Course guide  
230320 - EFPEI - Financial Engineering for Economic Planning of Investments  

Unit in charge: Barcelona School of Telecommunications Engineering  
Teaching unit: 744 - ENTEL - Department of Network Engineering.  
Degree:  
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: 2022  
ECTS Credits: 2.0  
Languages: Spanish  

LECTURER  
Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura  
Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma  

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  

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>20,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>30,0</td>
<td>60.00</td>
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</tbody>
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Total learning time: 50 h
## 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: