

# BLOCKCHAIN AND CRYPTOCURRENCY

**Bachelor in Economics BIE SEP-2024 BCRY-Ec.3.M.A**

Area Finance

Number of sessions: 15

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Semester: 1º

Category: COMPULSORY

Language: English

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## **GAEL SANCHEZ SMITH**

Gael Sánchez Smith has more than 7 years of experience in the world of Bitcoin and cryptocurrencies, including consultancy work and presenting at conferences on the economic and societal implications of Bitcoin and other cryptocurrencies and has published the book "Bitcoin lo Cambia Todo" with the Spanish publishing house Anaya. He has worked in the I.T. industry as and has more than 10 years of experience as an investor in a wide range of financial markets including Equities, Commodities, Bonds and Cryptocurrencies. He is cofounder of Alfa Bitcoin, the leading platform of market analysis for Bitcoin investors.

### **Office Hours**

Office hours will be on request. Please contact at:

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## **SUBJECT DESCRIPTION**

Many technologies we now take for granted were at some point obscure and only understood by a few enlightened experts. Blockchain and its most famous ambassador, the Bitcoin, belong to this category of inventions. Since its inception by Satoshi Nakamoto in 2009, blockchain applications have evolved from the niche world of cryptography researchers and coders to the spotlights of skyrocketing cryptocurrencies valuations.

Note that the class is not intended to teach students about trading or financial advisory as an asset class or profession.

## LEARNING OBJECTIVES

- Understand the origin and innovative aspects of Bitcoin.
- Develop a better understanding of the underlying technologies enabling blockchain.
- Get an insight on current applications for startups and corporations.
- Be able to design business models and value proposition where blockchain technology brings value.
- Develop a critical mindset about the potential for Bitcoin and other blockchain applications.

## TEACHING METHODOLOGY

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

| Learning Activity                                     | Weighting | Estimated time a student should dedicate to prepare for and participate in |
|-------------------------------------------------------|-----------|----------------------------------------------------------------------------|
| Lectures                                              | 20.0 %    | 15.0 hours                                                                 |
| Discussions                                           | 6.7 %     | 5.0 hours                                                                  |
| Exercises in class, Asynchronous sessions, Field Work | 6.7 %     | 5.0 hours                                                                  |
| Group work                                            | 33.3 %    | 25.0 hours                                                                 |
| Individual studying                                   | 33.3 %    | 25.0 hours                                                                 |
| TOTAL                                                 | 100.0 %   | 75.0 hours                                                                 |

## AI POLICY

In this course, the use of generative artificial intelligence (GenAI) is encouraged, with the goal of developing an informed critical perspective on potential uses and generated outputs.

However, be aware of the limits of GenAI in its current state of development:

·If you provide minimum effort prompts, you will get low quality results. You will need to refine your prompts to get good outcomes. This will take work.

·Don't take ChatGPT's or any GenAI's output at face value. Assume it is wrong unless you either know the answer or can cross-check it with another source. You are responsible for any errors or omissions. You will be able to validate the outputs of GenAI for topics you understand.

·AI is a tool, but one that you need to acknowledge using. Failure to do so is in violation of academic honesty policies. Acknowledging the use of AI will not impact your grade.

Suggested format to acknowledge the use of generative AI tools:

I acknowledge the use of [AI systems link] to [specify how you used generative AI]. The prompts used include [list of prompts]. The output of these prompts was used to [explain how you used the outputs in your work].

If you have chosen not to include any AI generated content in your assignment, the following disclosure is recommended:

No content generated by AI technologies has been used in this assignment.

## PROGRAM

### SESSION 1 (LIVE IN-PERSON)

#### Introduction

Lecture: Welcome, instructor presentation, course overview, grading policy. We will study money and its functions, the different types of money used thru history, fiat money and the advent of digital currencies.

Study questions

- What is money?
- Why is money important for a functioning society?
- What are the issues with the current monetary system?

*Article: From silkroad to ATMs: The history of bitcoin (The Guardian, Thu 14 Sep 2017)*

### SESSIONS 2 - 3 (LIVE IN-PERSON)

#### The creation of Bitcoin

Lecture: In this lecture we will study the creation of Bitcoin; the context in which it was created and what problems did its creator intend to solve.

Study questions

- In what context was Bitcoin created?
- Why was Bitcoin created?
- Does Bitcoin fulfil the functions of money (medium of exchange, store of value, & unit of account)? Can it do so in the future?

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#### The world of cypherpunks

In Session 3 we will analyze the different ideologies that gave birth to Bitcoin and identify who were Bitcoin's early adopters. Who are cypherpunks? Where do they come from? Students are requested to watch the series of videos and answer a set of questions:

Study Questions

- Where do Bitcoin and Blockchain come from?
- What do cypherpunks stand for?
- Who were the early adopters of the technology? Who is Satoshi Nakamoto?

