



Universidad de Jaén
School of Engineering of Linares

Science and materials engineering

2024-2025

Grado en Ingeniería Civil
Doble Grado en Ingeniería de Tecnologías Mineras e Ingeniería Civil
Grado en Ingeniería de Tecnologías Mineras
Grado en Ingeniería de Recursos Energéticos
Doble Grado en Ingeniería de Recursos Energéticos e Ingeniería Química Industrial



GRUPO



Guías docentes UJA

Horarios de tutorías

Llamamientos PAU

Syllabus 2024-25 - 14112002 - Science and Materials Engineering (Ciencia e ingeniería de los materiales)

Caption

- Level 1: Tutorial support sessions, materials and exams in this language
- Level 2: Tutorial support sessions, materials, exams and seminars in this language
- Level 3: Tutorial support sessions, materials, exams, seminars and regular lectures in this language

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Full version (Spanish)

English

DEGREE:	Grado en Ingeniería de minas (14112002)
FACULTY:	SCHOOL OF ENGINEERING OF LINARES
DEGREE:	Grado en Ingeniería de recursos energéticos (14212001)
FACULTY:	SCHOOL OF ENGINEERING OF LINARES
DEGREE:	Doble grado en Ingeniería de tecnologías mineras e Ingeniería civil (15012004)
FACULTY:	SCHOOL OF ENGINEERING OF LINARES
DEGREE:	Grado en Ingeniería civil (14012003)
FACULTY:	SCHOOL OF ENGINEERING OF LINARES
DEGREE:	Doble grado en Ingeniería de recursos energéticos e Ing. química industrial (15112004)
FACULTY:	SCHOOL OF ENGINEERING OF LINARES
ACADEMIC YEAR:	2024-25
COURSE:	Science and Materials Engineering

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Science and Materials Engineering	ACADEMIC YEAR: 2024-25
CODE: 14112002 (*)	LEVEL: 2
LANGUAGE: English	SEMESTER: PC
ECTS CREDITS: 9.0	YEAR: 2

2. LECTURER BASIC INFORMATION

NAME: PÉREZ VILLAREJO, LUIS
 DEPARTMENT: U122 - INGENIERÍA QUIM., AMBIENTAL Y DE LOS MAT.
 FIELD OF STUDY: 065 - CIENCIA DE MATERIALES E INGENIERÍA METALÚRGICA
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 LANGUAGE: - LEVEL: 2

3. CONTENT DESCRIPTION

UNIT 1. INTRODUCTION TO SCIENCE AND ENGINEERING OF MATERIALS

Materials and Engineering. Science and Engineering of materials. Types of materials. Selection criteria. Relationship between structure properties and processing. Influence of external agents on the behavior of materials.

BLOCK II: Chemistry of materials.

UNIT 2. ATOMIC STRUCTURE AND BONDS.

Concept of radiant energy: quantification, frequency and intensity. Atomic models. Emission spectrum. Quantum numbers of electrons. Exclusion principle. Electronic configuration of the elements. Forces and energies of interaction between atoms. Bonds.

UNIT 3. DISSOLUTION.

Types of solutions. Ways of expressing concentration. Solubility of ionic crystals: influence of temperature. Solubility of gases in liquids: effect of pressure and temperature. Ideal solutions: non-volatile solutes. Mixtures of liquids: ideal and real.

UNIT 4. THERMOCHEMISTRY.

Enthalpy of reaction. Heat and work: mechanical equivalent of heat. State functions. First Law of thermodynamics. Internal energy and enthalpy. Heat capacity: variation of internal energy and enthalpy with temperature. Standard states. Enthalpy formation. Indirect determination of reaction enthalpies: Hess's law. Spontaneous processes. Reversibility and spontaneity. The entropy and the second principle of thermodynamics. Molecular interpretation of entropy. Absolute entropy and third principle. Free energy: definition and physical interpretation. Free energy and spontaneity.

UNIT 5. CHEMICAL BALANCE.

Reversible reactions. Balance constant. Homogeneous equilibria. Ways express the equilibrium constant. Heterogeneous equilibria. Factors that affect chemical equilibrium: concentration, pressure, volume and temperature. Solubility product. Solubility with a common ion. pH and solubility.

UNIT 6. ELECTROCHEMISTRY.

Adjustment of redox reactions. Galvanic and electrochemical beads. Law of Faraday. Standard electrode potentials and sense of redox reactions. Electrochemical series. Effect of concentration on the electromotive force of the cell. Concentration cells. Batteries. Types and operation. Electrochemical processes. Corrosion and Corrosion protection.

BLOCK III: Structure of materials.

UNIT 7. CRYSTALLINE STRUCTURE.

Solid state: Crystalline and amorphous solids. Crystalline systems and elemental cell. Crystallographic notations: Miller indices. Isomorphism. Polymorphism and allotropy. Crystalline networks of metals.

Interatomic distances and densities. Introduction to the determination of crystal structures. Crystalline Imperfections: Point defects. Dislocations, their movement. Surface defects. Edges of grain.

UNIT 8. ALLOYS.

Introduction. Composition and constitution of alloys. -Solid solutions: Solvent and solute. Solid solutions by substitution. Solid insertion solutions. Theoretical density of solutions. Solid. Solid solutions ordered. Superlattices. Intermetallic compounds. Intermediate phases.

Defective structures. Insolubility.

UNIT 9. DIFFUSION.

Diffusion. Mechanism of the diffusion process: Dissemination by vacancies and Interstitial diffusion. Diffusion in steady state (First Law of Fick). Diffusion in non-stationary regime (Second Law of Fick). Effect of temperature on diffusion. Applications of the diffusion process.

UNIT 10. BALANCE DIAGRAMS

Introduction. Material system. Components and phases. Balance of a system. Balance factors. Balance classes. Variance or degrees of freedom.- Rule of Phases (Gibbs Law). Principle of Le Chatelier.

Cooling curves. Subfusion or overfusion. General law of mass distribution. Solidification binary diagrams: Their types. Eutectic, peritectic and monotonic reactions. Transformations in solid state: Changes in allotropic state. Eutectoid and peritectoid reactions. Diagrams of equilibrium with compounds and intermediate phases. General rules on binary equilibrium diagrams. Introduction to ternary equilibrium diagrams.

BLOCK IV: Properties of materials.

UNIT 11. MECHANICAL PROPERTIES.

Introduction. Efforts and tensions. Deformation of a single crystal. Influence of dislocations on plastic deformation. Deformation of a polycrystalline metal. Fiber making. Work-harden. Restoration. Recrystallization. Growth of the grain. Cold and hot work.

UNIT 12. INTRODUCTION TO TESTS. TRACTION AND FLUENCE TESTS.

Introduction to the tests: Classification.- Traction test. Diagram of stresses and deformations. Calculation of break elongation. Specimens. Tenacity module. Coefficient of fullness. Hot traction tests. Viscous creep tests.

UNIT 13. TEST OF HARDNESS.

Introduction.- Brinell hardness.- Vickers hardness. Microhardness.- Rockwell hardness.- Other hardness testing methods.

UNIT 14. TESTS WITH MULTIPLE STRESS.

Introduction. Ductile and fragile breaks. Effling enlargement: notes. Triaxiality. Temperature. Resilience. Methods of testing. Resilience considerations.

UNIT 15. FATIGUE. FATIGUE TESTS.

Introduction. Study of variable stresses. Fatigue rupture process. Curve and limit of fatigue. Diagram of fatigue. Influence of static charge. Simplified diagram for steels. Factors that influence fatigue. Fatigue tests. Fatigue at the level of parts.

UNIT 16. MACROGRAPHY AND MICROGRAPHY.

Introduction. Sampling. Preparation of sample. Macrography.- Micrography.

UNIT 17. NON-DESTRUCTIVE TESTS.

Introduction. Quality of a material. Tests with penetrating liquids. X-ray testing. Gamma ray testing. Ultrasonic testing. Magnetic testing.

BLOCK V: Metallic Materials

UNIT 18. FERROUS ALLOYS.

