University of St.Gallen

Course and Examination Fact Sheet: Autumn Semester 2019

7,264: Blockchain and Cryptocurrencies

ECTS credits: 4

Overview examination/s
(binding regulations see below)
Decentral - Oral examination (individual) (40%, 15 mins.)
Decentral - Group examination paper (all given the same grades) (40%)
Decentral - Active participation (20%)

Attached courses
Timetable -- Language -- Lecturer
7,264,1.00 Blockchain and Cryptocurrencies -- Englisch -- Prat Julien

Course information

Course prerequisites
The course is designed for first year Master students in Economics or Business. Besides their training in economics and quantitative methods, no specific knowledge about Blockchains is required. Basic programming skills in Python will also be useful.

Course content

The financial industry was until recently a very concentrated sector. This is becoming less and less true as a wave of innovations greatly lowers the barriers to entry and intensifies the degree of competition among providers of financial services. Disruptive technologies are being implemented at an increasing pace, leading to major changes in the realms of payments, lending and borrowing, insurance, wealth management, venture capital. To understand this revolution, one needs to have a good grasp of technological innovations as well as of the economics of the financial sector. This course will introduce students to both dimensions, allowing them to identify how financial services can be improved with new approaches. The course will focus on Blockchain protocols because of their disruptive potential, hopefully preparing the audience for the next wave of innovations. We will adopt a hands-on approach with the objective of enabling students to monitor transactions over Bitcoin's blockchain.

- The ongoing trends in the Fintech industry and their technological underpinnings;
- How cryptographic functions make it possible to secure transactions over a public network;
- Why the Blockchain technology can replace third-party certification;
- What are the main differences between the most prominent Blockchain infrastructures;
- How the market for cryptocurrencies operates, and critically assess its functions and vulnerabilities;
- What are "smart contracts".

Course structure

The course will be structured as a block course. Some classes will be taught in a computer lab.

Overall Structure of the course:

1. Introduction to Banking, Fintech and Payment Systems.
2. Basics of Cryptography: Public/private keys, Hash functions…
3. Blockchains: Tamper-evident database, Industrial application of Blockchains (supply chains, payment networks, smart grids, online banking…)
4. Decentralization of the Blockchain under "Nakamoto" consensus: Byzantine general's problem, transactions, mining, Proof-of-work.
5. Using Bitcoin core: How to operate a node in Bitcoin's network

6. The structure of transactions in Bitcoin: UTXOs and Bitcoin Script.
7. Theory of Money and Cryptocurrencies: Credit economy vs. Cash economy, Fundamental analysis of Bitcoin and alternative coins.
8. Smart Contracts: Algorithmic Decision making, Atomic Swaps, Programing self-executing contracts in Bitcoin script or Solidity (Ethereum).
9. Initial Coin Offerings: Venture Capital, Startups financing, Web 3.0 and decentralized infrastructures.
10. Advanced topics:

- New forms of governance;
- Alternative protocols: Proof-of-stake;
- Zero knowledge proofs and anonymous transactions;
- Scaling and Sidechains: Lightning Network, segregated witness…;
- Decentralized prediction markets;
- External data: Oracles and Internet-of-things.

Course literature

The subject being quite new, the related literature is still in its embryonic stage. The slides of the course will be self-contained as all the required material will be covered during the lectures. Additional material can be found in the following books:

- Bitcoin and Cryptocurrency Technologies, by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder.
- Mastering Bitcoin: Programming the Open Blockchain, Andreas Antonopoulos

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/3)

Examination time and form
Decentral - Oral examination (individual) (40%, 15 mins.)

Remark
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Examination-aid rule
Extended Closed Book
The use of aids is limited; any additional aids permitted are exhaustively listed under "Supplementary aids". Basically, the following is applicable:

- At such examinations, all the pocket calculators of the Texas Instruments TI-30 series and mono- or bilingual dictionaries (no subject-specific dictionaries) without hand-written notes are admissible. Any other pocket calculator models and any electronic dictionaries are inadmissible.
- In addition, any type of communication, as well as any electronic devices that can be programmed and are capable of communication such as notebooks, tablets, PDAs, mobile telephones and others, are inadmissible.
- Students are themselves responsible for the procurement of examination aids.

Supplementary aids
none

Examination languages
Question language: English
Answer language: English

2. Examination sub part (2/3)

Examination time and form
Decentral - Group examination paper (all given the same grades) (40%)

Remark
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Examination-aid rule
Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
none

Examination languages
Question language: English
Answer language: English

3. Examination sub part (3/3)

Examination time and form
Decentral - Active participation (20%)

Remark
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Examination-aid rule
Practical examination
No examination-aid rule is necessary for such examination types. The rules and regulations of the University of St. Gallen apply in a subsidiary fashion.

Supplementary aids
none

Examination languages
Question language: English
Answer language: English

Examination content
The exam will be composed of an oral examination and a project asking students to show that they have mastered the basics of Blockchain programming. Students will be encouraged to work cooperatively on their project.

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Examination relevant literature

As explained in the literature section above, the related literature is still in its embryonic stage. Hence all the required material for the examination will be contained in the slides of the course.

Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW51) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination typestarting from the beginning of the bidding on 22 August 2019
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 14 October 2019
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 4 November 2019

Please consult the fact sheet again after these deadlines have expired.