

TECHNOLOGY

IE University

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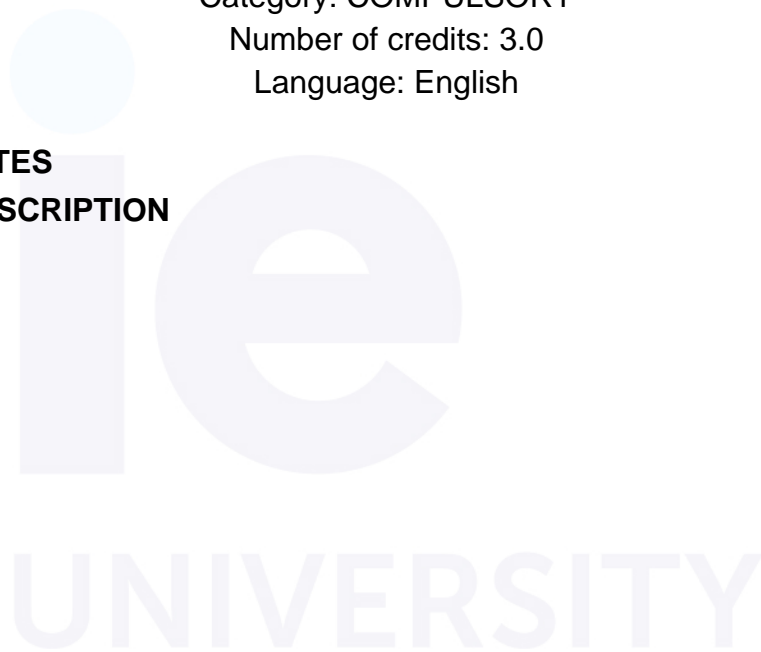
Category: COMPULSORY

Number of credits: 3.0

Language: English

PREREQUISITES

SUBJECT DESCRIPTION



Technology has transformed the way we live. Since the late 18th Century, we have been finding ways to overcome the limitations that nature imposed and to go beyond evolution. Advances in technology have allowed us to perform mind-bending calculations way beyond the capacity of our natural abilities. This has led to flight, space travel, quantum physics, nuclear power, and many other breakthroughs.

Since the advent of the integrated circuit and then silicon chips, our rate of evolution has accelerated in unprecedented ways. We will examine the impacts of current technologies such as big data, social media, machine learning, and smart factories to reflect how things have changed for us as a society since these technologies became commonplace.

As people, we have improved our ability to cope with physical problems. Advances in medical technologies have brought us longer lives, better treatment of disease, and a level of physical comfort never before known. Scientists are on the verge of developing treatments for almost every disability, from brain-controlled artificial limbs to human-computer interfaces that will allow us to communicate using thoughts. The future could see us surpass our current state of consciousness, allowing us to communicate in ways beyond our imaginations. The future could also see the emergence of immortal humans who might continue to exist forever.

We have gone beyond using our muscles to produce the things we need. Now, robotics and automation make producing anything quicker and more accurate than we could ever hope to achieve with our own hands. The future will see us developing technologies that will perform our mental processes in superhuman ways, leading to artificial life that will outsmart and outperform us.

Through new technologies, we have revolutionized communication over the last decade. This has transformed how we interact and communicate and has also raised many questions about how much advertisers should be able to manipulate us. We have seen the emergence of new mental health conditions such as the 'fear of missing out' and a huge rise in anxiety due to social media usage. While this technology has improved our ability to collaborate, it has also brought some unanswered mysteries.

Artificial intelligence is set to dominate the coming decade, and this course will have implications for every aspect of our lives. The idea of super-intelligence that is more sophisticated scares and amazes philosophers, scientists, and futurologists. It could mean that we create the ultimate invention. Every aspect of life could change, with 'robojudges' dealing out justice, possibly revolutionizing the legal system to make it safer and less corruptible. The ways our future could manifest will be explored and examined, and questions about the ethical and human impact will be examined. We will need to ask ourselves how an artificial creature that is more intelligent than humans could change the fabric of our society. We may even have to reassess what the role of a human will be in the future and whether we will value ourselves in the same way as we have done in the past.

Are you ready to see where all the innovation and disruption are leading? This course aims to prepare you for the coming storm of changes. The next decade will be unlike any other in the history of our species. The rate of change will increase, and without knowing what is coming, the opportunities may pass us by.

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. Analyze technologies that will be game-changers and the potential barriers of entry that they

- might face.
4. Demonstrate a working knowledge of the fundamentals of the 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 technologies have already been applied to societal challenges, which have led to the alleviation of such challenges.
 7. Discuss the SDGs and the ESG framework, which rely on technology to sustain planet Earth and the human species' continuity of life.

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/readings, and application of the content seen in class. The aim is to equip students with the fundamentals of some of the technologies that have brought about change and made an impact on society.

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.

Each session comprises a Lecture (20 to 30 minutes), Practice (20 minutes) and Group Project mentoring (30 minutes).

- The Lecture part will follow the points outlined above for each session.
- Practice may be anything from building a simple demo, a debate among students, a demonstration by the Professor and / or a Quiz. Quizzes for Sessions 8 and 12 will count towards your final grade (25%).
- Group Project mentoring blocks will guide students on the methodology and tools required to develop and execute their Project of choice.

Teaching methodology	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	13.33 %	10 hours
Discussions	9.33 %	7 hours
Exercises	10.67 %	8 hours
Group work	40.0 %	30 hours
Other individual studying	26.67 %	20 hours
TOTAL	100.0 %	75 hours

PROGRAM

IE IMPACT is a multi-bachelor, multi-school mandatory academic program for all IEU students whose mission is to foster the skills, mindsets, and knowledge we at IE University believe students need to develop into *leaders of positive change*.

IE IMPACT begins with “pillar courses” in three of IE’s core values: the Humanities, Technology and Entrepreneurship. The IE Impact learning journey aims to help IEU students to develop:

- humanistic approaches to interpersonal relations, decision-making and critical thinking;
- familiarity with the technologies that are applied to solve some of the world’s greatest

challenges; and

- entrepreneurial mindsets, know-how, and skills to identify and solve problems worth solving, and to create validated business models that enable solutions to be enduring and scalable

IE IMPACT OVERVIEW

The **IE Challenge** is the culmination of the IE Impact learning journey, and its fourth and final course. Students in the IE Challenge will apply the skills, mindsets, and knowledge they began to develop during the three pillar courses, and through their hands-on work they will deepen their learning development and skills related to IE's core value of Diversity. In the IE Challenge, IEU students will be placed in diverse teams with team members from other backgrounds, degrees, demeanors, etc. Each team will explore and innovate solutions for real-world challenges that are posed to them by startups or enterprises whose business models are driven by sustainability. By working directly in teams to support these enterprises to increase or scale their positive impact related to sustainability, IEU students will deepen their individual development as leaders of positive change.

Upon the successful completion of the IE Challenge, students will receive a certificate that demonstrates their participation in this rigorous program, which they will be encouraged to save and share as part of their portfolio of accomplishments to demonstrate their hard and soft skills.

SESSIONS

IE IMPACT TECHNOLOGY SYLLABUS

SESSION 1 (LIVE IN-PERSON)

Intro to Course

- Course summary: contents description.
- IE and Students expectations.
- Assignments and Grading.

Group Project: Project Introduction, survey for team formation, ideas on how to choose a project.

SESSION 2 (LIVE IN-PERSON)

The Origins of Technology.

- The scientific and 4 industrial revolutions and how they transform/ed society.
- The first computer design by Charles Babbage.
- The foundations of coding from Ada Lovelace and her famous notes.
- The foundation of data processing (Herman Hollerith and his Tabulating Machine Company and the formation of IBM).
- Alan Turing and his universal machine.
- Jon Von Newman and the design of modern computer architecture.
- The key technologies that drove the digital revolution:
 - vacuum tubes,
 - transistors,
 - integrated circuits,

- microprocessors
 - The Moore's law.
 - How technologies have transformed the business world and personal lives.
 - New behaviors and business models enabled by Technology.
- Group Project: Pitch initial ideas. Explain NABC with example.

SESSION 3 (LIVE IN-PERSON)

The Network and the World Wide Web.

- How J.C.R. Licklider created the concept of a network.
- The development of ARPAnet.
- The creation of Open Source through the Request for Comments system.
- Decentralization and the creation of the Internet.
- Unification of protocols and the rise of TCP/IP.
- Tim Berners Lee's World Wide Web.
- Ways the Internet could evolve in the future.

Group Project: Teams choose project. User/Customer Validation.

SESSION 4 (LIVE IN-PERSON)

Social Media

- A history of social media, from The Well in 1986 to Snapchat.
- How social media rose from gambling models (fruit machines were the basis for the timeline).
- The adoption of the Google advertising model.
- The social media attention economy.
- Addiction and mental health effects of social media.
- Social media as a means of behavior manipulation (Cambridge Analytica and terrorist recruitment on the platforms).
- How oligopolies are making money and driving Economy.

Group Project: Low-tech Demo

SESSION 5 (LIVE IN-PERSON)

Online Business and E-Commerce.

