

# יסודות הבלוקצ'יין – 1231.0000.00

## Blockchain Foundations

No formal prerequisites are required for this course

2019/2020

Group	1
Day	Sunday
Hour	18:45 – 21:30
Final Exam	The students will have final-project to submit
Lecturer	Dr. Jacob Mendel
Email	<a href="mailto:jacob4x4@gmail.com">jacob4x4@gmail.com</a>
Telephone	054-4547369
Office	417
Language	English

Teaching Assistant (TA): Dana, [danav@mail.tau.ac.il](mailto:danav@mail.tau.ac.il)  
Office Hours: By appointment

### Course Units

#### Course Units: 1 cu

4 ECTS (European Credit Transfer and Accumulation System) = 1 course unit

By making higher education comparable across Europe, ECTS makes teaching and learning in higher education more transparent and facilitates the recognition of all studies.

### Course Description

This course provides students with a basic understanding of blockchain technology, how it works, it's history and how it relates to the new digital economy. Covering essential areas and using cases regarding blockchain technology, how it's disrupting different domains such as: fintech, digital government activities, eHealth, Smart Cities etc., and how to use blockchain

technology to create new business opportunities. The students will learn to analyze and quantify the changes that blockchain will have on various industries. In addition, understanding the blockchain technology, challenges, and limitation. The teaching methodology will include business cases and lectures by industry thought leaders.

There are no formal prerequisites for this course. However, blockchain is technical in nature. If you have any concerns about the nature of this course, do not hesitate to reach out to the facilitators. The course can be taken by anyone who is interested in understanding blockchain technology, and its relation to different industries.

This course is entry level, and also contains basic finance and technologies terminology.

## Objectives

Upon course completion, students will have developed a clear understanding of the fundamental concepts of blockchain technology and will have acquired a range of skills allowing them to assess and work effectively with blockchain technology in different fields.

- Understanding the blockchain technology, challenges, gaps and problems.
- Better understanding of business needs and the connection to blockchain technology.
- Evaluate blockchain solutions and their economic impact.
- Understand how blockchain is applied to different aspects of the business.
- Expose the students to blockchain industry thought leaders

## Assessment and Grade Distribution

Percentage	Assignments	Date	Group Size / Comments
10%	Active participation	Throughout the course	Individual
10%	First Written Assignment	Will be provided at the beginning of the course	Individual
20%	Second Written Assignment	Will be provided at the beginning of the course	Groups of 2
60%	Final Project	3 weeks after the semester end	Maximum 3 students

This class relies on active yet judicious student participation. Students will have the opportunity to discuss the role of ethics in business in a safe environment with their peers. My goal is that everyone will contribute to the discussion (and get a good participation grade). Above-average participation grades will denote consistent, timely and astute observations, answers, or comments, which clearly elevate everyone's learning experience. Below-average participation grades will denote either lack of participation or excessive/disruptive comments that prevent others from getting the most of the class. Note that your participation grade will also be affected if you miss any class session(s), unless justified (such as in case of reserve duty).

- According to University regulations, a student must be present in every lesson (Article 5).
- The lecturer reserves the right to have a student removed from a course if the student is absent from a class with mandatory participation or did not actively participate in class. (The student will remain financially responsible for the course irrespective of his/her removal from the course)



## Course Assignments

Students are required to submit two written assignments and final project.

Should a student become unable to complete an assignment or course requirement, s/he must notify the TA of the course in advance via email

## Grading Policy

As of the 2008/9 academic year the Faculty has implemented a grading policy for all graduate level courses. This policy applies to all graduate courses in the Faculty, and will be reflected in the final course grade. Accordingly, the final average of the class for this course (which is a core course) will fall between 83-87%. Additional information regarding this policy can be found on the Faculty website.

## Evaluation of the Course by Student

Following completion of the course, students will participate in a teaching survey in order to evaluate the instructor and the course for the benefit of the students and the university.

## Course Site (Moodle)

The course site will be the primary tool used to communicate messages and material to students. It is, therefore recommended to periodically check the course site in general, periodically, before each lesson, at end of the course as well. (For example: final project details and updates regarding assignments)

Course slides will be available on the course site.

