# TECHNOLOGY

**IE University**
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Semester: 1º
Category: COMPULSORY
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Language: English

## PREREQUISITES

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## SUBJECT DESCRIPTION

Everyday technology is changing the way customers and enterprises interact. In this fast paced environment early adoption of technology when tailoring or adding value to customers draws the line between failure and success. Competitive advantage no longer comes through the whimsical use of technology but through how technology solves the main challenges that customers/individuals face in terms of providing a response to human behaviour, motivations and contexts. New ways of solving daily problems (e.g. smart chatbots) and accelerating daily processes are changing the way in which organisations are designed, not only to look after their customers' needs but also to implement the dynamically changing technology enhancing the overall experience for both.

This course covers the latest technology trends around understanding technology, how technology is implemented, and how technology varies across generations and cultures. It specifically will focus on how technology is applied by society, enterprises and individual people, and the implication of how it is applied by those same segments. Although we will be talking about technology, we will employ a human-centred approach. This practical approach will help students frame, develop and discover how technology will aid them in future projects, entrepreneurial initiatives, and even in identifying or generating new business model opportunities.

This course forms part of a larger program, IE Impact, which is explained below under Program Overview

## SUBJECT DESCRIPTION

## OBJECTIVES AND SKILLS

After this course students will be able to:

1. List key technology trends to date and the latest developments in the field that have impacted positively or have the most potential to impact positively society.
2. Compare how the adoption or use of technologies affects and influences daily lifestyles, behaviors and mindsets/views – now vs. grandparents' generation.
3. Analyse the exponential technologies that will be game changers and what the potential barriers of entry are that they might face.
4. Demonstrate a working knowledge of what the fundamentals are of the exponential technologies discussed in the course.
5. Demonstrate an understanding of what technology or technologies could provide a solution to a specific problem or challenge faced in society and identify the potential implications of its application.
6. Identify specific cases in which exponential technologies have already been applied to societal challenges, which have led to the alleviation of such challenges.

## OBJECTIVES AND SKILLS

## METHODOLOGY

This is a pragmatic course, which explores the latest trends in technology. Students will learn via class conferences and discussions, use cases, shared articles, and application of the content seen in class. The aim is to equip students with the fundamentals of technology and critical thinking towards exponential technologies so that they develop a familiarity and working knowledge both about what exponential technologies are having the greatest impact in terms of solving some of the world's most pressing societal challenges and about how such technologies work.

Students will learn how and when these technologies can be applied and for what purpose, as well as about their possibilities and limitations. Students will be able to identify the opportunities as well as highlight the implications that come with the application of certain technologies, including such important aspects as ethics, bias and security.

## METHODOLOGY

| Teaching methodology | Weighting | Estimated time a student should dedicate to prepare for and participate in |
|---|---|---|
| Lectures | 6.67 % | 5 hours |
| Discussions | 13.33 % | 10 hours |
| Exercises | 0.0 % | 0 hours |
| Group work | 6.67 % | 5 hours |
| Other individual studying | 73.33 % | 55 hours |
| TOTAL | 100.0 % | 75 hours |

## PROGRAM

## IE IMPACT OVERVIEW

This Technology course forms part of the IE IMPACT, which is a transversal academic program for all IEU students. IE Impact's mission is to prepare students to be agents of positive change in society.

You will be in class with students from all IE schools and undergraduate degrees. At IE, we believe firmly that one of the keys to innovation and growth is diversity. By bringing all students together during the core components of IE Impact and also in the IE Challenge, we hope to deepen and enrich your learning experience.