Introduction. The iron. Steel and foundries. Balance diagram of iron-carbon alloys. The austenite in the Fe-C diagram. Isothermal transformations of austenite. Types of TTT curves. Influential factors. Transformations of the austenite by continuous cooling.

UNIT 19. THERMAL TREATMENTS OF STEELS.

Introduction. Warm-ups and cooling. Severity of temper. Annealing. Types of annealing. Normalized. Temper. Temperament and resilience. Measurement of hardenability: Critical diameters. U CURVES. Jominy test. Factors that influence the hardenability. Temper defects. Types of temper. Temper Thermochemical treatments.

UNIT 20. ALLOY STEELS.

Carbon steels and alloy steels. Objectives of alloying elements. Influence of alloying elements on: The Fe-C equilibrium diagram. The grain size. The hardenability. The martensitic transformation The temperings. - Criteria of classification of steels. Resistance steels. High tensile steels. Steels of easy machining. Cementing steels. Nitriding steels. Steels with magnetic properties. Tool steels. Stainless steels.

UNIT 21. NON-FERREUS ALLOYS: LIGHT ALLOYS.

Introduction. Aluminum: Applications. Elements of alloy. Constituents. Classes of alloys. Magnesium: Applications. Elements of alloy. Constituents. Classes of alloys. Titanium: Applications. Alloys. Thermal treatments of light alloys.

UNIT 22. NON-FERREAS ALLOYS: HEAVY METALS.

Copper and its alloys: Brass and bronze. Types. Properties and treatments. Anti-friction alloys. Refractory alloys. Other alloys of heavy metals.

BLOCK VI: Ceramic Materials

UNIT 23. CERAMIC MATERIALS.

Introduction. Crystal structure of simple ceramics. Structures of silicates. Processing of ceramics. Traditional and engineering ceramics. Properties of ceramics. Glasses.

UNIT 24. AGGREGATES

Source of aggregates. Classification. Applications. Properties of aggregates.

UNIT 25 CEMENT.

Introduction. Chemical composition of cement. Properties. Types of cement. Cement Additives.

BLOCK VII: Polymeric Materials.

UNIT 26. POLYMERIC MATERIALS.

Introduction. Polymerization reactions. Industrial methods of polymerization. Processing of plastic materials. Thermoplastics. Thermosetting plastics. Elastomers. Rubber. Deformation and hardening of plastic materials. Thermofluence and fracture of polymeric materials.

UNIT 27. ASPHALTIC AGGLOMERANTS AND ASPHALTIC MIXTURES.

Types and uses. Chemical properties of asphalt. Characterization. Classifications of asphalts. Design of mixtures. Additives.

BLOCK VIII: Composite Materials

UNIT 28. COMPOSITE MATERIALS.

Introduction. Plastics reinforced with fibers. Processed in open molds and in closed molds. Sandwich structures. Metal matrix compounds. Ceramic matrix compounds.

UNIT 29. CONCRETE.

Introduction. Properties. Essays. Self-compacting concrete. Lightweight concrete. Heavy concrete. Polymeric concretes. Concrete with fiber.

The contents connect with the Sustainable Development Goals (SDGs):

Goal 9: Industry, Innovation and Infrastructure.

Goal 11: Sustainable Cities and Communities

Goal 12: Responsible Consumption and Production

Goal 13: Climate Action

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

Large-group lectures: These will consist of lectures on the content of the programme for the whole group. The contents will be developed and discussed. Problems and exercises proposed by the teacher will be solved. This methodology and activities will allow students to acquire the indicated competences (CBB3, CC5, CG7) and the achievement of Learning Outcomes 07.

Small group classes: The practicals will be carried out in the laboratory where the student will receive a script with the objectives of each test and the procedure to follow for the development of the same. The student will have to take note of the necessary experimental data to carry out the corresponding calculations and to be able to make a correct practical report. Computer exercises will be carried out with specific software for Materials Selection. In addition, exercises will be solved, presentations will be given and other practical activities will be carried out. This methodology and activities will allow students to acquire the indicated competences (CBB3, CC5, CG7) and the achievement of Learning Outcomes 08.