- An introduction to digital business.
 - How technologies have been used in businesses.
- 10 Types of Innovation: The Art of Discovering a Breakthrough Product.
- Digital Thinking.
- Agile Methodologies.
- The rise of Amazon and eBay in the 1990s and early 2000s.
- The effects of online commerce on traditional industries.
- The effects of technology in different sectors:
 - The creation of free online services like Wikipedia and Google Maps.
- Replacing traditional maps and encyclopedias.

- Online streaming revolutionizing the music industry.
 - Apple and Google's takeover of Nokia and Blackberry's mobile business.
 - Streaming video and the effect on cable.
 - App Store and Play store commissions landscape.
 - B2B and B2C differences.
 - The effects of the pandemic on online purchasing behavior.
- Group Project: Where to start

SESSION 6 (LIVE IN-PERSON)

Artificial Intelligence.

- Introduction to AI (machine learning, deep learning, neural networks, "Good Old-Fashioned AI" vs modern AI).
 - Definition of Artificial General Intelligence and when it may materialize.
 - NLP and chatbots.
 - Computer vision for robotics.
 - Deep Blue and the defeat of the world chess champion and Watson and the jeopardy challenge.
 - Deepmind and the defeat of the world poker and go champions.
 - The ethics of AI and the implications of AGI for the future.
 - The different belief systems about AI.
 - Digital Utopians
 - Techno Sceptics
 - The Beneficial AI movement.
 - The ethics of AI, autonomous weapons, the impact of super-intelligence
- Group Project: Explain Tech strategy

SESSION 7 (LIVE IN-PERSON)

Smart Manufacturing and a Smart Future.

- Look at the mass personalization of products replacing mass manufacturing.
 - From things that do, to things that act and operate.
 - The smart factory.
 - Internet of (every)Thing and Industrial IoT.
 - Smart cities.
 - Life Automation, Robotics.
 - Digital Twins.
 - Everything as a service.
 - The new economy effect on jobs.
 - RPA taking our jobs.
- Group Project: Showcase.

SESSION 8 (LIVE IN-PERSON)

The Evolution of the Data Economy.

- An introduction to data and information.
- The difference between relation and big data.
- Traditional data analytics: relational data and business intelligence.
- An introduction to Big Data and NoSQL (MapReduce, Hadoop etc.).
- The ethical implications of the data economy.
- Data as a model for advertising.
- The ethics of online profiling.
- How data can make businesses smarter.
- Data storytelling.

Quiz 1: session 2 to session 8

Group Project: Showcase.

SESSION 9 (LIVE IN-PERSON)

Blockchain and NFTs.

- An introduction to Blockchain.
- Blockchain as a replacement for traditional trust.
- Environmental impact.
- The first blockchain application: cryptocurrency.
- Digital Money versus cryptocurrencies.
- Industrial applications and success case studies.
- An introduction to NFTs.
- The crazy world of the NFT:
 - Cryptokitties
 - CryptoPunks
 - Beeple's Everydays
 - The Pixel
 - NFT practical applications
 - Jack Dorsey's first tweet NFT.
- NFTs in the metaverse.

Group Project: Showcase.

SESSION 10 (LIVE IN-PERSON)

Extended Reality and the Metaverse.

- Introduction to virtual and augmented reality.
- Industrial uses for VR.
- Use cases of VR.
- Holograms and 3D collaborative technologies.
- Future uses for the technology.
- The possible replacement of the mobile phone with AR.
- Current metaverses.
- The metaverse and how it will affect all aspects of life.
- Ethics and Governance.

Group Project: Showcase.

SESSION 11 (LIVE IN-PERSON)

Cybersecurity

- An introduction to cybersecurity.
- Physical and Logical security.
- Types of cyber threats:
 - Malware
 - Hacking
- Cyber-activism - including a brief history of the Anonymous group.
- Examples of companies hacked and the effect on their businesses.
- Governments and cyberwarfare - e.g., hacking of the Iranian nuclear enrichment program and use by national security agencies.
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SESSION 12 (LIVE IN-PERSON)

Data Law and Sustainability.

- An introduction to the relationship between technology and law.
- Fundamentals of data law and ethics.
- US Regulations.
- The implications of the GDPR.
- The new European DMA and DSA.
- How computing has become more sustainable.
- The effects of blockchain and cloud computing on sustainability.
- Smart grids and AI.
- Sustainable technologies.
- SDGs.
- ESG principles.

Quiz 2: session 9 to session 12

Group Project: Showcase.

SESSION 13 (LIVE IN-PERSON)

Biotechnology and Nanotechnology.

