



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93000855 - Ict Business Analysis

DEGREE PROGRAMME

09AQ - Master Universitario en Ingeniería de Telecomunicacion

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	93000855 - Ict Business Analysis
No of credits	3 ECTS
Type	Optional
Academic year of the programme	Second year
Semester of tuition	Semester 4
Tuition period	February-June
Tuition languages	English
Degree programme	09AQ - Master Universitario en Ingenieria de Telecomunicacion
Centre	09 - Escuela Tecnica Superior de Ingenieros de Telecomunicacion
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Zoraida Frias Barroso	C-431	zoraida.frias@upm.es	Sin horario. Please, you can arrange an appointment by email.
Luis Castejon Martin (Subject coordinator)	C-426	luis.castejon@upm.es	Sin horario. Please, you can arrange an appointment by email.

Fernando Herrera Gonzalez	C-425	fernando.herrera@upm.es	Sin horario. Please, you can arrange an appointment by email.
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* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

- Redes De Comunicaciones
- Arquitecturas De Conmutacion Y Transporte
- Direccion Y Administracion De Empresas
- Comunicaciones Moviles
- Vision Estrategica De La Integracion De Tecnologias Y Sistemas En El Sector Tic
- Tecnologias De Acceso Radio

3.2. Other recommended learning outcomes

- An intermediate level on financial accounting is required to the students (income statement, cash flow and balance sheet), equivalent to the actual ETSIT student's level.
- All students should come from a Telecommunication major with deep knowledge on telecom networks, architecture, transport and access networks, spectrum and mobile networks, telecom and OTT markets at European and global level including the main operators.

4. Skills and learning outcomes *

4.1. Skills to be learned

CE15 - Capacidad para la integración de tecnologías y sistemas propios de la Ingeniería de Telecomunicación, con carácter generalista, y en contextos más amplios y multidisciplinares como por ejemplo en bioingeniería, conversión fotovoltaica, nanotecnología, telemedicina.

CE16 - Capacidad para la elaboración, dirección, coordinación, y gestión técnica y económica de proyectos sobre: sistemas, redes, infraestructuras y servicios de telecomunicación, incluyendo la supervisión y coordinación de los proyectos parciales de su obra aneja; infraestructuras comunes de telecomunicación en edificios o núcleos residenciales, incluyendo los proyectos sobre hogar digital; infraestructuras de telecomunicación en transporte y medio ambiente; con sus correspondientes instalaciones de suministro de energía y evaluación de las emisiones electromagnéticas y compatibilidad electromagnética.

CE7 - Capacidad para realizar la planificación, toma de decisiones y empaquetamiento de redes, servicios y aplicaciones considerando la calidad de servicio, los costes directos y de operación, el plan de implantación, supervisión, los procedimientos de seguridad, el escalado y el mantenimiento, así como gestionar y asegurar la calidad en el proceso de desarrollo.

CG1 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

CG2 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.

CG3 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.

CG4 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

CG5 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CT1 - Capacidad para comprender los contenidos de clases magistrales, conferencias y seminarios en lengua inglesa.

CT2 - Capacidad para dinamizar y liderar equipos de trabajo multidisciplinares.

CT3 - Capacidad para adoptar soluciones creativas que satisfagan adecuadamente las diferentes necesidades planteadas.

CT5 - Capacidad para gestionar la información, identificando las fuentes necesarias, los principales tipos de documentos técnicos y científicos, de una manera adecuada y eficiente.

CT6 - Capacidad para emitir juicios sobre implicaciones económicas, administrativas, sociales, éticas y medioambientales ligadas a la aplicación de sus conocimientos.

