



Course Syllabus

1. Course Title:

Cryptocurrencies and blockchain technologies

2. Academic Level:

Master

3. ECTS Credits:

5 ECTS

4. Semester:

3, autumn semester

5. School/Department:

Faculty of Management

6. Location:

200/1 Stachki Avenue, Rostov-on-Don

7. Instructor:

Associate Prof. Evgenia Ischukova. Email: uaishukova@sfedu.ru

8. Language of Instruction:

English

9. Course Description:

Design, development, and application features of modern cryptocurrencies based on blockchain technologies.

10. Course Aims:

- ✓ To form an idea of the main tasks and concepts of modern cryptocurrencies and blockchain systems;
- ✓ To study the protocols used to ensure the operation of blockchain systems;
- ✓ To study the formats used for consensus mechanisms, collective signature mechanisms, mechanisms for signing and distributing transactions, including blindly, as well as solving other problems, including for protecting blockchain systems;
- ✓ To study the methods of building smart contracts for modern blockchain platforms;
- ✓ To reveal the security properties of protocols;
- ✓ To give an idea of the vulnerabilities of blockchain systems.

11. Specific entry requirements (if any):

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12. Course Content:

Topic 1. Cryptographic methods for blockchain systems. Asymmetric cryptography. Development of keys for asymmetric systems. EDS, integrity control, Merkle tree.

Topic 2. Consensus protocols. Proof of Work, Proof of Stake, Byzantine Generals Problem, and more.

Topic 3. Identification-authentication protocols. Password schemes. Request-response schemes. handshake protocol.

Topic 4. Modern blockchain platforms.

Topic 5. Vulnerabilities of modern blockchain platforms. On the example of Ethereum, Hyper Ledger, EOS, NEO platforms.

Topic 6. Methods for building smart contracts. Smart contract for the Ethereum system. Solidity language.

Topic 7. Methods for building smart contracts. Smart contract for the Hyper Ledger system. Golang language.

Topic 8. Main vulnerabilities of the client application for working with the blockchain system.

Topic 9. Modern cryptocurrencies.

13. Intended Learning Outcomes:

The process of studying the discipline is aimed at the formation of elements of the following competencies

Know: 1) the basic principles of creating and using modern cryptocurrencies
 2) programming languages for writing a smart contract
 3) devices of modern blockchain platforms, modern cryptocurrencies

Be able to: 1) implement tokens based on modern blockchain platforms
 2) deploy a private network to work with modern blockchain platforms
 3) monitor changes in cryptocurrency rates, search for information on the blockchain database

Possess: 1) skills of analyzing the current state of the economy in the field of cryptocurrencies
 2) skills of writing and testing a smart contract
 3) skills of working with modern blockchain platforms

14. Learning and Teaching Methods:

When implementing various types of educational work (lecture course, practical classes), the principle of combining classroom and electronic forms of teaching is used. In lectures, interactive forms of communication with students are used in the form of analysis of specific tasks and algorithms, modern information technologies are used in the form of presentations using interactive whiteboards and projection equipment.

15. Methods of Assessment/Final assessment information:

The educational process of teaching the discipline includes classroom classes (lectures, practical classes) and independent work. In the end of the course students pass an exam. The lecturer and teachers who lead the classes control the attendance of all types of classroom classes.

16. Reading List:

1. Satoshi Nakamoto Bitcoin: A Peer-to-Peer Electronic Cash System <https://bitcoin.org/bitcoin.pdf>
2. BitcoinWiki https://en.bitcoin.it/wiki/Main_Page
3. Blockchain from the inside: how Bitcoin works <https://vas3k.ru/blog/blockchain/>
4. How Ethereum and smart contracts work <https://vas3k.ru/blog/ethereum/>
5. BaumankaCoin - a bicycle with 3000 lines or blockchain on fingers <https://habr.com/ru/post/340206/>
6. Daniel Drescher Blockchain Fundamentals: An introductory course for beginners in 25 small chapters / per. from English. A. V. Snastina. – M.: DMK Press, 2018. – 312 p.: ill.
7. Frolov A.V. Creation of Solidity smart contracts for the Ethereum blockchain. Practical guide / A. V. Frolov - "LitRes: Samizdat", 2019. - 258 p. / <https://www.litres.ru/aleksandr-frolov-198/sozdanie-smart-kontraktov-solidity-dlya-blokcheyna-et/chitat-onlayn/>