio Code (https://code.visualstudio.com) - Code Runner (https://marketplace.visualstudio.com/items?itemName=formulahendry.code-runner) - clang-format (https://docs.kernel.org/dev-tools/clang-format.html)
Ziele für nachhaltige Entwicklung (SDGs)	Hochwertige Bildung

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Operating Systems M1:Operating Systems and Networking
Code der Lehrveranstaltung	76270A
Wissenschaftlich-disziplinärer Bereich	INFO-01/A
Sprache	Englisch
Dozenten/Dozentinnen	dr. Abdul Haleem Butt, AbdulHaleem.Butt@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/54504
Wissensch.	

Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	40
Laboratoriumsstunden	20
Stunden für individuelles Studium	90
Vorgesehene Sprechzeiten	18
Inhaltsangabe	- Operating Systems Structures - Processes, Threads and Concurrency - CPU Scheduling and Synchronization - Memory and Mass-Storage - I/O, File Systems - Networks and Distributed Systems
Themen der Lehrveranstaltung	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.
Unterrichtsform	The course includes 40 hours frontal lectures and 20 hours lab sessions.
Pflichtliteratur	• Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, and Riccardo Melen. Sistemi operativi. Concetti ed esempi. Ediz. Mylab. Con Contenuto digitale per accesso online. Pearson, 10th edition, February 2019. ISBN 978-88-919-0455-3.
Weiterführende Literatur	Operating System Concepts - slides

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Operating Systems M2: Programming in C
Code der Lehrveranstaltung	76270B
Wissenschaftlich-disziplinärer Bereich	INFO-01/A
Sprache	Italienisch
Dozenten/Dozentinnen	Prof. Alessandro Artale, Alessandro.Artale@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/3026
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	3
Verantwortliche/r Dozent/in	
Vorlesungsstunden	10
Laboratoriumsstunden	20
Stunden für individuelles Studium	45
Vorgesehene Sprechzeiten	9
Inhaltsangabe	• Data types, variables, operators, control structures, functions, dat structures: arrays and pointers

	• Dynamic memory allocation and correct memory management, dynamic data structures (e.g. linked lists, stacks, and queues), • Debugging, file handling, multi-processing (i.e. fork/exec/etc.), and multi-threading
Themen der Lehrveranstaltung	This course belongs to the type "Attività formative di base" and the subject area is "Informatica". The goal of this module is to provide students with a solid understanding of operating systems and their core components and functionalities, the fundamentals of programming in C, scheduling algorithms, process management and synchronization, as well as memory management techniques.
Unterrichtsform	The course includes frontal lectures and lab sessions.
Pflichtliteratur	• C tutorial at https://www.w3schools.com/c/ • C. Programming Language, Brian W. Kernighan e Dennis M. Ritchie
Weiterführende Literatur	Lecture Notes