4.2. Learning outcomes

RA172 - Analizar las finanzas de un operador de telecom, comparativamente con las de una OTT, para conocer EBITDA, rotación activos, ROE, caja, Capex

RA24 - Adquisición de conocimientos sobre aspectos complementarios para la gestión de un proyecto de ingeniería: gestión de calidad y riesgos y toma de decisiones. (CT1, CE6, CE7, CE8)

RA33 - Capacidad para abordar y desarrollar en grupo casos prácticos de análisis, diseño, dimensionamiento, simulación, pruebas y su gestión técnico-económica de sistemas de comunicaciones que usen redes satelitales, redes fijas troncales y de acceso óptico y/o eléctricas y redes móviles incluyendo el concepto de "Internet de las Cosas"

RA145 - Capacidad de desarrollar estrategias funcionales y globales en una empresa

RA29 - Habilidad para diseñar y dimensionar un sistema de comunicaciones que integre partes tanto fijas como móviles, de forma práctica, en grupo y con una orientación profesional al trabajo en una empresa

RA139 - Ser capaz de definir un plan estratégico de empresa basado en información interna y externa

RA138 - Conocer los procesos de toma de decisiones implicados en la dirección de empresas

RA23 - Capacidad de abordar la gestión de un proyecto de ingeniería sencillo, en todas sus fases: planificación, asignación de recursos, estudio de la viabilidad económica y seguimiento y control. (CG1, CG2, CT3)

RA25 - Práctica de habilidades transversales necesarias para la gestión y participación en proyectos de ingeniería. (CG4, CT2, CT4)

RA76 - Habilidad de comunicación oral y escrita

RA244 - Analizar con criterios financieros y otros métodos cuantitativos las diferentes alternativas de inversión

RA245 - Analizar modelos de negocio TIC con métodos cuantitativos (DFC) y cualitativos (ecosistema, cadena de valor)

RA70 - Comprensión de los procesos de decisión en las actividades de Gestión y Dirección

RA243 - Análisis de viabilidad financiera de un proyecto de inversión en TIC

RA246 - Formular hipótesis de negocio y cuantificar variables económicas de penetración, cuota de mercado, ingresos, gastos e inversiones

RA146 - Capacidad de analizar y desarrollar estrategias empresariales en contexto de la economía digital

RA10 - Saber realizar una presentación de carácter técnico, ante una audiencia de pares, que describa el trabajo realizado y sus resultados, de forma clara y bien estructurada, en el tiempo establecido, y usando un lenguaje preciso

RA148 - El alumno tendrá una visión general sobre los elementos claves que determinan el pasado, presente y una visión estratégica sobre el futuro del sector de las de las tecnologías de la información y las comunicaciones. Será capaz de realizar análisis de entorno e identificar el comportamiento de los agentes que participan en el ecosistema digital

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Main features of this course:

- **Blended course methodology:** some theoretical contents can be followed online without face-to-face classes, while other workgroup presentation sessions are face-to-face. See the section "Other information".
- **Digital Business Analysis:** relevant firms competing in digital -also called ICT- markets are analysed through the course as Yoigo, MasMovil, Telefónica, Cellnex, iZettle, and Paypal.

Instructions for Incoming Students

All students should come from a Telecommunication major with deep knowledge on telecom networks, architecture, transport and access networks, spectrum and mobile networks, telecom and OTT markets at European and global level including the main operators.

An intermediate level on financial accounting is required to the students (income statement, cash flow and balance sheet), equivalent to the actual ETSIT student's level.

Overview

The course ICT Business Analysis is aimed at training students to analyze business cases wherein Information and Communications Technologies (ICTs) are key drivers for the business model. Particular emphasis is put on methodologies and tools for decision-making, which will be useful *know-how* for future ICT professionals.

The methodology of the course follows the *learning-by-doing* paradigm, which helps students learn theoretical concepts by providing them with hands-on activities. Throughout the course, we will analyze three real case studies that cover varying industries of the ICT sector, such as telecommunications, startups and the Internet.

The above-referred tools to analyze ICT businesses try to model business opportunities by quantifying the investments required to develop the project. This is commonly addressed in a two-step analysis: i) analysis of the value chain or the ecosystem in which the company operates, looking at potential strengths, weaknesses, opportunities, and threats (SWOT); ii) development of the investment project taking into consideration different

scenarios and hypothesis (for example, regarding service penetration, market shares or costs) to estimate cash flows and the subsequent investment attractiveness.

We regularly review the case studies to reflect the most up-to-date situations in the ICT sector where informed strategic decision-making is needed. Some of the topics we usually cover refer to *make-it or buy-it* strategies for mobile operators, Initial Public Offering (IPOs) of telcos, startup valuation processes for OTTs, etc.

