BACHELOR'S DEGREE IN INDUSTRIAL DESIGN ENGINEERING

SYLLABUS
MECHANICS

ACADEMIC YEAR: 2026-27
COURSE: 1st
SUBJECT TYPE: Basic Training
SEMESTER: 2nd
ECTS: 6
TEACHING HOURS: 49
AUTONOMOUS WORKING HOURS: 101
TOTAL HOURS: 150
LANGUAGE/S: Spanish/Catalan
CODE: 17037

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PRESENTATION OF SUBJECT / GOALS

The subject of Mechanics establishes the basis for facing the subjects of subsequent years that will culminate in the ability of students to solve the optimization of a product at a structural and mechanical operation level through calculation and simulation.
The subject is focused on the understanding of the concepts of statics and dynamics to apply them to the resolution of specific technical problems.
The statics of mechanical systems, the bases of kinematics and dynamics of mechanisms and the application of power balance to solve mechanical systems will be studied. Students shall have to understand the theory, apply it correctly to the approach of a mechanical problem, solve it and propose possible solutions and improvements to the mechanical product/system.

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

This subject does not specifically incorporate any SDGs.

CONTENTS

Block I: Static
1.1. Statics of the point solid. Forces. Diagram of the free solid.
1.2. Moments of strength.
1.3. Centres of gravity.
1.4. Resulting from distributed loads. Equivalent systems of force.
1.5. Equilibrium of the rigid solid. Reactions in junctions and connections
1.6. Static and dynamic friction.

Block II: Kinematics of mechanisms
2.1. Basic concepts of kinematics. Absolute and relative speed. Decomposition of movement into rotation and translation.
2.2. Degrees of freedom of a mechanism. Definition and calculation.
2.3. Instantaneous centre of rotation.
2.4. Basic mechanisms: articulated quadrilateral and piston-connecting rod-crank. Grashof's Law.
2.5. Calculation and graphical representation of the input and output velocities of a mechanism. Analytical method and graphic method.
2.6. Gears: Introduction to the calculation of angular and linear velocities. Gear ratio.

Block III: Dynamics of mechanisms
2.7. Basic concepts of dynamics. Linear and angular acceleration. Moment of inertia.
2.8. Calculation of accelerations of a mechanism. Inertial forces.

Block IV: Work and energy
3.1. Definitions of work and energy. Principle of conservation of energy.
3.2. Balance of energy and power of a mechanism.
3.3. Friction and mechanical performance.

TEACHING METHODOLOGIES

- Work sessions with the whole group, class with the teacher. (PA)

COMPETENCIES

- Students must have the ability to gather and interpret relevant data (usually within their area of study) in order to make judgments that include reflection on relevant social, scientific or ethical issues (CB3)
- Developing a creative attitude of experimentation, under scientific and humanistic criteria, which favours the exploration of relevant and innovative contributions (CG1)
- Acting with spirit and critical reflection in the face of knowledge, in all its dimensions, showing intellectual, cultural and scientific concern and with a commitment to rigour and quality in professional demand (CT1)
- Being the main actor in the training process itself, aimed at personal and professional improvement, and to acquire a comprehensive training that allows learning and living together in a context of linguistic diversity and with very diverse social, cultural and economic realities (CT7)
- Applying the modelling and simulation techniques of industrial design engineering for the appropriate selection of processes and decision-making in the development of the project (CE2)

LEARNING OUTCOMES

- Collecting and interpreting data and information on which to base their conclusions, including reflections on social, scientific or ethical issues in the field of simulation.
- Globally evaluating the learning processes carried out according to the plans and objectives set and establishing individual improvement measures.
- Defining their own learning objectives and design coherent and realistic development processes with the same objectives and time available.
- Evaluating product requirements through technical calculations.

TRAINING ACTIVITIES

Each subject will present at the beginning of the course its WORK PLAN where the didactic activities per week / session / autonomous work are recorded.

EXAMINATION

EXAMINATION SYSTEMS
The evaluation of the subject will be based on continuous monitoring of the student's academic work throughout the course.

EXAMINATION SYSTEM	FINAL WEIGHTING
P-1 Observation of participation	0
P2-Follow-up of the carried-out work	10
P4- Specific assessment tests: exams	60

EXAMINATION SYSTEM	FINAL WEIGHTING
P5-Carrying out of required work or projects	30

EXAMINATION CRITERIA
The final grade of the subject will be the weighted average of the grades of the assessable activities according to the following table:

EXAMINATION ACTIVITY	WEIGHT	RECOVERABLE (up to 50%)	EVALUATION SYSTEM
Activity-1 Performing exercises and participating in class	10%	NO	P-2
Activity-2 Laboratory practices	10%	NO	P-5
Activity-3 Projects. Challenge Resolution	20%	YES*	P-5
Activity-4 Midterm Exam	20%	NO	P-4**
Activity-5 Final Exam	40%	YES*	P-4**

Students will have the option of retaking the retake tests. The retake tests will be carried out in the period of the semester allocated to this function, not being able to recover more than 50% of the subject.
* In the event that the Recoverable Assessable Activities exceed 50%, the student body may choose, up to a limit of 50%.
The unjustified non-submission of any assessable activity implies a grade of 0, even if the activity has been classified as Recoverable.
Recoverable Activities can only be recovered when they have been submitted by the student body on the indicated date and with a grade equal to or greater than 3.
** In order to calculate the final grade of the subject, it will be necessary to obtain a minimum grade of 4 in the weighted average of the exams (P-4 evaluation system).
If access to the retake test is waived, the grade achieved in the first instance will be maintained.
In case of taking the recovery, the grade obtained will be the last, even if it is lower than the first.
Plagiarism or copying of other people's work is penalised in all universities and, according to the Rules of Coexistence of the University of Vic-Central University of Catalonia, they constitute serious or very serious offences. That is why in the course of this subject any indication of plagiarism or misappropriation of texts or ideas other people (What is considered plagiarism?) as well as the improper or undeclared use of Artificial Intelligence in an activity, automatically translates into a suspension and/or other disciplinary measures (Normes de Convivencia de la Universitat de Vic-Universitat Central de Catalunya).
For any questions or queries, see the (Academic Regulations of the Bachelor's Degree of the Faculty of Design and Engineering Elisava UVic-UCC).

BIBLIOGRAPHY AND TEACHING RESOURCES

- Meriam & Kraige. 1998. *Mecánica para ingenieros* (volumen 1: Estática, volumen 2: Dinámica). Ed: Reverté.
- Riley. 1995. *Ingeniería mecánica* (volumen 1: Estática, volumen 2: Dinámica). Ed: Reverté.
- Tipler. 1997. *Física*, 2 volums. Ed: Reverté.
- Calero. 2004. *Fundamentos de mecanismos y máquinas para ingenieros*. Mc Graw Hill.

The teaching staff will provide a specific bibliography at the beginning of the subject, if applicable.

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