Elective Courses 2024-2025

Formats

- **ONLINE Eskolak**

  Classes Will be via streaming at a specific schedule time Friday from 13:30-15:30 the 2nd year electives and Fridays from 11:00 - 13:00 3rd year electives together with the teacher and the rest of the students.

  Students can only choose one subject in this modality for each year.

- **ONLINE Nahieran**

  Each student will be able to develop the contents whenever he/she wants. There will be no classes, but the material of the course Will be in Mudle for the student to work on. The teacher Will be able to establish certain milestones throughtout the semester in order to ensure the adequate development of the contents.

2ⁿᵈ year Elective Courses

Course	Code	ECTS	Language	Format (Online)		Semester	
				Eskolak	**Nahieran**	**S1**	**S2**
Efficient team working	GH8227	3	EN	x		x	
Effective decisión-making processes	GH8218	3	EN		x		x
Engineering Deontology	S1: GH8202 S2: GH8219	3	EN	x		x	x
Sustainable development and environmental ethics	S1: GH8228 S2: GH8215	3	EN		x	x	x
Formación y orientación laboral	S1: GH8204 S2: GH8226	3	ES	x		x	x
Occupational Health and Safety	S1: GH8205 S2: GH8221	3	EN		x	x	x
English I: Scientific and Technical English	S1: GH8206 S2: GH8222	3	EN	x		x	x
English II: Oral Communication	S1: GH8208 S2:GH8225	3	EN	x		x	x
Redacción de textos Científico-Técnicos	S1: GH8209 S2: GH8224	3	ES	x		x	x

Efficient team working

Mondragon Unibertsitatea
Goi Eskola Politeknikoa

General Information

Semester: **S1**   Language: **English**   Format: **Online nahieran**

Description

This subject will help the student to understand the variables that influence working teams understood as a process and will provide them with tools to perform more efficiently when working in a group (as a member or a leader).

Methodology

- Readings and videos will be available online.
- Working teams will be created and each team will submit different practical exercises.
- Final individual test.
- Final grade will be an average between the final exam and the exercises.

Contents

- **Topic 1: Introduction**
- What is a team?
- Why do we want to work in teams?
- Basic concepts about teams
- **Topic 2: Leadership**
- The basics of Power
- Types of Leadership
- Efficient Team Leadership
- **Topic 3: Communication & Conflict Management**
- The basics of Communication
- Non-violent Communication
- Types of Conflicts
- The conflict Process
- Conflict Management
- **Topic 4: The process of Efficient Team Working**
- From groups to teams
- The process of becoming an efficient team

Effective decision making processes

General Information

Semester: **S2**   Language: **English**   Format: **Online nahieran**

Description

This suject will help the student to know the variables that influence the decision-making process, whether simple or complex decisions, and will allow them to select the most appropiate method depending on the given scenario.

Methodology

- Readings and videos will be available online.
- Working teams will be created and each team will be working on different practical exercises.
- Final individual test.
- Final grade will be an average between the final exam and the exercises.

Contents

Topic 1. **Variables to be taken into account.**
- The process of decision making.
- The importance of the emotions.

Topic 2: Analysis of different scenarios for decision making.
- Types of problems.
- Difficulties when making a decision.
- Analytical vs. Systemic Thinking perspective.

Topic 3: Analytical Thinking.
- Inquiry Techniques.
- Methods and Tools for decision making.

Topic 4: Systemic Thinking.
- Introduction to systemic thinking.
- Basic concepts.
- Practical cases.

Engineering Deontology

General Information

Semester: **S1 and S2**   Language: **English**   Format: **Online Eskolak**

Description

In this course we will deal with the ethics of engineering. We will approach the relationship between science, technology and society from a genealogical and systemic point of view. We will analyse the development of the regulatory framework in the European Union. Finally, we will experiment with how to integrate the ethical approach in our research practice.

Methodology

- Master classes.
- Tutorial sessions.
- Guided readings.
- Discussion groups.
- Practical exercises (challenges, case analysis...).

Contents

- **Engineering Ethics.**
- **Science, technology and society.**
  - **Standard model.**
  - **Socio-technical model.**
  - **Global challenges and innovation systems.**

- **Systematic approach**
  - **Classical theories: the concept of responsibility.**
  - **Contemporary theories: risk paradigm.**
  - **Responsible research and innovation (RRI).**
  - **Case studies.**

- **Normative framework**
  - **ELSA: Ethical, Legal and Social Aspects of Science.**
  - **RRI: Responsible Research and Innovation.**

- ***"Doing and Experiencing Dialogical Reflection on Research and Innovation"***

Sustainable development and environmental ethics

General Information

Semester: **S1 and S2** Language: **English** Format: **Online Nahieran**

Description

The course deals with the fundamentals of the environmental ethics of sustainable development, knowledge of the existing tools for its assessment and the characteristics of the most commonly used tools at present.