We describe next some examples:

- **Case 1:** *Yoigo, the mobile network operator: to roam or not to roam.* Do I need to expand my network coverage?
- **Case 2:** *Masmovil: the build-up process of a mobile virtual operator.* Business plan analysis and stock exchange valuation.
- **Case 3:** *Valuation of technology-based startups according to the venture capital method.* How much is my startup worth? The case of a fintech company.

Other additional cases may be required upon the development of the course.

5.2. Syllabus

1. CHAPTER 1

1.1. Engineering economics and decision-making in engineering (I)

1.1.1. Time Value of Money (TVM)

1.1.2. Net present value (NPV) and Internal Rate of Return (IRR)

1.1.3. Weight Average Cost of Capital (WACC)

1.1.4. Methods for project valuation: equivalent annual value and replacement decisions

1.2. CASE STUDY 1: Yoigo: to roam or not to roam

2. CHAPTER 2

2.1. Engineering economics and decision-making in engineering (II)

2.1.1. Cash Flow projections

2.1.2. Business plans

2.1.3. Company valuation

2.1.4. Stock exchange valuation

2.2. CASE STUDY 2: Masmovil, the build-up process

3. CHAPTER 3

3.1. Valuation of technology-based startups

3.1.1. Methodology: The Venture Capital Method

3.1.2. Fund-raising rounds

3.1.3. Exit value estimation

3.2. CASE STUDY 3: Valuation of a fintech startup

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	Course presentation Duration: 02:00 Lecture			
2	CHAPTER 1. Time Value of Money Concepts (TVM). On-line class Duration: 02:00 Lecture			CHAPTER 1. Practical exercises Group work Continuous assessment Not Presential Duration: 05:00
3	CHAPTER 1. Case study 1 theory and explanation Duration: 02:00 Lecture			Development of case study 1 Group work Continuous assessment Not Presential Duration: 15:00
4		NTICLab1. Case study 1. Session to review students' developments Duration: 02:00 Laboratory assignments		
5	CHAPTER 1. Case study 1. Students' presentation and discussion. Duration: 02:00 Cooperative activities			
6	CHAPTER 2. Concepts Duration: 01:00 Lecture CHAPTER 2. Case study 2, part 1, description Duration: 01:00 Lecture			
7	CHAPTER 2. Case study 2, part 2, description Duration: 00:30 Lecture	NTICLab2. Case study 2, part 1. Session to review students' development Duration: 01:30 Laboratory assignments		Development of case study 2 Group work Continuous assessment Not Presential Duration: 25:00
8	CHAPTER 2. Case study 2, part 1. Students' presentation and discussion. Duration: 00:30 Cooperative activities	NTICLab2. Case study 2, part 2. Session to review students' development Duration: 01:30 Laboratory assignments		
9	CHAPTER 2. Case study 2, part 3, description Duration: 02:00 Lecture			

10		NTICLab2. Case study 2, part 3. Session to review students' development Duration: 01:30 Laboratory assignments		
11	CHAPTER 2. Case study 2, part 3. Students' presentation and discussion. Duration: 01:00 Cooperative activities			
12	CHAPTER 3. Concepts and case description Duration: 02:00 Lecture			Development of case study 3 Group work Continuous assessment Not Presential Duration: 12:00
13		NTICLab3. Case study 3. Session to review students' development Duration: 02:00 Laboratory assignments		
14	CHAPTER 3. Case study 3. Students' presentation and discussion. Duration: 01:30 Cooperative activities Wrap-up session Duration: 00:30 Lecture			
15				Participation and course involvement Other assessment Continuous assessment Presential Duration: 03:00
16				
17				Final exam - theory Written test Final examination Presential Duration: 01:30 Development of a case study, presentation, defense, and discussion with the faculty Problem-solving test Final examination Presential Duration: 03:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	CHAPTER 1. Practical exercises	Group work	No Presential	05:00	5%	5 / 10	CG3 CG5 CT1 CT2 CT6 CG2 CE7 CG1 CT3 CT5 CE15 CE16
3	Development of case study 1	Group work	No Presential	15:00	30%	5 / 10	CG3 CG4
7	Development of case study 2	Group work	No Presential	25:00	35%	5 / 10	CG4 CT2
12	Development of case study 3	Group work	No Presential	12:00	20%	5 / 10	CG5 CT1 CT2 CT3 CE16
15	Participation and course involvement	Other assessment	Face-to-face	03:00	10%	5 / 10	CG4 CG5 CT6 CG1 CT5