- An introduction and a brief history of biotechnology.
- Transhumanism and the singularity.
- Efforts to extend human lifespans and reverse aging.
- Technology and healthcare - automating surgery, analyzing the genome, personalized medicine and healthcare. E-health, CRISPR ...
- AI in healthcare.
- Nanotechnology pioneers.
 - Jon Von Neumann's self-replicating system, a universal constructor, combined with a universal computer

- The conceptual birth of nanotechnology by Richard Feynman
 - Current uses for nanotechnology.
 - The nano future.
- Group Project: Showcase.

SESSIONS 14 - 15 (LIVE IN-PERSON)

- Group Presentations and wrap up.
- Group presentations
 - Course Wrap up

READINGS

Session materials will be provided in advance (slides and recommended readings).

BIBLIOGRAPHY

Recommended

- Ikhtlaq Sidhu. (2020). *Innovation engineering : a practical guide to creating anything new*. Sidhu Innovation Engineering. ISBN 9781733431705 (Printed)

EVALUATION CRITERIA

Criteria	Percentage	Comments
Class Participation	20 %	Class Comments (quality), Practice, Attendance.
Individual Evaluation	20 %	Quizzes: Sessions 8 and 12
Individual Work	25 %	Individual essay on student's contribution to Group Project Proposal, Design and Execution
Group Assignment	35 %	Group Project Delivery. Evaluation based on: Project Proposal (30%) Project Design (30%) Demo Day & Tool utilization (30%) Peer Review by group team members (10%)

PARTICIPATION

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.

The "Practice" portions of class sessions may require students to upload a small contribution to IE Campus. This will be factored into your Class Participation evaluation.

In this IE Impact-Technology course, you will work during the entire semester on a group project. Learning to work effectively in diverse teams is a fundamental aspect of the overall IE Impact program. Teams are required to work together to manage, execute and monitor the tasks and deliverables of this final group project.

"Free-riding" (any student who does not take an active role in contributing to the progress and completion of the work expected of each team weekly and who allows the work to be done by others) will be monitored and evaluated accordingly.

Any student who is having difficulty in developing the skills, mindsets and know-how necessary to contribute actively to his/her team, should email the IE Impact Team at ieimpact@ie.edu to request additional support so that the the IE Impact team, in collaboration with your Technology professor, can help those students who want to do better but may be unclear about how to do better on their own.

Likewise, any student who thinks that his/her team may need extra support in terms of team management should also reach out to ieimpact@ie.edu to discuss options and redirect team dynamics, if necessary

PROFESSOR BIO

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EDUARDO RODRÍGUEZ LORENZO

Eduardo Rodriguez Lorenzo is Senior Manager at NETSCOUT and Adjunct Professor at IE School of Science and Technology. He is a technologist specializing in Telecommunication Networks, Cybersecurity, Software Architecture, Data Engineering and Analytics.

He studied at UPM (Universidad Politécnica de Madrid), King's College London and London University.

At NETSCOUT, he leads a global team of Data and Network Engineers with a strong focus on Network Service Assurance, Cybersecurity, Data Engineering and Analytics.

He has gained broad international experience delivering high-value Consulting Services (Customer Experience & Customer Journeys, Business Intelligence, Service Assurance, Data Monetization, Process Engineering...) and Data-driven Solutions (Cloud & Backend Architecture, Data Feeds, Database, Dashboard, Interaction & Visualisation Design) to global Enterprises and Communication Service Providers. He has played an active role in the launch, measurement and optimisation of Mobile Networks for various top international Telcos.

He is a member of the Spanish Charter of Telecommunications Engineers (COIT) where he is an active member of the Telecommunications Policy and Regulation Group and the Digital Transformation Group.

His main interests include Disruptive Technologies, Data Engineering Architectures, Networks, Distributed Systems and Graph technology.

He joined IE University in 2020.

[LinkedIn](#) | [Twitter](#)

OTHER INFORMATION



ATTENDANCE POLICY

Attendance to IE Impact Technology sessions is essential and just like any other IEU academic course all students must follow IEU's Attendance Policy. Any and all questions about attendance in this course should be directed to ieimpact@ie.edu (not to a student's bachelor degree program).

As per IE University policy, every student must attend at least 70% of sessions. The IEU attendance policy applies to any type of session: live in-person sessions on campus, asynchronous sessions, or live-online as stipulated in the syllabus. Students attending less than 70% of sessions will be graded with a FAIL for the course. This FAIL will apply to the ordinary and the extraordinary calls of the current academic year.

