



Course guides

230320 - EFPEI - Financial Engineering for Economic Planning of Investments

Last modified: 29/04/2020

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 744 - ENTEL - Department of Network Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018). (Optional subject).

Academic year: 2020 **ECTS Credits:** 2.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Jose Luis Melús Moreno

Others: Jose Luis Melús Moreno

PRIOR SKILLS

Basic calculus (integrals, derivatives, partial derivatives, Taylor expansion, etc.), Linear Algebra (Matrices and operations) and probability theory (mean, variance, normal random variables, Poisson, etc.)

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

Economic planning of an investment is not simple or easy sometimes. The economic constraints of enterprises to tackle this task requires the use of financial tools to evaluate, through appropriate methods the characteristics and timing of investment to make. This seminar introduces the essential foundations of financial engineering in the economic planning of network investments and provides the basic mathematical tools to address these challenges. Attendance at this seminar can be very attractive, since not only the basics of financial engineering but also the way they treat are introduced, reviewing math skills already acquired.

STUDY LOAD

Type	Hours	Percentage
Hours large group	20,0	40.00
Self study	30,0	60.00

Total learning time: 50 h



CONTENTS

1- Introduction to the seminar

Description:

- 1.1. Main objectives of the seminar
- 1.2. Basics of financial engineering (interest rate, bonds, futures contracts, options on assets, etc.)
- 1.3. Application exercises

Full-or-part-time: 2h

Theory classes: 2h

2- Mathematics in financial engineering. Review

Description:

- 2.1. Reviewing calculus (integration, derivation, Taylor developments, etc)
- 2.2. Probability review
- 2.3. Linear algebra review
- 2.4. Application exercises

Full-or-part-time: 4h

Theory classes: 4h

3- Interest rate and bonds

Description:

- 3.1. Compound Interest
- 3.2. Bond yields
- 3.3. Application exercises

Full-or-part-time: 2h

Theory classes: 2h

4- Forward and futures prices

Description:

- 4.1. Trading strategies
- 4.2. Determination of forward and futures prices
- 4.3. Application exercises

Full-or-part-time: 2h

Theory classes: 2h



5- Pricing financial derivatives. Pricing an option

Description:

- 5.1. Trading strategies involving options
- 5.2. European and American options
- 5.3. Methods to price options. Methods:
 - 5.3.1. Binomial trees
 - 5.3.2. Cox Rubinstein formula
 - 5.3.3. Black-Scholes-Merton. Implied volatility
 - 5.3.4. Monte Carlo simulation
- 5.4. Application exercises

Full-or-part-time: 8h

Theory classes: 8h

6- Efficient Portfolios. Risk management. Markowitz's portfolios

Description:

- 6.1. Maximum expected value of the return on a portfolio
- 6.2. Efficient Portfolios. Maximum expected return and minimum variance
- 6.3. Application exercises

Full-or-part-time: 2h

Theory classes: 2h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- Wilmott, Paul. Paul Wilmott introduces quantitative finance [on line]. 2nd ed. Wiley, 2007 [Consultation: 02/04/2020]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=309819>. ISBN 9780470319581.
- Stefanica, Dan. A primer for the Mathematics of Financial Engineering. 2nd ed. New York: FE Press, 2011. ISBN 9780979757624.
- Capinski, Marek, Zastawniak, Tomasz. Mathematics for finance : an introduction to financial engineering [on line]. 2nd ed. London ; New York: Springer, 2003 [Consultation: 13/05/2020]. Available on: <http://link.springer.com/book/10.1007/b97511>.
- Neftci, Salih N.; Hirsu, Ali. An Introduction to the mathematics of financial derivatives. 3rd ed. San Diego [etc.]: Academic Press, 2014. ISBN 9780123846822.
- Hull, John. Options, futures and other derivatives. 9th ed. Harlow [etc.]: Pearson, 2015. ISBN 9780133456318.