Many of you, if not all, already studied the first course in the IE Impact program – which was a course in the Humanities in the previous spring semester. By studying a course in the Humanities, the IE Impact program's aim is to help you to develop critical thinking skills and to help you begin to be aware of an array of societal challenges affecting the world. You are currently in the second course of the IE Impact, Technology. Here, we aim to help you learn about exponential technologies that are having the greatest impact on solving some of the world's most pressing societal challenges and are reshaping how enterprises are designed, managed and executed. The next course in this program is Entrepreneurship, where you will learn to step out of your comfort zones, question both yourselves and existing solutions and/or systems, and work in conditions of uncertainty. You will begin to develop entrepreneurial mindsets by ideating, validating, and developing innovative business models, which can be applied to societal challenges, providing sustainable solutions. The culmination of IE IMPACT is the IE Challenge where you will work in teams to tackle real-world problems by ideating and designing proposals to help a startup or organization advance, amplify or scale its impact on achieving one or more of the Sustainable Development Goals. You will participate in the IE Challenge in the first semester of your third year of studies and apply all of the skills and knowledge you have developed in the program's first three pillars (Humanities, Technology, Entrepreneurship).

## SESSION 1 (LIVE IN-PERSON)

**Innovation, disruption <---> Digital Transformation. Disruptive New Normal.**

In this session on Technology Megatrends and Implications, we will have an overview of the key innovation waves, technology trends influencing businesses, governments, and societies. Particularly, we will see how these technology trends are shaping the past, present and future across industries and the role of technology for customer experience, and our habits and behaviors. We will use these megatrends to introduce later the different technologies that we will be discussing and learning during the course.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 2 (LIVE IN-PERSON)

**Networks and Technology <---> New behaviors. Surfing the "Always on" Connectivity Wave.**

Connectivity is the society bias that drives most, if not all of our new ways of doing things. We shop, attend meetings, read books, travel, date, rent cars, etc., in different ways than our grand/parents did. Also, we are always producing/consuming data in the social networks from the time we wake up until we go to sleep. What enables this "always-on" way of life is the networks and their technology that supports their service coverage, the throughput, and the move to cloud storage; as well as processing all the services demanded by the new services and habits. Those are becoming the new people and society behaviors.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 3 (ASYNCHRONOUS)

**Big Data, Analytics, and Storytelling. The Data Tsunami.**

The data: basic concepts and technologies for its organization and management.

The concept of what is “data” will be covered, making the differentiation between what is data and what is information. We will explain how and why the world has evolved from “analogue” to “digital”, which involves operating with data, and what the conceptual basis of today’s electronics are (Moore’s Law/processing and storage units/computing and storage techniques). We will see what is the basic evolution of both computing and cloud storage.

In this asynchronous session, you will develop an understanding of the main operating systems/types of databases/data networks / the functioning of the internet. You will learn about the ways in which the data is valued (monetization) and you will see some examples of data monetization.

Software is eating up the world, many tasks and functions, whether performed by machines or by people, that used to be done by hardware (machines or tools operated by people) are now performed by software programming, virtualization, applications, etc.

The “everything as a service” models (e.g. renting a car instead of buying it are being imposed at all levels: XaaS -X as a Service-). We look at how data management is carried out around the world, what are the main legal aspects that are involved in it.

We will describe the use of data by large corporations and social networks, i.e. who and what the OTTs -Operators Over the Top- know about us, and we will end with tips on how to prepare presentations with data / build storytelling / and some examples of it all.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch during this asynchronous session.

## SESSION 4 (LIVE IN-PERSON)

**Open-sourcing. Cognitive science: The scientific basis of emerging information technologies.**

The impact of information technology is being felt in education, government, and industry. It is radically changing the way we do things at home and in the workplace, personally, and professionally. This is felt in a myriad of ways associated with the automation of information flow and management—from office automation to home banking, from expert systems to adaptive sensors and production site robots, from computer-aided drawing and instruction to brain imaging.

The scientific basis of the emerging information, technologies is cognitive science, involving the multidisciplinary work concerned with the understanding and modelling of intelligence.

Open-sourcing is a driver that is affecting several industries and verticals.

Data Science is being affected by new players and roles accordingly. The new emerging information technologies are shaping new business models consequently.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 5 (ASYNCHRONOUS)

**Internet of (every and smart) Thing. The Ecosystem Society.**

Today, the internet is everywhere (at least in modern developed countries). The new technologies of connectivity are bringing coverage to everything, including humans, machines, sensors, etc. Everything gets an IP address and gets connected to the Internet, opening a world of possibilities for data collection, analytics, new services, and new business models.