Students with special educational needs should contact the Student Attention Service (Servicio de Atención y Ayudas al Estudiante) in order to receive the appropriate academic support

5. ASSESSMENT METHODOLOGY

The final evaluation activity consists of a written exam at the end of the course, in which will evaluate the theoretical and practical knowledge of the different families of materials, as well as the knowledge acquired to relate their structure and properties.

The examination will consist of two parts: a theoretical part where the student will have to answer test questions or short questions related to the agenda developed in the subject; a practical part where the student will solve problems.

To evaluate laboratory practices, a practical exam will be conducted in which the student is confronted with the performance of one of the practices of the program presented in the laboratory.

The presentation of proposed problems, presentation and presentation of group work, Self-assessment, contributions to the forum, or chats, all through the ILIAS virtual platform, as well as tutoring assistance. In addition, active participation in class, group work and discussions.

All this to evaluate the capacity CBB3, CC5 and CG7, as well as the learning result 7 and 8.

When calculating the final grade of the subject taking into account all the above aspects, will have to have passed each of the parts separately, mainly the theoretical examination and the examination of practices.

Students who for work reasons, properly justified, cannot attend classes get in touch with the teachers of the subject at the beginning of the semester.

In the case of changing to a multimodal scenario, the percentages will be identical to the face-to-face scenario. In this case, the exam will be online and there will be a built-in data protection clause. If the scenario were to move towards totally virtual teaching, both the evaluation and the weights would be the same as in the multimodal case.

6. BOOKLIST [\(Access the bibliography in the Library catalog\)](#)

MAIN BOOKLIST:

- Materials : engineering, science, processing and design . Edition: 2nd ed., North American ed.. Author: Ashby, M. F.. Publisher: Butterworth-Heinemann [\(Library\)](#)
- Problemas de ciencia de materiales [Recurso electrónico] . Edition: -. Author: Salas Vicente, Fidel. Publisher: Universitat Politècnica de València [\(Library\)](#)
- Cuestiones y problemas de ciencia de los materiales . Edition: -. Author: Jiménez Expósito, José.. Publisher: Universidad de Jaén, Servicio de Publicaciones e Intercambio Científico [\(Library\)](#)

