



Universidad de Jaén

School of Engineering of Jaén

Mechanical behaviour of materials

2024-2025

Máster Universitario en Ingeniería mecatrónica



CREA



Acceso Mayores 40

Guías docentes UJA

Horarios de tutorías

Llamamientos PAU

Movilidad (Coordinador)

P.O.D.

Solicitud bilingüismo

Syllabus 2024-25 - 77312004 - Mechanical Behaviour of Materials (Comportamiento mecánico 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

[Back](#)[Full version \(Spanish\)](#)[English](#)

DEGREE:

Máster universitario en Ingeniería mecatrónica

FACULTY:

SCHOOL OF ENGINEERING OF JAÉN

ACADEMIC YEAR:

2024-25

COURSE:

Mechanical Behaviour of Materials

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Mechanical Behaviour of Materials

CODE: 77312004

ACADEMIC YEAR: 2024-25

LANGUAGE: English

LEVEL: 1

ECTS CREDITS: 4.0

YEAR: 1

SEMESTER: PC

2. LECTURER BASIC INFORMATION

NAME: FELIPE SESE, LUIS ANTONIO

DEPARTMENT: U121 - INGENIERÍA MECÁNICA Y MINERA

FIELD OF STUDY: 545 - INGENIERÍA MECÁNICA

OFFICE NO.: -

E-MAIL: -

P: -

WEBSITE: -

ORCID: <https://orcid.org/0000-0002-7119-512X>

LANGUAGE: -

LEVEL: 1

3. CONTENT DESCRIPTION

Topic 1. Fundamentals of elasticity and plasticity

1.1. Introduction. Review of the concepts of stress and deformation

1.2. Mechanical properties of materials

1.3. Mechanical characterization of materials

1.4. Stress-strain relationship for multiaxial states. Main stresses, stress state and plane deformation.

1.5. Strain turbuckles

1.6. Isotropy and anisotropy

1.7. Plasticity criteria

1.8. Deformation hardening

Topic 2. Fatigue and fracture

2.1. Introduction. Criteria for fatigue analysis

2.2. Mechanisms of the fatigue process: cyclic deformation and crack initiation

2.3. The mechanics of fracture and its applications for the study of fatigue

Topic 3. Analysis of creep and behavior of materials at high temperature

3.1. Introduction. Influence of temperature on the mechanical behavior of materials

3.2. Fundamentals and mechanisms of high temperature creep

3.3. Temperature dependence and deformation mechanisms

Topic 4. Polymers and composite materials

4.1. Introduction to the mechanical behavior of polymers

4.2. Mechanical parameterization: damping, yielding and strain-rate

4.3. Introduction to the mechanical behavior of fiber reinforced materials

4.4 Mechanical parameterization: elastic properties, resistance, influence of fiber orientation, fiber volume fraction and failure mechanisms.

Topic 5. Experimental techniques of stresses and deformations

5.1 Fundamentals and classification of experimental methods

5.2 Full field techniques: photoelasticity, digital image correlation, interferometric techniques, thermal method

Contents developed in practices:

- Study of mechanical properties by extensometry
- Study of mechanical properties using full field optical measurement techniques.
- Study of mechanical properties at high temperature
- Vibration tests using experimental optical techniques.

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

The course will be developed through:

Master classes. The basic concepts of the subject will be presented through multimedia presentations, theoretical presentations, and realization of examples.

Laboratory practice sessions. Various practices will be carried out in order to reinforce the theoretical concepts of tartar in master classes.

Collective tutoring. This activity is organized in short seminars where, through problems, some of the topics studied in the master classes will be deepened, and students' doubts will also be resolved.

Seminars: A seminar will be organized on one of the topics related to the context in which the subject is developed.

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

CT4: The collaborative and team work developed by the students will be evaluated, weighing it positively, and with the percentage that corresponds within the activity / type of evaluation that is framed.

ATTENDING AND PARTICIPATION. The correct participation and active intervention of the student in class will be valued. Weight 5% Attendance and 5% Participation.

THEORY TEST. Written test on the theoretical and practical contents of the subject. It is necessary to achieve a minimum score of 7 points out of 10 in order to pass the course. Weight 65%.