Although IoT was first introduced in 1999, at a business level it has been around since the last decades of the 20th century at an experimental level. Since the use of this technology has become widespread across industries of all kinds, it is now used from farming to healthcare to autonomous vehicles. We’ll review its state-of-the-art technology and the use cases under consideration.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch during this asynchronous session.

Ø Individual Assignment 1 related to this session: you will receive instructions from your professor.

## SESSION 6 (LIVE IN-PERSON)

**AI and Computer Vision. Mimic the Human Being.**

AI: Machine Learning: Supervised, Unsupervised and Deep Learning.

In this session, we will look under the hood of machine learning. When we hear the expression “we will apply machine learning” What does it really mean? How does it work? what kind of problems can it solve and how is it applied to transform big data into smart data generating insights about the customer and therefore improving its overall experience.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 7 (LIVE IN-PERSON)

**Extended Reality, use cases and models. Extracting New intelligence.**

In this session, we will discuss the differences between virtual, augmented, and mixed reality.

Extended reality is close to disrupting our mobile experience with the use of 5G and concepts like network slicing, latency reduction, etc. Among other things, we will understand how extended reality works and needs to be designed to provide customers/users with enhanced experiences.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 8 (ASYNCHRONOUS)

**Digital Economy <---> Ecosystems. The Apps Economy.**

In this session, we will learn about how technology has no reason to exist except to support the economy, and how satisfying society’s needs is how technology contributes and influences how to push forward the world’s economy. Today we address the Digital Economy, but we realize GDP does not reflect it properly. Also, we will discuss the ecosystems and the apps economies. We will uncover the tricks and tips of those concepts.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch during this asynchronous session.

Ø Individual Assignment 2 related to this session: you will receive instructions from your professor.

*Practical Case: DBS: From the "World's Best Bank" to Building the Future-ready Enterprise (HBS NTU231-PDF-ENG)*

## SESSION 9 (LIVE IN-PERSON)

**From cloud/edge computing to Quantum era. The Network and Computational Thinking.**

The objective of this session is twofold. On the one hand, we will learn how computing has evolved from one computer for many users to many computers for one user. This evolution added to the affordability of technology and brought the current computing technologies to maturity … for the moment! On the other hand, we will see how quantum computing works and how it is changing the way in which we will understand computing and the next leap in technology (and many other industries). We will outline the next quantum internet era and its consequences on a global cognitive world.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 10 (LIVE IN-PERSON)

**Blockchain and cryptocurrencies. New Digital Identity, contracts, and money issues.**

In this session, we will discuss Blockchain: from use cases to intermediation disruption.

Blockchain is the technology that is disrupting businesses and is much more than cryptocurrencies and fintech. Although the initial hype foresaw that this technology was going to be implemented across sectors in the short term it is clear that the scalability of this technology is making it more difficult than originally was expected. After the hype has passed, it is clear that blockchain is here to stay and reshape the way we understand the democratization of different sectors.

In this session, we will learn the fundamentals of this technology such as nodes, tokens, etc.

Furthermore, we will see how to choose between different blockchains based on their features and the problem we want to solve. We will also see when the best time to use this technology is.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 11 (LIVE IN-PERSON)

**Cybersecurity <---> the safe digitalization challenge. Risk Management in a new world.**

Cybersecurity: the great challenge of digitalization.

In this session, we will study what the big challenge of digitalization is: physical security versus logic and we will see what cybersecurity is, what certifications are used, and we will explain basic concepts such as what is a firewall, an antivirus, etc. We will distinguish between the concepts of Cybersecurity, information security, network security, vulnerability assessment, information assurance to differentiate the aspects of corporate and personal cybersecurity, describe the main types of attacks and point out the challenges ahead.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 12 (ASYNCHRONOUS)

**The World of Digital Twins and Cognitive Mimetics. From things that do to cognitive things.**

In this asynchronous session, you will learn to study how a digital twin is a digital replica of a physical-world asset or process that integrates data from both the digital and material worlds, enabling companies to run virtual simulations before committing to physical-world actions.