- Advanced composite materials . Edition: -. Author: Pilato, Luis A.. Publisher: Springer-Verlag (Library)
- Foundry technology [electronic resource] . Edition: 2nd ed.. Author: Beeley, Peter R.. Publisher: Butterworth Heinemann (Library)
- Métodos de ensayos no destructivos . Edition: 4ª ed.. Author: Ramírez Gómez, Francisco, coaut.. Publisher: Instituto Nacional de Técnica Aeroespacial (Library)
- Fundiciones férreas: materiales para ingeniería . Edition: -. Author: Pero-Sanz Elorz, José Antonio 1934-2012.. Publisher: Dossat (Library)
- Aceros: metalurgia física, selección y diseño . Edition: -. Author: Pero-Sanz Elorz, José Antonio 1934-2012.. Publisher: CIE Dossat 2000 (Library)
- Materials science of polymers for engineers . Edition: 2nd ed.. Author: Osswald, Tim A.. Publisher: Hanser Publishers (Library)
- Fundamentals of ceramics . Edition: -. Author: Barsoum, M. W.. Publisher: IOP Publishing, (Library)
- Foundations of Materials Science and Engineering . Edition: 5th SI ed.. Author: Smith, William F.. Publisher: McGraw Hill (Library)
- Diseño y análisis de materiales compuestos . Edition: -. Author: Tsai, Stephen W.. Publisher: Reverté (Library)
- Materials in environmental engineering.. Edition: -. Author: Annual International Conference on Materials Science and Environmental Engineering (4th). Publisher: De Gruyter (Library)
- An introduction to composite materials . Edition: [1st ed. repr.]. Author: Hull, Derek. Publisher: University Press (Library)
- Colección de problemas resueltos de ciencia de materiales aeroespaciales . Edition: -. Author: Pérez Soriano, Eva María.. Publisher: Editorial Universidad de Sevilla (Library)
- Hormigón : adaptado a la Instrucción de Recepción de Cementos RC-08 y a la Instrucción de Hormigón Estructural EHE-08 . Edition: 10ª ed.. Author: Fernández Cánovas, Manuel.. Publisher: Garceta (Library)
- Corrosión y degradación de los materiales. Edition: -. Author: Otero Huerta, Enrique. Publisher: Síntesis (Library)
- Introducción a la ciencia de los materiales polímeros: síntesis y caracterización . Edition: -. Author: Katime, Issa. Publisher: Universidad del País Vasco, Servicio Editorial (Library)
- Materiales refractarios y cerámicos . Edition: -. Author: Verdeja González, Luis Felipe.. Publisher: Síntesis, (Library)
- Problemas de ciencia de los materiales . Edition: -. Author: Varela Lafuente, Ángel.. Publisher: s.n.], (Library)
- Ciencia e ingeniería de los materiales . Edition: 1ª ed. 2ª reimp.. Author: Montes, Juan Manuel. Publisher: Paraninfo (Library)
- Fundamentos de la ciencia e ingeniería de materiales . Edition: 5ª ed.. Author: Smith, William F.. Publisher: McGraw-Hill Education (Library)
- Materials science and engineering: an introduction . Edition: 10th. ed.. Author: Callister, William D.. Publisher: John Wiley & Sons (Library)
- Cuestiones y problemas de ciencia de los materiales . Edition: -. Author: Jiménez Expósito, José.. Publisher: Universidad de Jaén, Servicio de Publicaciones e Intercambio Científico (Library)
- Introducción al conocimiento de los materiales y sus aplicaciones. Edition: -. Author: Barroso, Segundo.. Publisher: Universidad Nacional de Educación a Distancia (Library)
- Ciencia e ingeniería de materiales . Edition: 6ª ed.. Author: Askeland, Donald R.. Publisher: CENGAGE Learning (Library)
- Materiales para ingeniería 1: introducción a las propiedades, las aplicaciones y el diseño . Edition: Reimp. digital.. Author: Ashby, Michael F.. Publisher: Reverté (Library)
- Materiales para ingeniería. 2 : introducción a la microestructura, el procesamiento y el diseño . Edition: -. Author: Ashby, M. F., author.. Publisher: Editorial Reverté (Library)
- Ciencia de materiales: selección y diseño. Edition: -. Author: Mangonon, P. L.. Publisher: Pearson Educación, (Library)
- Materials Engineering and Science for chemical and materials engineers. Edition: -. Author: Brian S. Mitchell. Publisher: Wiley Interscience (Library)
- Polymer materials for energy and electronic applications . Edition: -. Author: Peng, Huisheng, coaut.. Publisher: Academic Press is an imprint of Elsevier (Library)

ADDITIONAL BOOKLIST:

- Foundations of Materials Science and Engineering . Edition: 5th SI ed.. Author: Smith, William F.. Publisher: McGraw Hill (Library)
- Fractura de materiales . Edition: -. Author: Anglada, M. (Marc J.), ed. lit.. Publisher: Universidad Politécnica de Cataluña (Library)
- Foundations of Materials Science and Engineering . Edition: 5th SI ed.. Author: Smith, William F.. Publisher: McGraw Hill (Library)
- Fundamentals of ceramics . Edition: -. Author: Barsoum, M. W.. Publisher: IOP Publishing, (Library)
- Materials science of polymers for engineers . Edition: 2nd ed.. Author: Osswald, Tim A.. Publisher: Hanser Publishers (Library)
- Aceros: metalurgia física, selección y diseño . Edition: -. Author: Pero-Sanz Elorz, José Antonio 1934-2012.. Publisher: CIE Dossat 2000 (Library)
- Fundiciones férreas: materiales para ingeniería . Edition: -. Author: Pero-Sanz Elorz, José Antonio 1934-2012.. Publisher: Dossat (Library)
- Métodos de ensayos no destructivos . Edition: 4ª ed.. Author: Ramírez Gómez, Francisco, coaut.. Publisher: Instituto Nacional de Técnica Aeroespacial (Library)
- Tecnología de materiales . Edition: -. Author: Puértolas Ráfales, José Antonio, coaut.. Publisher: Síntesis (Library)
- Foundry technology [electronic resource] . Edition: 2nd ed.. Author: Beeley, Peter R.. Publisher: Butterworth Heinemann (Library)
- Tecnología de materiales. Edition: -. Author: Ferrer Giménez, Carlos.. Publisher: Universidad Politécnica de Valencia (Library)

