

Specification for the book of courses

Study program		Computing and Informatics		
Module		Computer Systems Security		
Type and level of studies		Master studies		
The name of the course		Blockchain Technologies		
Lecturer (for lectures)		Janković S. Dragan, Ćirić M. Vladimir, Stanimirović S. Aleksandar		
Lecturer/associate (for exercises)		Davidović P. Nikola		
Lecturer/associate (for OFE)				
Number of ECTS	4	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	The aim of the course is to gain knowledge on advance distributed algorithms and data structures, which enable the understanding of blockchain concepts, as well as with the advanced technologies used for the implementation of such a systems.			
Course outcomes	It is expected for the students to be able to understand the principles and concepts of the blockchain technology, as well as to apply available tools and development environments to design and implement private and public blockchain systems. Also, students should be able to use technologies to develop and implement distributed applications using Ethereum platform.			
Course outline				
Theoretical teaching	Basic blockchain concepts. Decentralization. Communication within the decentralized system. Elements of cryptography, cryptographic primitives. Public key cryptography, PKI, RSA, ECC. Hash functions, SHA-1, SHA-2, MD5. OpenSSL. Fault tolerance and consensus algorithms. Cryptocurrencies and cryptoeconomics. Public and private blockchains. Bitcoin. Digital keys and address. Transactions. Mining, CPU, GPU, FPGA, ASIC. Alternative currencies. Ethereum. Smart contracts. Programming in Ethereum. Developer Tools. Hyperlegder. Blockchain applications.			
Practical teaching (exercises, OFE, study and research)	Digital wallet. The difference between the main Ethereum network and the test network. Programming in Solidity. Programming smart contract. Remix development environment. Basics of programming language Node.js and npm package manager. EC6 Javascript. Truffle tools. Setting up a smart object to blockchain. Web3.js and interaction with smart contract. Testing smart contract. React Basics of Web technology. Web applications.			
Textbooks/references				
1	Imran Bashir, "Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained", 2nd Edition, 978-1788839044			
2	Andreas Antonopoulos, Gavin Wood, "Mastering Ethereum: Building Smart Contracts and DApps", 978-1491971949			
3	Chris Dannen, "Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners", 1st ed. Edition, 978-1484225349			
4	Arshdeep Bahga, Vijay Madiseti, "Blockchain Applications: A Hands-On Approach", 978-0996025553			
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	0		
Teaching methods	Lectures, exercises, team projects, seminar.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam	Points	
Activity during lectures	10	Written exam	40	
Exercises	10	Oral exam		
Colloquia				
Projects	40			