In this session, we will understand how IoT brings a better understanding of the physical world generating data that with the help of wireless technologies and across networks help to improve reality understanding, customer experience, provide a strong base for decision making and generate value for a business.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch during this asynchronous session.

Ø Final Group Assignment: you will receive instructions from your professor.

*Practical Case: Tencent (HBS 718426-PDF-ENG)*

## SESSION 13 (LIVE IN-PERSON)

**Technology, Ethics, and the AI disruption use cases. Digital principles under control.**

In this session, we will understand how computers are trained through deep learning to see the world. While we are able to discern between objects in an image, computers see pixels, shades and borders of objects within pictures or frames. This field started with a part of artificial intelligence in the 1960s, and it is since 2010 – thanks to the development of computing power, deep learning and the availability of datasets – that is, has experienced its major developments like being able to discern vehicles from the rest of the objects on a road to being able to identify whether an object is a car or a bus, its colour and make/model. Furthermore, the capacity of computers to learn and identify automated alignment, motion, track objects and action recognition has moved image processing to the next level of Vertical AI. During the session, we will explore the technology behind robots, the latest R&D in the area, types and the use of robotics to drive value for organizations. While the cost of robots, and in particular, humanoids still keeps it from scale, RPA confidently gains ground in automating processes, infrastructure also entering client-facing areas. Finally, we will also explore the ethical aspects that accompany AI because while it is radically changing the world we live in to improve and make our lives easier, bias is an ethical aspect that must be taken into consideration.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 14 (LIVE IN-PERSON)

**Sustainable Development Goals <---> ESG, Environmental, Social, Governance, and Data Governance. Saving our World.**

In this session, we will discuss the Sustainable Development Goals (SDGs) also known as the Global Goals, which were adopted in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. From Davos Conferences, a new vision and approach to a new economy in the form of shareholders capitalism has been outlined. As such, we will also discuss how corporations are now reporting, more and more, as per an ESG (Environmental, Social and Governance) Framework.

Ø Use cases and/or other materials will be sent to you by the professor to read, review or watch before class.

## SESSION 15 (LIVE IN-PERSON)

**Conclusions and wrap-up. A new human species for a new era. A new culture and new values to compete and survive in a better world.**

In this session we will discuss, What is Digital Transformation? The CXO Approach: Application of acquired Technology understanding to your IE Challenge.

We will end up by wrapping up the concept of Digital Transformation enabled by learned technologies (and other hard/soft skills). This is your time, as a real CXO, to capture the principles you may need to apply next year during the IE Challenge (in year 3 of the IE Impact) about one of the technologies that we have seen to enhance, change, or discover new ways of bringing value to users/customers.

Ø Highlights of previous sessions and/or other materials will be sent to you by the professor to read, review or watch before class.

## EVALUATION CRITERIA

**Individual class participation:** Active participation in sessions represents an important part of learning. Both quantity and quality of comments will be evaluated. Each student is expected to participate proactively, demonstrating they have read the recommended readings (or watched any media) and making at least a meaningful contribution to the conversations in each of the in-person class sessions in the form of asking a question / stating an agreement/disagreement or new perspective / providing answers to the professor's open questions / sharing technology use cases from their own experience or knowledge, etc.

**Assignments:** You will be responsible for the following assignments.

- Individual Assignment 1 will be related to the Asynchronous Session 5 and you will receive instructions from your professor. This assignment will be 25% of your final grade. Format ppt max. 10 slides.
- Individual Assignment 2 will be related to the Asynchronous Session 8 and you will receive instructions from your professor. This assignment will be 25% of your final grade. Format ppt max. 10 slides.
- Final Group Assignment will be a final report on a topic that is proposed to you by your professor and will focus on you demonstrating the knowledge and perspectives you have developed during the entire course. This assignment will be 35% of your final grade. Format ppt max. 15 slides.

| **Criteria** | **Percentage** | **Comments** |
|---|---|---|
| Class Participation | 15 % | Quality over quantity. Class Comments, etc. |
| Individual Assignment 1 | 25 % | Proposed at Asynchronous Session 5 |
| Individual Assignment 2 | 25 % | Proposed at Asynchronous Session 8 |
| Final Group Assignment | 35 % | Final Report on topic proposed at Session 12 |

**RESIT / RETAKE POLICY**

Each student has four (4) chances to pass any given course distributed over two (2) consecutive academic years. Each academic year consists of two calls: one (1) ordinary call (during the semester when the course is taking place); and one (1) extraordinary call (or "re-sit") in June/July.