Methodology

- Individual learning + participative lectures (tutorial sessions to clarify doubts and contextualise/explain the topics to be covered).
- Guided practice (debates - forum)
- Problem-based learning / learn by doing

Contents

Topic 1: Environmental issues
Topic 2: Types of environmental impacts
Topic 3: Calculate your environmental footprint
Topic 4: Environmental communication
- Ecolabels
- Sustainability Report
- SDGS
- GRI

Formación y Orientación Laboral

Datos generales

Semestre: **S2**   Idioma: **Castellano**   Formato: **Online Eskolak**

Descripción

El objetivo principal es preparar al alumnado para el mercado laboral.

Metodología

- Teoría y ejercicios individuales online, cada uno/a podrá desarrollarlos a su ritmo, cumpliendo los plazos establecidos.
- Algunas sesiones se realizarán online.

Contenido

- **Tema 1: AUTOCONOCIMIENTO**
  - Definición de competencias y habilidades
  - Competencias técnicas y personales
  - Autoanálisis
- **Tema 2: CURRICULUM**
  - Tipos de CV
  - Pasos para hacer un buen CV
  - Red Social Profesional: LinkedIn
- **Tema 3: ENTREVISTA DE TRABAJO**
  - Tipos de entrevista
  - Preparación de la entrevista
- **Tema 4: CONTRATACIÓN**
  - Tipos de contrato
- **Tema 5 : NÓMINAS y SEGURIDAD SOCIAL**
  - Condiciones y prestaciones SS
  - Cálculo de nóminas

Occupational Health and Safety

General Information

Semester: **S1 and S2**   Language: **English**   Format: **Online Nahieran**

Description

Students will acquire theoretical and practical knowledge about prevention, safety and health at work in order to become active agents in prevention planning and in promoting an integrated preventive culture in the organizations where they are part.

Methodology

- Selfstudy + participatory lectures (tutoring sessions for doubts and to contextualize/explain the topics of the subject).
- Guided practices (discussions – forum)
- Problem-based learning / learn by doing.
- Cooperative/collaborative learning

Contents

- **Topic 1: Introduction to the occupation health and safety.**
- **Topic 2: Healthy and safe working environments. Risks**
  - Security
  - Industrial hygiene
  - Health surveillance
  - Ergonomics and applied psychosociology
- **Topic 3: Integration of prevention at the workplace**
  - Risk assessment
  - Preventive action principles
  - Protective and preventive services
- **Topic 4: employers` & workers' obligations**
- **Topic 5: accidents investigation**
- **Topic 6: CE marking**

English I: Scientific and Technical English

Datos generales

Semestre: **S1 & S2**   Idioma: **English**   Format: **Online Eskolak**

Descripción

The course will provide students with the opportunity to practice the target language in different contexts and using all skills (reading, listening, writing and speaking). Students will have the opportunity to work individually and in groups where the teacher will act as a facilitator/guide.

Metodología

The course is based on three formats/methodologies:
- Individual work with online content.
- Flipped learning. Individual work with content as a basis for group teaching sessions.
- Flipped learning. Group sessions. Teamwork / participatory work based on individual work.

Contenido

- **Topic 1:** Technical Vocabulary
- **Topic 2:** The Decision making Process
- **Topic 3**: Dragons den
- **Topic 4:** Cars of the future
- **Topic 5:** Artificial Intenlligence
- **Topic 6:** Safety
- **Topic 7:** Security
- **Topic 8:** Megastructures

English II: Oral Communication

General Information

Semester: **S2**   Language: **English**   Format: **On line Eskolak**

Description

The course will provide students with the opportunity to practice the target language in different contexts and using productive skills (writing and speaking). Students will have the opportunity to work individually and in groups where the teacher will act as a facilitator/guide.

Methodology

The course is based on three formats/methodologies:
- Individual work with online content.
- Flipped learning.
  Individual work with content as a basis for group teaching sessions.
  Group sessions. Team/participatory work based on individual work.