- Advanced composite materials . Edition: -. Author: Pilato, Luis A.. Publisher: Springer-Verlag ([Library](#))
- Materiales compuestos . Edition: 1st ed.. Author: Hull, Derek, autor.. Publisher: Editorial Reverté ([Library](#))
- Fiber-reinforced composites : materials, manufacturing, and design . Edition: 3rd ed. Author: Mallick, P. K.. Publisher: CRC Press, ([Library](#))
- Diseño y análisis de materiales compuestos . Edition: -. Author: Tsai, Stephen W.. Publisher: Reverté ([Library](#))
- Foundations of Materials Science and Engineering . Edition: 5th SI ed.. Author: Smith, William F.. Publisher: McGraw Hill ([Library](#))
- Fractura de materiales . Edition: -. Author: Anglada, M. (Marc J.), ed. lit.. Publisher: Universidad Politécnica de Cataluña ([Library](#))
- Análisis de las patologías en las estructuras de hormigón armado : causas, inspección, diagnóstico, refuerzo y reparación . Edition: -. Author: Donini, Hugo Juan.. Publisher: Editorial Nobuko ([Library](#))
- Ingeniería de los materiales plásticos . Edition: -. Author: Ramos Carpio, M. A.. Publisher: Díaz de Santos ([Library](#))
- Problemas de dosificación de hormigones . Edition: -. Author: González Díaz, Eduardo.. Publisher: Universidad de La Laguna ([Library](#))
- Técnicas de caracterización de Polímeros . Edition: [1ª ed.]. Author: Llorente Uceta, Miguel Ángel.. Publisher: Universidad Nacional de Educación a Distancia ([Library](#))
- Fundamentos de manufactura moderna: materiales, procesos y sistemas. Edition: 3ª ed.. Author: Groover, Mikell P., 1939-. Publisher: Prentice-Hall Hispanoamerica, ([Library](#))
- Adhesivos industriales . Edition: -. Author: Liesa, Francisco. Publisher: Marcombo ([Library](#))
- Light alloys: metallurgy of the light metals . Edition: 3rd ed. Author: Polmear, I.J.. Publisher: Arnold ([Library](#))
- Polímeros . Edition: -. Author: Areizaga, Javier coaut. Publisher: Síntesis ([Library](#))
- Ciencia y tecnología de materiales: problemas y cuestiones. Edition: -. Author: Cembrero Cil, Jesús, coaut. Publisher: Pearson ([Library](#))
- Procesado y puesta en servicio de materiales. Edition: -. Author: Barroso, Segundo.. Publisher: UNED ([Library](#))
- Ciencia de materiales: selección y diseño. Edition: -. Author: Mangonon, P. L.. Publisher: Pearson Educación, ([Library](#))
- Procesos industriales para materiales no metálicos . Edition: 2ª ed. Author: Rodríguez Montes, Julián.. Publisher: Vision Net ([Library](#))
- Fundamentals of composites manufacturing: materials, methods and applications . Edition: 2nd ed.. Author: Strong, A. Brent. Publisher: Society of Manufacturing Engineers ([Library](#))
- practical use of fracture mechanics . Edition: 3rd printing 1991, reprinted 199.. Author: Broek, David. Publisher: Kluwer Academic ([Library](#))
- Ciencia de materiales: teoría, ensayos, tratamientos . Edition: [9ª ed.]. Author: Coca Rebollero, Pedro. Publisher: Pirámide ([Library](#))
- Fabricación de hierro, aceros y fundiciones . Edition: -. Author: Apraiz Barreiro, José.. Publisher: Urmo ([Library](#))
- Introducción a la metalurgia física . Edition: 2ª ed. Author: Avner, Sydney H.. Publisher: McGraw-Hill ([Library](#))
- Materiales: estructura, propiedades y aplicaciones . Edition: -. Author: Saja Sáez, José Antonio de. Publisher: Thomson-Paraninfo ([Library](#))
- Introducción a la ciencia de materiales para ingenieros. Edition: 4ª ed. Author: Shackelford, James F.. Publisher: Prentice Hall ([Library](#))
- Ciencia de materiales para ingenieros . Edition: -. Author: Güemes Gordo, Alfredo.. Publisher: Pearson Educación ([Library](#))
- Metal fatigue analysis handbook practical problem-solving techniques for computer-aided engineering . Edition: -. Author: Lee, Yung-Li.. Publisher: Butterworth-Heinemann ([Library](#))
- Materiales y procesos de manufactura para ingenieros. Edition: 3ª ed. rev. Author: Doyle, Lawrence E.. Publisher: Prentice-Hall Hispanoamericana ([Library](#))