Students who do not comply with the 70% attendance requirement in each subject during the semester will automatically fail both calls (ordinary and extraordinary) for that Academic Year and will have to re-take the course (i.e., re-enrol) during the next Academic Year.

Regarding the newly implemented ´liquid learning´ model, all students must still abide by the same IEU attendance policy, including those students who are connecting remotely to class sessions and not physically in the classroom because they are unable to be physically in Spain, on campus. During the sessions, students connecting remotely are required to fully connect their camera and microphone at all times, and must actively participate during the sessions (using all necessary audiovisual equipment), just as their fellow peers who are physically present in the classroom on campus.

The Extraordinary Call Evaluation criteria will be subject to the following rules:

- Students failing the course in the ordinary call (during the semester) will have to re-sit the evaluation for the course in June/July (except those students who do not comply with the attendance rule and therefore will not have that opportunity, since they will fail both calls and must directly re-enrol in the course during the next Academic Year).
- It is not permitted to change the format nor the date of the extraordinary call exams or deadlines under any circumstance. All extraordinary call evaluation dates will be announced in advance and must be taken into consideration before planning the summer (e.g. internships, trips, holidays, etc.)
- The June/July re-sit will consist of a comprehensive evaluation of the course. Your final grade for the course will depend on the performance in this exam or evaluation only. I.e., continuous evaluation over the semester (e.g. participation, quizzes, projects and/or other grade components over the semester) will not be taken into consideration on the extraordinary call. Students will have to achieve the minimum passing grade of 5 and the maximum grade will be capped at 8.0 (out of 10.0) – i.e., "notable" in the extraordinary call.

After exams and other assessments are graded by the professor (on either the ordinary or extraordinary call), students will have a possibility to attend a review session (whether it be a final exam, a final project, or the final overall grade in a given course). Please be available to attend the session in order to clarify any concerns you might have regarding your grade. Your professor will inform you about the time and place of the review session.

In case you decide to skip the opportunity to re-sit for an exam or evaluation during the June/July extraordinary call, you will need to enrol in that course again for the next Academic Year as a re-taker, and pay the corresponding tuition fees. As you know, students have a total of four (4) allowed calls to pass a given subject or course, in order to remain in the program.

## PROFESSOR BIO

Professor: **MARIANO ALVAREZ DIENTE**

E-mail: mad2@faculty.ie.edu

### ÁLVAREZ DIENTE, Mariano

**Academic Background**

Graduate and Master in Telecommunication Engineer, Universidad de Valladolid
Graduate and Master in Literary Theory and Comparative Literature, Universidad de Valladolid.
Master in E.S.O, Bachillerato, Professional training and languages teaching.
Master in Philological studies: professional/business applications.

**Academic experience**

Colegio San José. Valladolid.
Currently, Instructor at IBM Global Services on Internetworking and Information and Telecommunication Technologies. Since 2004.
Courses:

- Big Data & Analytics
- Mobile & corporate strategy
- New technologies in communications
- WLAN networks implementation
- WLAN security
- WiMAX technology
- TCP/IP fundamentals
- Networks Implementation & administration
- IP Telephony (VoIP).
- IoT (IBM Cloud)

**Professional experience**

Currently. Freelance. Telecommunication and Information Technologies projects.
Currently. Instructor at IBM Global Services
Engineer in Acoustics. Acoustic municipal centre Hall of Valladolid
Solyven S.L. Solar energy projects.

In a market as complex as IT, Professor Álvarez has worked (and still does) in different roles for medium size and large companies like IBM, which has led to in-depth experience in IT.

## BIBLIOGRAPHY