COURSE OUTLINE

GENERAL

SCHOOL	Sciences and Engineering		
ACADEMIC UNIT	Computer Science		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	COMP-387	**SEMESTER**	Spring
COURSE TITLE	Blockchain Programming		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2.5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialization
PREREQUISITE COURSES:	COMP-221
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After completion of the course students are expected to be able to:

- Describe the key components of a blockchain, including blocks, transactions, consensus mechanisms, and different blockchain architectures.
- Demonstrate proficiency in developing, testing, and deploying smart contracts on Ethereum and other blockchain platforms.
- Design and implement decentralized applications (Dapps) that interact seamlessly with backend blockchain infrastructures.
- Critically assess the potential impacts, both positive and negative, of blockchain

implementations across various sectors.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Working independently

Project planning and management

Criticism and self-criticism

Production of free, creative and inductive thinking

SYLLABUS

1. Introduction to Blockchain
2. Bitcoin basics: Bitcoin clients, APIs, exploration, transaction scripting.
3. Ethereum and Smart Contracts
4. Solidity Programming I
5. Solidity Programming II
6. Dapp Development Basics
7. Advanced Dapp Development
8. Alternative Blockchains
9. Layer 2 Solutions and Scaling
10. Blockchain Interoperability
11. Real-world Use Cases & Ethical Implications
12. Blockchain security, final project and review

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching / Χρήση ΤΠΕ* *Communication with students / Επικοινωνία με Φοιτητές*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Project (creating own blockchain application or currency), Continuous Assessment / participation, Final Exam

Activity	***Semester workload***
Lectures	35
Preparation, homework, quizzes	50
Project	30
Exam preparation	33
Final Exam	2
Course total	***150***

ATTACHED BIBLIOGRAPHY

Recommended Textbooks / Reading:

Title	Author(s)	Publisher	Year	ISBN
Mastering Bitcoin, 3rd Edition: Programming the Open Blockchain	Andreas M. Antonopoulos	O.Reily media	2023	978-1098150099
Mastering ethereum: building smart contracts and dapps.	Antonopoulos, Andreas M., and Gavin Wood.	O'Reilly Media	2019	978-1491971949
Bitcoin: A Peer-to-	Satoshi Nakamoto	Prentice Hall	2008	https://bitcoin.org/bitcoin.pdf

Peer Electronic Cash System				

Recommended Articles / Reading List:

- Original Satoshi article (http://bitcoin.org/bitcoin.pdf)
- Exploring traffic with wireshark-bitcoin dissector (https://github.com/lbotsch/wireshark-bitcoin)
- Bitcoin Protocol Specifications(https://en.bitcoin.it/wiki/Protocol_specification)
- Bitcoin transaction Scripting (https://en.bitcoin.it/wiki/Script)
- Majority is not Enough: Bitcoin Mining is Vulnerable (http://arxiv.org/abs/1311.0243)
- Two Bitcoins at the Price of One? Double-Spending Attacks on Fast Payments in Bitcoin (http://eprint.iacr.org/2012/248.pdf)
- Ethereum Project (https://ethereum.org/)
- Waves Platform for Developers (https://wavesplatform.com/developers)
- Wood, Gavin. "Ethereum: A secure decentralised generalised transaction ledger." Ethereum project yellow paper 151, no. 2014 (2014): 1-32.
- http://gavwood.com/paper.pdf
- Wattenhofer, Roger. The science of the blockchain. CreateSpace Independent Publishing Platform, 2016.
- Trón, Viktor, Aron Fischer, Dániel A. Nagy, Zsolt Felföldi, and Nick Johnson. "Swap, Swear, and Swindle: Incentive System for Swarm." (2016).
- Atzei, Nicola, Massimo Bartoletti, and Tiziana Cimoli. "A survey of attacks on ethereum smart contracts (sok)." In International Conference on Principles of Security and Trust, pp. 164-186. Springer, Berlin, Heidelberg, 2017.