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam - theory	Written test	Face-to-face	01:30	50%	5 / 10	CG4 CG5 CT1 CT2 CT6 CG2 CG3 CE7 CG1

							CT3 CE15 CE16
17	Development of a case study, presentation, defense, and discussion with the faculty	Problem-solving test	Face-to-face	03:00	50%	5 / 10	CG3 CG4 CG5 CT1 CT2 CE7 CT3 CT5

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final exam - Theory	Written test	Face-to-face	01:30	50%	5 / 10	CG3 CG4 CG5 CT1 CT2 CT6 CG2 CE7 CG1 CT3 CE15 CE16
Development of a case study, presentation, defense, and discussion with the faculty	Problem-solving test	Face-to-face	03:00	50%	5 / 10	CG3 CG4 CG5 CT1 CT2 CE7 CT3 CT5

7.2. Assessment criteria

Students will be qualified through continuous evaluation by default. According to the Normativa de Evaluación del Aprendizaje de la Universidad Politécnica de Madrid, students willing to renounce to continuous evaluation must complete the Moodle task entitled "Renounce to continuous evaluation" before the end of week 3 (deadline will be announced in Moodle).

The evaluation will assess if students have acquired all the competences of the subject. Thus, evaluation through the final assessment will be carried out considering all the evaluation techniques used in continuous evaluation (EX, ET, TG, etc.), and will be celebrated in the exam period approved by Junta de Escuela for the current academic semester and year. Evaluation activities that assess learning outcomes that cannot be evaluated through a single exam can be carried out along the semester.

Continuous assessment

Attendance is mandatory to be assessed in the continuous assessment mode (90% of the lectures). The case studies will be developed in small groups seized upon the number of students enrolled.

1. The case studies must be solved and handed-in by the students before we discuss them in the lectures. Each case study will be weighted differently according to the effort required.
2. The case studies will be discussed in the lectures among all the students enrolled and the faculty. The presentations of the different case studies will be weighted a total of 15% of the total grade (a 5% for each of the three cases). Each group will be given the chance to present at least one of the case studies (depending on the number of students per group.)
3. Students are expected to engage in the course attending the lectures, expressing their points of view, etc.

Final assessment Extraordinary examination

Those students opting for the final assessment choice:

1. Final written exam (50%).
2. All the course assignment should be prepared with one of the other course groups (50% final grade). The students choosing the final assessment option should join other groups of the course to do all the assignments through the term and in the same times and delivery dates. It will not be accepted any assignment individually done. Students should ensure that they engage with other groups in the beginning of the course. They can be with continuous assessment students or also final assessment students.

Extraordinary exam call

For those having attended a significant part of the blended sessions, but not having delivered the case studies in the ordinary assessment period, their extraordinary examination will consist on: development of the different case studies, with a presentation of some of them, a discussion with the faculty, and answering orally some theoretical questions related to the course topic (100%).

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Excel - Tool for valuation of investment projects	Equipment	Excel file to model investment projects
Chan S. Park. Fundamentals of Engineering Economics. Prentice Hall; 3 edition (February 16, 2012)	Bibliography	
Donald G. Newnan, Jerome P. Lavelle, Ted G. Eschenbach. Engineering Economic Analysis. Oxford University Press; 11 edition (February 3, 2011)	Bibliography	
Tom Copeland, Vladimir Antikarov. Real Options, Revised Edition: A Practitioner's Guide 1st Edition. Texere; 1 edition (November 3, 2003).	Bibliography	

9. Other information

9.1. Other information about the subject

Blended methodology

- Some theoretical classes will be recorded in the ETSIT video recording facilities or delivered synchronously. Then the video recording will be available online in Moodle to the students, in order they can follow the course online.
- Discussion through the NTICLab: the working progress of student assignments will be developed through Webex, Skype or hangout collective videoconferences, or one-to-one online sessions.
- All the deliverables will be uploaded by students on the Moodle website.