7. SUSTAINABLE DEVELOPMENT GOALS

Educación de calidad

Igualdad de género

Industria, innovación e infraestructura

Producción y consumo responsables

Acción por el clima

DETAILED INFORMATION

Goal 4. Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.. Specifically, significantly increase the number of youth and adults who have the necessary skills, particularly technical and vocational skills, to access employment, decent work and entrepreneurship (target 4.4). In addition, ensure that all learners acquire the knowledge and skills necessary to promote sustainable development, including through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and the contribution of culture to sustainable development (Target 4.7).

Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all. Specifically, Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including by focusing on high value-added and labour-intensive sectors (target 8.2). Progressively improve global resource efficiency in production and consumption by 2030 and aim to

decouple economic growth from environmental degradation, in line with the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, starting with developed countries (target 8.4).

Industry, innovation and infrastructure. Build infrastructure, promote inclusive and sustainable industrialisation and foster innovation. Develop reliable, sustainable, resilient and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with particular emphasis on affordable and equitable access for all Target 9.1). By 2030, upgrade infrastructure and retrofit industries to make them sustainable, using resources more efficiently and promoting the adoption of clean and environmentally sound industrial processes and technologies. environmentally sound industrial processes and technologies, with all countries taking action in accordance with their respective capabilities.

Goal 11: Sustainable cities and communities. Make cities and human settlements inclusive, safe, resilient and sustainable. By 2030, reduce the per capita negative environmental impact of cities, including through a focus on air quality and municipal and other waste management (target 11.6).

Objective 12: Responsible consumption and production. Ensure sustainable consumption and production patterns. Specifically, by 2030, achieve sustainable management and efficient use of natural resources (target 12.2). In addition, By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse effects on human health and the environment (target 12.4). Significant reductions in waste generation must also be addressed by 2030 through prevention, reduction, recycling and reuse activities (12.5).

Goal 13: Climate action. Take urgent action to combat climate change and its impacts. Specifically, improve education, awareness and human and institutional capacity for climate change mitigation, adaptation, mitigation and early warning (target 13.3).

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

Multimodal or mixed scenario in which a mixed, hybrid or multimodal model that combines face-to-face and non-face-to-face teaching (asynchronous and synchronous) is contemplated. Depending on the number of students, it may occur that: a) There is a situation in which the number of students exceeds the capacity limited by the classroom. In this case, the promotional activities are planned as follows:

Formation activities	Format (classroom / online) *	Teaching methodology Description
15 practical sessions in specialized laboratories	In-person at 50%	Development of 15 practical sessions, lasting two hours each, in laboratories applying rotation in small groups of 50%. Retransmission of practical classes to the rest of the group.
60 Theory sessions on the contents of the program	In-person at 50%	60 sessions of participatory master classes, lasting one hour each, held in the classroom and broadcast by videoconference to the rest of the group. Periodic rotation of students.
Tutoring	On-site + Online	Some tutoring sessions will be done in person and others online (synchronous and asynchronous)

b) There is a situation in which the number of students is below the capacity limited by the classroom. In this case, the promotional activities are planned as follows:

Formation activities	Format (classroom / online) *	Teaching methodology Description
15 practical sessions in specialized laboratories	100% In-person	Development of 15 practical sessions, lasting two hours each, in laboratories.
60 Theory sessions on the contents of the program	100% In-person	60 sessions of participatory master classes, lasting one hour each, held in the classroom.
Tutoring	On-site + Online	Some tutoring sessions will be done in person and others online (synchronous and asynchronous)

The means and resources used in this scenario will be those provided by the University of Jaén, as well as other types of resources such as electronic bibliographic resources that do not require the physical

presence in the library.