*Other / Complementary Documentation: Bitcoin open source implementation of P2P currency (Satoshi Nakamoto Institute)*

*Article: From Silk Road to ATMs (The Guardian, Thu 14 Sep 2017)*

*Multimedia Material: Video: Before the Web: The 1980s Dream of a Free and Borderless Virtual World (YouTube)*

*Multimedia Material: Video: Cryptography vs. Big Brother: How Math Became a Weapon Against Tyranny (YouTube)*

*Multimedia Material: Video: When Encryption Was a Crime: The 1990s Battle for Free Speech in Software (YouTube)*

### SESSIONS 4 - 5 (LIVE IN-PERSON)

#### The Engineering of Bitcoin

During this session we will study the set of challenges that Satoshi needed to surmount in order to create the first decentralised, digital monetary system. We will focus on how Satoshi used existing technologies to engineer the socio-economic incentives that underpin Bitcoin.

Study questions

- What were the main challenges for the development of a decentralised digital currency?
- What is the double-spending problem and how does the Bitcoin protocol prevent it?
- What are cryptographic hash functions, asymmetric cryptography and the law of large numbers and how are they relevant to Bitcoin?

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### Technical concepts (simulation)

In session 5, students will simulate the role of a miner and understand their role in the ecosystem. We will see what is a hash, a transaction, a block and how those blocks are linked together.

Study questions:

- Mining blocks. How a miner works and what is his role?

Article: *Bitcoin Whitepaper: "A Peer-to-Peer Electronic Cash System"* (bitcoin.org)

Article: *Reid Hoffman: Why the blockchain matters* (Wired, 15.05.2015)

Article: *Gael Sánchez Smith: The Engineering of Bitcoin* (Medium)

Multimedia Material: *Video: How Bitcoin works under the Hood* (YouTube)

Multimedia Material: *Video: Blockchain 101 - A Visual Demo* (YouTube)

## SESSIONS 6 - 7 (LIVE IN-PERSON)

### Mining Industry

The miner's role is crucial in securing transactions happening on the blockchain. By providing their CPU time, miners are rewarded in cryptocurrencies (bitcoin, ether,...) but overtime, mining activity has become very competitive and often unprofitable for individuals. We will study the different types of mining, their evolution and economical aspects associated with this activity.

Study questions

- How to calculate the profitability of mining activities?
- What is the payback period?
- Are miners centralized or decentralized?

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### Bitcoin and Macro

During this session, we will take a critical examination of Bitcoin's monetary attributes and whether they allow its widespread use as money. Students will have the opportunity to think critically about the current fiat monetary system, how a bitcoin based system would differ from it, and whether this change would be feasible and desirable.

Study questions:

- Does Bitcoin's monetary rule prevent it from being money?
- An economy works under price inflation, can it work under price deflation? Why or why not?
- Under price deflation, debt servicing becomes more costly with time, is this an issue?
- If there was no debt, what other conventions could be used to enable economic coordination?

Article: *Proof-of-Stake and Stablecoins: A Blockchain Centralization Dilemma; Section 1: Proof-of-Stake vs Proof-of-Work* (Lyn Alden, November 2021)

Multimedia Material: *Podcast: Why Proof of Stake is Flawed with Lane Rettig- First 28 minutes* (YouTube)

## SESSIONS 8 - 9 (LIVE IN-PERSON)

### Introduction to Blockchain

Lecture: In this session we will study the link between bitcoin and blockchains, the different types and use cases and the compromise that they are willing to make.

Study questions

- Why were other blockchains invented beyond Bitcoin?
- What are smart contracts and decentralised applications?
- How do blockchains differ from Bitcoin architecture? Use the analytical framework introduced in Session 4.
- What other consensus protocols are there? What are some of the tradeoffs of alternative consensus algorithms?

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### Tokenization: From ICOs to NFTs

We will dive into the fast-changing world of tokens and Initial Coin Offering (ICO). We will cover the case study of FileCoin's ICO and see how tokens are being traded on dedicated platforms.

Study questions

- What is a token and how does it differ from a coin?
- Why were blockchain tokens invented?
- What types of tokens exist?
- What is an ICO?
- What are the risks and benefits, and the implications for the global capital market?

Article: *A NEXT GENERATION SMART CONTRACT & DECENTRALIZED APPLICATION PLATFORM* ([ethereum.org](https://ethereum.org))

Article: *Blockchain Technology* (Medium)

Practical Case: *Filecoin's Initial Coin Offering: Using Blockchain to Decentralise Storage* (HBS NTU182-PDF-ENG)

Article: *Types of Cryptocurrency* ([corporatefinanceinstitute.com](https://corporatefinanceinstitute.com))

## SESSIONS 10 - 11 (LIVE IN-PERSON)

### Decentralized Finance

In this session we will explore some of the new tools being built on top of decentralised networks. The very vibrant world of Decentralized Finance - or DeFi - opens the door to new possibilities to enable a P2P economy. Students will be given the opportunity to place orders with the tokens in their possession on a decentralised exchange platform and put their token at use

**Study questions:**

What's the difference between decentralised finance and centralised finance? What are some examples of each service?

Readings:

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### Other Blockchain Trends: DAOs, Metaverse and Gamefi.