In the case of IE Impact Technology, a 15 session course, IEU's attendance policy means that if a student has more than 4 absences, s/he will FAIL and will have to re-enroll (paying all corresponding fees) and retake the IE Impact Technology course again in the next academic year. (See the Resit/Retake policy in the syllabus).

All IE Impact Technology sessions are scheduled to be LIVE IN-PERSON. Therefore, students will be marked absent if:

- they attend an in-person session via Zoom, or any remote format;
- they do not attend the session in-person or in any mode;
- they attend virtually a live in-person session, for which they received an authorized attendance waiver to attend the session online, but they do not have their camera turned on, they are not engaged, and they are not seated without distraction during the entire class session.

If for any reason, an IE Impact Technology session is re-scheduled to be LIVE-ONLINE, students will be marked absent if:

- they attend the session online but they do not have their camera turned on, they are not engaged, and they are not seated without distraction during the entire class session.

PLEASE NOTE: the final two sessions of the IE Impact Technology course are a double session and if any student is marked absent (for attending online without an authorized waiver or for not attending in any mode), the absence constitutes 2 absences.

Attendance waivers

Under exceptional circumstances (serious health problems, visa delays, and travel restrictions), a student can ask for a temporary attendance waiver and may be allowed to attend online (or not in any format) and not have his/her 70% attendance affected. For this to be possible, a written and documented request must be made in advance to the IE Impact Program Management Team. Students must email ieimpact@ie.edu with the request and any related documentation. Last minute changes in attendance or verbal request will not be considered. If the request is approved, an attendance waiver will be granted over one or more sessions and the allowed 30% will only be applied to other absences (without an authorized waiver).

Rules for online attendance (when authorized or when stipulated in syllabus).

Any student who receives (or expects to receive) authorization for an attendance waiver to attend a live in-person session online (via Zoom) or any student who attends a previously scheduled live-online session online (zoom) must meet the following criteria to be marked present: must have his/her camera on at ALL times, must be actively engaged during the entire class session and with any and all team-work, and must be located in an appropriate learning environment (e.g. student must be seated and free of distractions for the entire session).

Use of the 30% absences

No sessions or activities may be "skipped". If a student is under the impression that s/he can skip up to 30% of the IE Impact Technology sessions, this is a mistake. The 30% "rule" is reserved for those circumstances that are out of a student's control. Personal trips, interviews, appointments, mild illnesses, family celebrations or ceremonies, or other personal matters will not be treated as

exceptional cases and should be considered part of the 30% of allowed absences.

Attending online but still absent

Students, who do not have an authorized attendance waiver, are allowed to attend a class session online, however they must understand that they will be marked absent, and their participation grade may be influenced negatively by a high percentage of absences during the semester.

Role of Professors in Attendance

Professors are responsible for recording attendance; however, they have no authority to grant any student permission to have an excused absence of any kind (or to change the format of how a student may attend a session).

Any inquiries or requests must be made by the student to the IE Impact Program Team via email ieimpact@ie.edu

Professors are instructed to mark as ABSENT:

- students who do not attend a session in its previously scheduled format
- students who attend a session in a different format (online) than what was previously scheduled (i.e. they attend online instead of in-person).
- students who attend a previously scheduled online session (or a session they were previously authorized to attend online) but do not have their cameras on, engage actively or stay seated in an environment free of distractions for the entire session.
- students who do not complete the work adequately assigned for an asynchronous session.

If a student receives authorization for an attendance waiver and the student was already marked absent, the professor will be informed and the attendance record will be modified from absent to whatever is authorized (present, excused, etc).

Authorization for Attendance Waiver from a Student's Bachelor Program

If a student has received authorization for an attendance waiver from his/her bachelor degree's program to be absent (from any format of class) or to attend a live in-person session online (via Zoom), then the student must forward the email authorization to the IE Impact Team (ieimpact@ie.edu) and it will be verified. Upon verification, the professor will be informed to either not record a student as absent or to change a previous attendance record from absent to present, excused, etc.

RE-SIT / RE-TAKE 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 have to re-take the course (i.e., re-enroll) during the next Academic Year.

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 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-enroll 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 your 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.

Re-takers: Students who failed the subject in a previous Academic Year and are now re-enrolled as re-takers in a course will need to check the syllabus of the assigned professor, as well as contact the professor individually, regarding the specific evaluation criteria for them as re-takers in the course during that semester (ordinary call of that Academic Year). The maximum grade that may be obtained as a retaker during the ordinary call (i.e., the 3rd call) is 10.0 (out of 10.0).

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.

Students failing more than 18 ECTS credits after the June/July re-sits will be asked to leave the Program. Please, make sure to prepare yourself well for the exams in order to pass your failed subjects.

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