The evaluation system of the multimodal system will be the same as in the face-to-face system.

9. VIRTUAL TEACHING SCENARIO

Formation activities	Format (classroom online)	Teaching methodology Description
15 practical sessions in specialized laboratories	No presential	Substitution of the 15 practical sessions for online training activities (these activities must be specified, whether synchronous or asynchronous).
60 Theory sessions on the contents of the program	No presential	60 sessions of participatory master classes, lasting one hour each, conducted by videoconference.
Tutoring	No presential	All tutoring sessions will be conducted online (synchronous and asynchronous)

The means and resources used in this scenario will be those provided by the University of Jaén, as well as other types of resources such as electronic bibliographic resources that do not require the physical presence in the library.

In this scenario, the evaluation will be online with the same percentages as in the face-to-face and multimodal scenarios.

DATA PROTECTION CLAUSE (on line exams)

Institution in charge of data processing: Universidad de Jaén, Campus Las Lagunillas, s/n, 23071 Jaén

Data Protection Delegate: dpo@ujaen.es

Purpose: In accordance with the Universities Law and other national and regional regulations in force, carrying out exams and assessment tests corresponding to the courses students are registered in. In order to avoid frauds while sitting the exam, the exam will be answered using a videoconference system, being able the academic staff of the University of Jaén to compare and contrast the image of the person who is answering the exam with the student's photographic files. Likewise, in order to provide the exam with evidential content for revisions or claims, in accordance with current regulation frameworks, the exam will be recorded and stored.

Legitimacy: compliance with legal obligations (Universities Law) and other national and regional regulations currently in force.

Addressees: service providers who are the owners of the platforms where the exams are carried out and with whom the University of Jaén has signed the corresponding data access contracts.

Storage periods: those established in current in force regulations. In the specific case of exam videoconference recordings, not before the examination records and transcripts are closed or the exam can still be reviewed or challenged.

Rights: you can exercise your right of access, amendment, cancellation, opposition, suppression, limitation and portability by sending a letter to the postal or electronic address indicated above. In the event that you consider that your rights have been violated, you may submit a complaint to the Andalusian Council for Transparency and Data Protection www.ctpdandalucia.es

CLASS RECORDING CLAUSE PERSONAL DATA PROTECTION

Person in charge: Universidad de Jaén, Paraje Las Lagunillas, s/n; Tel.953 212121; www.ujaen.es

Data protection delegate (DPO): TELEFÓNICA, S.A.U. ; Email: dpo@ujaen.es

Procedure aim: To manage proper recordings of teaching sessions with the aim of facilitating learning process under a multimodal and/or online teaching

Period for record storage: Images will be kept during legal term according to regulations in force

Legitimacy: Data will be managed according to legal regulations (Organic Law 6/2001, December 21, on Universities) and given consent provided by selecting corresponding box in legal admission documents

Data recipients (transfers or assignments): Any person allowed to get access to every teaching modality

Rights: You may exercise your rights of access, rectification, cancellation, portability, limitation of processing, deletion or, where appropriate, opposition. To exercise these rights, you must submit a written request to the Information, Registration and Electronic Administration Service of the University of Jaen at the address above, or by e-mail to the address above. You must specify which of these rights you are requesting to be satisfied and, at the same time, you must attach a photocopy of your ID card or equivalent identification document. In case you act through a representative, legal or voluntary, you must also provide a document that proves this representation and identification. Likewise, if you consider that your right to personal data protection has been violated, you may file a complaint with the Andalusian Data Protection and Transparency Council www.ctpdandalucia.es

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