In this session we will explore some of the most prevalent trends that have recently emerged in the blockchain space.

Readings:

*Article: DeFi is eating finance, Bankless. (Bankless)*

*Article: DeFi: The Ultimate Beginner's Guide to Decentralized Finance (Decrypt)*

*Article: Why DAOs are the new firms Corporate firms have been decentralising for decades. DAOs are the next evolution. Ryan Sean Adams (Bankless, Mar 16)*

*Article: GameFi: How to Earn Crypto Playing Games Online, By Annika Feign, Ollie Leech. (Coin Desk, Mar 9, 2022)*

*Article: The Metaverse Emerges (Bankless, Sep 1, 2021)*

## **SESSION 12 (LIVE IN-PERSON)**

### **Blockchain Corporate adoption (Guest Speaker)**

Banks and financial institutions have stayed away from bitcoin due to its toxic reputation. This session is an opportunity to understand current business trends regarding Bitcoin and other blockchain applications.

## **SESSION 13 (LIVE IN-PERSON)**

### **Risks and Critiques of Bitcoin and Blockchain**

In the final session we look at some of the strongest arguments against the promises of Bitcoin and Blockchain innovations.

#### **Study Questions**

- Can Bitcoin's volatility come down enough for it to act as money?
- How robust is the Bitcoin network and what are the risks associated with the concentration of mining?
- Could CBDC's replace current cryptocurrencies?
- Most blockchains are migrating to proof of stake, what are the risks with this consensus mechanism? Are proof of stake blockchains sufficiently decentralised to fulfil their promises?
- Can decentralised applications really scale to serve the world?

*Article: The Major Risk to Bitcoin That Many Bitcoiners Ignore, Gael Sánchez Smith (Medium, Sep 12, 2022)*

## **SESSIONS 14 - 15 (LIVE IN-PERSON)**

During the last 2 sessions, students will be invited to form groups of 4-5 people. Each group will choose an existing blockchain protocol and will analyse using the knowledge acquired throughout the course:

1. Why was this protocol built? What benefits does it bring?
2. How is it engineered, is the security model sound?
3. Is blockchain the best tool for this service?

The instructor will challenge the teams to apply some of the models that have been discussed in class.

During the second session, each team will pitch their solution to the rest of the class for 5mn and answer questions for 4 minutes

## **EVALUATION CRITERIA**

| criteria | percentage | Learning Objectives | Comments |
|----------|------------|---------------------|----------|
|----------|------------|---------------------|----------|

|                     |      |  |                                          |
|---------------------|------|--|------------------------------------------|
| Class Participation | 20 % |  | Participation and attendance.            |
| Group Presentation  | 40 % |  | Group research project and presentation. |
| Individual Quiz     | 40 % |  | Multiple Choice quiz.                    |

## RE-SIT / RE-TAKE POLICY

### Class participation

Students are requested to read the case studies, documents and watch the videos before each session and be prepared to discuss them actively during class. Course grade will be determined by value-added participation (ie quality, not quantity of comments).

### Individual work

Individual work is composed of a multiple choice individual test. For the test, the student will respond to a set of questions related to the topics that have been covered during the course. Date not communicated.

### Final Exam: Workshop

Students will form teams of 4-5 people to prepare and deliver a 10-minute pitch in class on the last day followed by 5mn of Q&A.

Students will be graded based on the following list of criteria:

1. Demonstration of understanding of the project's objectives and goals; Why does the project exist? What problems does it solve?
2. Ability to explain how the project achieves the abovementioned goals; what's the technology behind the project and how it operates. (apply the analytical framework developed in class).
3. Ability to assess the project's positive and negative potential impacts on a specific industry and on society as a whole.
4. Critical thinking on the project and its potential.
5. Clear structure and presentation of the material.
6. Identification of potential risks and challenges.
7. Accuracy of data and facts presented throughout.
8. Use relevant and up-to-date sources.
9. Identification of potential opportunities for the project.
10. Ability to answer questions and defend the project.

## BIBLIOGRAPHY

### Recommended

- Saifedean Ammous. *The Bitcoin Standard: The Decentralized Alternative to Central Banking*. John Wiley & Sons Inc. ISBN 1119473861 (Digital)
- Nik Bhatia. *Layered Money: From Gold and Dollars to Bitcoin and Central Bank Digital Currencies*. ISBN 1736110519 (Digital)
- David Graeber. *Debt. The First 5,000 Years*. ISBN 9781612194196 (Digital)
- Yan Pritzker. *Inventing Bitcoin: The Technology Behind The First Truly Scarce and Decentralized Money Explained*. Yan Pritzker. ISBN 9781794326316 (Digital)

## BEHAVIOR RULES

Please, check the University's Code of Conduct [here](#). The Program Director may provide further indications.

### **ATTENDANCE POLICY**

Please, check the University's Attendance Policy [here](#). The Program Director may provide further indications.

### **ETHICAL POLICY**

Please, check the University's Ethics Code [here](#). The Program Director may provide further indications.