The theoretical exam assesses the competences: CB7, CG2MMKTR, CG4MMKTR, E04MMKTR

PRACTICES AND WORKS. The correct resolution of the practices, works and proposed cases will be valued. For this, a Practice Report will be made and questionnaires and reports will be delivered. Attendance at laboratory practical sessions is compulsory, additionally it is necessary to deliver all the practice reports on the dates indicated by the teacher. Failure to attend practices or non-delivery of reports on the dates established by the teacher will imply that the student does not pass the subject. The delivery of activities proposed by the teacher will be positively valued. Weight 25%.

The practices that they will carry out during laboratory and work hours evaluate the competencies: CB7, CG2MMKTR, CG4MMKTR, E04MMKTR, CT4

On the other hand, the positive evaluation of the student will imply that they have achieved the learning results: Result RB7, Result RB7b, Result RB7c, Result RE04MM, Result RG2mMKTR, Result RG4mMKTR, Result RT4

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

MAIN BOOKLIST:

- Mechanical behavior of materials [electronic resource] William F. Hosford.. Edition: 2nd ed.. Author: Hosford, William F.. Publisher: Cambridge University Press ([Library](#))
- Springer Handbook of Experimental Solid Mechanics [electronic resource] edited by William N. Sharpe, Jr.. Edition: 1st ed. 2008.. Author: Sharpe, Jr., William N. editor.. Publisher: Springer US ([Library](#))

7. SUSTAINABLE DEVELOPMENT GOALS

Industria, innovación e infraestructura

DETAILED INFORMATION

The content of the subject tries to raise awareness of the importance of mastering mechanical characteristics to optimize the design of mechanical actuators.

In this way, throughout all the topics the different points related to ODS 9 will be developed: Industry,

Innovation, and Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

Methodology

Actividades Formativas	Formato (presencial/online)*	Metodología docente Descripción
Theory sessions on the contents of the program	In class	Master classes and resolution of participatory exercises, lasting one / two hour / s each, held in the classroom and / or broadcasting by videoconference to the rest of the group. In case it was necessary for capacity, prespecialidad to 50% and periodic rotation of students would be used.
Practical sessions in laboratories.	In class	Development of practical and participative laboratory sessions, in groups if possible or through videos or online otherwise. In case it was necessary for capacity, prespecialidad to 50% and periodic rotation of students would be used.
Tutoring	On-site + Online	Tutoring sessions will be attended in person or online at the scheduled time.

The Center may vary the specific attendance percentage of the number of students and the capacity of the classroom / laboratory according to university measures. In the case of less than 100% attendance, there will be periodic rotation of students as determined by the Center.

Evaluation:

Item	Format	Description	Percentage
Practical theory exam	in class	Mastery of theoretical and practical content. A grade of 5 out of 10 must be passed to choose to pass the course and take into account the rest of the grades.	50%
Active participation	In class /Online	Notes	5%
Carrying out work, cases or exercises	Online	Carry out the work and present it	25%
Practical work	Online/On site	Based on practice work: -Do the deliverable exercises. -Delivery of practices. Both concepts are compulsory to pass the subject.	20%

The student could request an evaluation by means of a single test in which the weight of the exam would be 100% whenever justified circumstances arise in accordance with article 13 of the Regulation of Academic Regime and Evaluation of Students of the University of Jaén. The request, accompanied by the justification, must be made during the period in which the teaching is carried out.

9. VIRTUAL TEACHING SCENARIO

Methodology

Actividades Formativas	Formato (presencial/online)*	Metodología docente Descripción
Theory sessions on the contents of the program	Online	Master classes and resolution of participatory exercises each, by videoconference to the rest of the group.
Practical sessions in laboratories.	Online	Development of practical and participative lessons about practical issues or laboratory sessions
Tutoring	Online	Tutoring sessions will be attended online

Evaluation:

Item	Format	Description	Percentage
Practical theory exam	Online	Mastery of theoretical and practical content. A grade of 5 out of 10 must be passed to choose to pass the course and take into account the rest of the grades.	50%
Active participation	Online	Notes	5%
Carrying out work, cases or exercises	Online	Carry out the work and present it	25%
Practical work	Online	Based on practice work: -Do the deliverable exercises. -Delivery of practices. Both concepts are compulsory to pass the subject.	20%

The student could request an evaluation by means of a single test in which the weight of the exam would be 100% whenever justified circumstances arise in accordance with article 13 of the Regulation of Academic Regime and Evaluation of Students of the University of Jaén. The request, accompanied by the justification, must be made during the period in which the teaching is carried out.

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

Campus Las Lagunillas s/n | 23071 - Jaén

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