Contents

- **Topic 1:** Presentations and lectures

- **Topic 2:** Describing a process

- **Topic 3:** Negotiations

- **Topic 4:** Telephoning

- **Topic 5:** Dealing with people at work

- **Topic 6:** Describing graphs and visual data

Redacción de textos Científico-Técnicos

Datos generales

Semestre: **S1 y S2**　　　　Idioma: **Castellano**　　　　Formato: **Online Eskolak**

Descripción

Proporcionar las técnicas, los métodos, los recursos y las herramientas para la elaboración y redacción de documentos académicos y científico-técnicos. El objetivo es dotar al alumnado de herramientas que les permita desenvolverse en diferentes contextos profesionales y académicos.

Metodología

Flipped Learning o aprendizaje invertido: el alumnado dispondrá de todo el material de aprendizaje en el curso de MUdle. La lectura de materiales y la resolución de ejercicios se realiza fuera del aula de forma individual o en equipo. El tiempo de clase en el aula se destinará a actividades más complejas (razonar, examinar, priorizar, argumentar, proponer, etc.) que requieren la interacción entre iguales y la ayuda del docente como facilitador.

Contenido

Bloque 1
-Introducción: la alfabetización académica y la comunicación científico-técnica
-La alfabetización académica
-La comunicación, el discurso, el texto
-Las particularidades del ámbito científico-técnico y académico
-Tipos de texto y géneros discursivos

Bloque 2
- Los géneros discursivos académico y científico técnico
-Propósito y características formales
-Estructura general y estructura de cada tipo de texto
-Estilo de la escritura académica y científica

Bloque 3
- La información científico-técnica
-Fuentes de información académicas, científicas y técnicas: identificar, evaluar, seleccionar, organizar.
-Características de la información académica y especializada
-La búsqueda estratégica y las principales herramientas de búsqueda especializadas
-Evaluación, selección y organización de los recursos (criterios, métodos y herramientas)
-Uso reflexivo, crítico y proactivo de la información
-Uso ético y legal de la información textual y no textual

Bloque 4
-Escritura de textos académicos y científico técnicos
-Claves de la escritura en el ámbito académico, técnico y científico
-Estrategias de planificación, organización y presentación de trabajos y documentos
-Técnicas de redacción y revisión de un trabajo o documento
-Métodos y herramientas para crear trabajos académicos

3rd year Elective courses

Course	Code	ECTS	Language	Format (Online)		Semester	
				Eskolak	Nahieran	S1	S2
XXI century challenges	S1: GH8301 S2: GH8320	3	EN	x		x	x
Sostenibilidad Industrial	S1: GH8303 S2: GH8322	4,5	ES		x	x	x
Food, Science & Technology	S1: GH8304 S2: GH8323	4,5	EN	x		x	x
Economics and Finance	S1: GH8305 S2: GH8324	4,5	EN		x	x	x
Calibration of Industrial Instruments	S1: GH8307 S2: GH8326	3	EN		x*	x	x
Computional Mathematics Laboratory	S1: GH8308 S2: GH8327	4,5	EN	x		x	x
Computer Vision	S1: GH8309 S2: GH8328	4,5	EN		x*	x	x
Data Analysis	S1: GH8310 S2: GH8329	4,5	EN		x	x	x
Introduction to additive manufacturing (3D printing)	S1: GH8311 S2: GH8330	4,5	EN		x*	x	x

* This course will have face-to-face practical work

XXI Century Challenges

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Eskolak**

Description

The lesson will deal with the socio-economic and cultural situation at the beginning of the twenty-first century. We have different challenges as a society to deal with current and future problems. What are those challenges? Social and economic transformation and the challenges facing businesses will be analysed.

Methodology

- Klase magistralak.
- Tutoretza saioak.
- Irakurketa gidatuak.
- Talde eztabaidak.
- Ariketa praktikoak (erronka, kasua azterketa…).

Contents

- **Topic 1: The main trends of the 21st century**
- Demographic dispute
- Other mega-trends
- Technological convergence and new international trade
- Human Development Goals
- **Topic 2: . Digital transformation and employment**
- Social and cultural function of work
- New composition of employment and occupational structure
- Prospective employment and employment trends
- The transformation of the company into the digital age
- Responsible technology company
- **Topic 3: The Basque economy and society**
 - Historical evolution of the Basque economy
- The Basque Economy Today
- Challenges of the Basque economy
- **Topic 4: The challenges of the 21st century company in our country**
- Training, talent and training
- Management of business culture
- Mondragon Cooperative Experience

Sostenibilidad Industrial

Datos generales

Semestre: **1 y 2** Idioma: **Castellano** Formato: **Online Nahieran**

Descripción

La materia aborda los fundamentos de la sostenibilidad industrial, conceptos que facilitan la transición a organizaciones más sostenibles desde el punto de vista medioambiental. Aportando conocimientos sobre técnicas, métodos, tecnologías, etc.