Please note that topics which are not covered in the slides, but are discussed in class are considered an integral part of the course material and may be tested in the class assignments.

## Course Outline\*

Session	Topic(s)	Comments
1	An introduction to blockchain technology	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>What is blockchain ? Why do we care about blockchain ? The move to decentralization Ledgers, Distributed Ledgers, Consensus What is Cryptocurrency ? (examples: Bitcoin, ETH) Introduction to Ethereum</p>
2	Cryptocurrency and blockchain technology	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>Basic blockchain cryptography Hash Functions, Markle Trees, Public Key Cryptography - Elliptic Curve Cryptography Digital Signature (Signing/Verifying Messages) Zero Knowledge Proof Trusted Execution Environment/Trust Zone (TEE/TZ/Enclave)</p>
3	Blockchain in practice (data protection, privacy and security)	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>PoW (Proof of Work), PoS (Proof of Stake), PoA Validating PoW Consensus Mechanisms (BFT) Public/Private Blockchain</p> <p>Ethereum (DLT scheme) Nodes Forks Mining Privacy 51% Attacks Double Spending Problem</p> <p>The DAO</p>
4	Blockchain - Smart Contracts, Wallets, ICO's, Private Blockchain	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p>

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	Written Assignment due	<p>Wallets ERC standards: ERC20 Tokens Smart Contracts Transactions Gas and Fees</p> <p>Initial Coin Offerings (ICO's) and token sales</p> <p>Private Blockchain, Hyperledger Fabric, Quorum</p> <p>Monitoring: ethstat</p>
5	Blockchain cost benefit / Guest Lecture	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>When should we use/or not use blockchain (limitations) Blockchain scalability, Performance, Privacy, Permissions</p> <p>On-chain/Off-chain Blockchain non-Cryptocurrency applications</p> <p>Blockchain Use Cases: Supply Chain and Asset Tracking, Customers loyalty program</p>
6	Blockchain Use Cases	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>Blockchain Use Cases</p> <p>Implications of blockchain on traditional business and organization activities</p>
7	<p>Drawbacks &amp; Challenges of Blockchain Technology</p> <p>The future of blockchain technology, AI, and digital privacy</p>	<p><u>Preparation guidelines</u></p> <p>1. The reading materials will help you to expand your knowledge of the materials presented in this module</p> <p>IPFS Swarm Regulation (Utility Tokens vs. Security Tokens)</p> <p>Summary and Students Use Case presentation (optionally)</p>

\* Subject to changes

## Required Reading

- Blockchain Economics, Joseph Abadi and Markus Brunnermeier, 2018 (Session 5-7)
- Blockchain-based database to ensure data integrity in cloud computing environments. Gaetani, Edoardo & Aniello, Leonardo & Baldoni, Roberto & Lombardi, Federico & Margheri, Andrea & Sassone, V. (2017). (Session 6-7)
- Distributed ledger technology: beyond block chain, A report by the UK Government Chief Scientific Adviser, 2016 (Session 1-3)
- Distributed Ledger Technology & Cybersecurity, Improving information security in the financial sector, ENISA, 2016 (Session 3-5)
- Banking on Blockchain: Costs Savings Thanks to the Blockchain Technology; Luisanna Cocco, Andrea Pinna and Michele Marchesi (2017) (Session 2-4)
- Blockchain Technology Innovations, K. Coperich, E. Cudney, H. Nembhard (2017) (Session 6-7)
- Fintech: Ecosystem, business models, investment decisions, and challenges; In Lee, Yong Jae Shin (2018) (Session 1)
- The IoT electric business model: Using blockchain technology for the internet of things, Yu Zhang, Jiangtao Wen, 2017 (Session 5-7)

## Recommended Reading

- The future of financial infrastructure, an ambitious look at how blockchain can reshape financial services, The future of financial infrastructure, World Economic Forum, 2016
- Blocks and Chains, Introduction to Bitcoin, Cryptocurrencies, and their Consensus Mechanisms, Aljosha Judmayer Nicholas Stifter Katharina Krombholz Edgar Weippl, 2017
- Mastering Bitcoin, Programming the Open Blockchain, Andreas M. Antonopoulos, 2017