Metodología

- Aprendizaje individualizado + materias magistrales participativas (realización de sesiones de tutoría para dudas y contextualización/exposición de los temas a tratar).
- Prácticas guiadas (debate-foro)
- Aprendizaje basado en problemas/lean by doing

Contenido

Tema 1: Técnicas de creatividad aplicada a la sostenibilidad
- Introducción a la creatividad aplicada
- Casos de estudio / Ejercicios

Tema 2: Ecología Industrial (System Thinking)
- Introducción a la ecología industrial
- Simbiosis industrial y ecosistemas industriales
- Casos de estudio / Ejercicios

Tema 3: Diseño inspirado en la naturaleza (Product Design)
- Introducción a la biomimética
- Casos de estudio

Tema 4: Economia circular
- Introducción a la economia circular
- Indicadores de circularidad
- Casos de estudio

Food, Science & Technology

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Eskolak**

Description

Food Science & Technology was developed for enginering students seeking the specialist skills and knowledge required to excel within the food industry.

The subject has been designed to provide you with knowledge of the most commonly used technological processes and latest advances in food production. Throughout this course, we will explore key areas of food-processing and learn the fundamentals of food-biotechnology, focusing on the use of microbes and enzymes. The subject will demonstrate the most predomenatly used techniques, processes and equipments and provide you with the tools to practically apply this knowledge in designing and implementing new processes in developing food products.

Methodology

- Online classes, reverse classes, group work

Contents

- **Part 1:** Introduction. Food technology. Food processing

- **Part 2:** Ambient temperature processing. Raw material preparation. Extraction and separation of food. Mixing, forming and coating. Minimal processing methods

- **Part 3:** Processing by application of heat. Cooking. Evaporation & destillation. Sterilisation and pasteurization. Food drying and smoking

- **Part 4:** Processing by removal of heat. Chilling, refrigeration and freezing. Freeze drying

- **Part 5:** Food biotechnology. Fermentation technology. Microbial fermentations. Enzyme technology

- **Part 6:** Food and drinks processing, an overview. Brewing, baking, winemaking, cheesemaking, olive oil production, chocolate processing, etc.

Economics and Finance

General information

Semester: **1 and 2**   Language: **English**   Modlaity: **Online Nahieran**

Description

Oriented to deepen the economic-financial analysis of the company, in the framework of the current financial system and the economic bases of the socioeconomic environment.

In this itinerary, the engineer reinforces their skills and competencies, increasing their understanding of the economic-financial context.

Methodology

- Personal learning and acquisition of concepts using active dynamics to promote more meaningful learning
- Reading and personal or shared analysis of relevant and current publications in the specialty (books, articles, catalogues, etc.)
- Realization of practical simulation exercises, individually or in groups
- Carry out tests, presentations, defenses, exams and/or control points

Contents

1. ECONOMIC & FINANCIAL ANALYSIS IN THE COMPANY
- Analytical accounting
- Cost process
- The economic viability

2. THE FINANCIAL SYSTEM
- Financial framework
- The investment
- Analytical Tools

3. FUNDAMENTALS OF ECONOMICS
- Introduction to macroeconomics

Calibration of Industrial Instruments

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Nahieran + 2 prácticas (4 horas)**

Description

In the industrial world, measurement is indispensable to know and ensure that what we make-manufacture is correct or not. But how do we know if the measuring element used (caliper, micrometer, etc.) is working correctly or not? In this course, you will learn how to analyse measurement systems, in order to know and ensure whether the element used is correct or not.

Methodology

- You will have material, documentation and exercises available in Mudle to study asynchronously.
- During the course, you will have the opportunity to carry out practical exercises in order to apply what you have seen theoretically in a real environment (in your usual campus).
- The evaluation will take into account the work submitted and the checkpoint.

Contents

- **Analysis of the measurement system**
- Introduction
- Errors in the measurement system
- Calibration, Repeatability and Reproducibility Studies

- **Introduction to industrial calibration**
- Calibration plan
- Uncertainty calculation

- **Repeatability and reproducibility**
- Continuous variable methods
- Discrete variable methods

Computional Mathematics Laboratory

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Eskolan**

Description

This course aims to deepen the use of the Matlab tool for solving mathematical and engineering problems of various kinds. Students will solve practical cases such as the calculation of the load that a structure can support or the propagation of epidemics.

Methodology

- The course will include lectures in which theoretical concepts and application examples will be explained. It will also have a very practical character as a large number of exercises and group or pair work will be carried out.

Contents

1. Introduction.

2. Solving non-linear equations.

3. Solving systems of equations

4. Interpolation and curve fitting

5. Derivation and numerical integration.

6. Solving differential equations and systems of differential equations.

7. Optimization

Computer Vision

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Nahieran**

Description

This course is designed to provide students with a comprehensive understanding of computer vision, a rapidly growing field that has revolutionized various industries. Throughout the course, students will learn how computers can process and interpret images and they will develop practical skills to tackle real-world problems. This course provides students with a solid foundation in computer vision and equips them with practical skills and knowledge to succeed in this exciting field.

Methodology

- Theoretical concepts will be understood by reading selected papers and book chapters, as well as videos and tutorials, which will be complemented by a discussion session for each topic.
- The guided mini-project, carried out by teams, serves to understand the theory's practical aspects..

Contents

1. Introduction to Computer Vision.
- Camera types.
- Communication protocols.
- Lenses and lens equation.
- Illuminations.

2. Camera modelling.
- Introduction to geometric transformations.
- The pin-hole model.
- Distorsion models.
- Affine transformations.

3. Homographies.
- Definition and estimation.
- Use cases.

4. Fundamental image processing techniques.
- Thresholding and segmentation.
- Edge detection and filtering.
- Blob analysis.

5. Mini Project: Detection and classification of objects in a real application.

Data Analysis

General Information

Semester: **1 and 2**   Idioma: **English**   Modality: **Online Nahieran**

Description

This course is designed to provide students with a comprehensive understanding of the issues involved in data analysis, a rapidly growing field that has revolutionized several industries. Throughout the course, students will learn how to work through the different phases involved in data analysis, as well as different tools and solutions to implement it. This course provides students with a structured foundation in data analysis and provides them with the practical skills and knowledge necessary to extract knowledge from data.

Methodology

- Theoretical concepts will be understood by reading the slides, as well as videos and tutorials, which will be complemented by a discussion session for each topic.
- The guided mini-project, carried out by teams, serves to understand the theory's practical aspects.

Contents

- **Introduction to Data Analysis:**
  - **Theoretical concepts**
  - **Data Life Cycle**
  - **Business vision**

- **Working with data:**
  - **Data collection**
  - **Pre-processing**
  - **Visualization**
  - **Descriptive analysis**
  - **Interpretation of results**

- **Data Analysis Tools:**
  - **Open Source tools**
  - **Proprietary tools**

Introduction to additive manufacturing (3D PRINTING)

General information

Semester: **1 and 2**   Language: **English**   Modality: **Online Nahieran**

Description

Additive Manufacturing (AM) is one of the enabling technologies for the 4th industrial revolution. Even if AM is in its earliest stage of development, it is already applied in high added-value applications like in health, sport, robotics or aeronautics. The scope of the present course is to present the basic concepts of the technology and the specific virtual tools for design and manufacturing with AM.

Methodology

- Theoretical concepts will be understood by reading selected papers and book chapters, as well as videos and tutorials, which will be complemented by a discussion session for each topic.
- The guided mini-project, carried out by teams, serves to understand the theory's practical aspects.. A schedule with the intermediate deliverables related to each topic will be used for evaluating the progress. The main result will be your 3D-printed prototype.

Contents

1. **Additive Manufacturing (AM) basic principles**
   - What is AM?
   - Pros, cons and challenges
   - New business models based on AM
2. **Design for Additive Manufacturing (DfAM)**
   - Generative design approach
   - Topology Optimisation
3. **Additive Manufacturing technologies**
   - Material extrusion
   - Material jetting
   - Vat photopolymerization
   - Powder bed fusion
   - Directed energy deposition
   - Binder jetting
4. **Additive Manufacturing and sustainability**
   - In terms of product, processing and market

Eskerrik asko
Muchas gracias
Thank you

Ines Solozabal Astiazaran

int.eng@mondragon.edu

Loramendi, 4. 20500 Arrasate – Mondragon
T. +34 943 794700
int.eng@mondragon.edu