Universidad de Navarra

Neumática y Oleohidráulica(Ing.Gr.)
Guía docente 2026-27

PRESENTACIÓN

Breve descripción:

Pneumatics and Oil hydraulics are two technologies that are widely used in the industrial field. The main application of Pneumatics is the automation of industrial processes through actuators that are driven by compressed air. In Oil hydraulics, high-pressure oil-operated actuators are used to carry out processes that require significant force and precision. The course describes the fundamentals of both technologies, emphasizing the aspects they have in common and indicating their differences. Practical exercises in the laboratory and on computers help students to assimilate the concepts explained and put them into practice. In addition, students develop, working in groups, complete projects of design and assembly of an automated process using pneumatic technology.

La Neumática y la Oleohidráulica son dos tecnologías que se emplean ampliamente en el ámbito industrial. La Neumática tiene como principal aplicación la automatización de procesos industriales a través de actuadores que son accionados mediante aire comprimido. En Oleohidráulica se utilizan actuadores operados mediante aceite a alta presión para llevar a cabo procesos que requieren de una fuerza y precisión considerables. La asignatura describe los fundamentos de ambas tecnologías, haciendo hincapié en los aspectos que tienen en común e indicando sus diferencias. Las prácticas que se realizan en el laboratorio y en los ordenadores sirven para que los estudiantes asimilen los conceptos explicados y los pongan en práctica. Además, los estudiantes desarrollan, trabajando en grupos, sendos proyectos completos de diseño y montaje de un proceso automatizado mediante tecnología Neumática.

Titulación (Módulo/Materia):

- Ingeniería Mecánica (Bloque Especializado Mecánica/Tecnología Térmica y Fluidos)
  - Ingeniería en Diseño industrial y Desarrollo de productos (Conocimientos Científicos Aplicados/Conocimientos Científicos Aplicados)

Detalles:

- **ECTS**: 4 ECTS
- **Curso, semestre**: 4.º curso, 1.º semestre
- **Carácter**: Obligatorio
- **Idioma**: Inglés

Profesores de la asignatura:

- Sánchez Larraona, Gorka / Profesor titular
- Laurent, Julie / Colaborador docente
- Villarón Baz, Juan Ignacio / Colaborador docente

RESULTADOS DE APRENDIZAJE (Competencias)

INGENIERIA MECÁNICA

CE20 - Conocimientos y capacidades para el cálculo, diseño y ensayo de máquinas.

CE24 - Conocimiento aplicado de los fundamentos de los sistemas y máquinas fluidomecánicas.

CG10 - Capacidad de trabajar en un entorno multilingüe y multidisciplinar.

INGENIERÍA EN DISEÑO INDUSTRIAL Y DESARROLLO DE PRODUCTOS

CB2 - Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.

CB3 - Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética.

CE19 - Conocimientos de los principios básicos de la mecánica de fluidos y su aplicación a la resolución de problemas en el campo de la ingeniería. Cálculo de tuberías, canales y sistemas de fluidos.

PROGRAMA

1. Introduction to Pneumatics

2. Introduction to Oil Hydraulics

3. Pneumatic and Hydraulic Actuators

4. Generation of Pneumatic and Hydraulic Energy

5. Pneumatic and Hydraulic Valves

6. Electro-Pneumatics and Electro-Hydraulics

7. Pneumatic Automation with PLCs

8. Selection of Pneumatic and Hydraulic components

9. Advanced Oil Hydraulics Circuits

ACTIVIDADES FORMATIVAS

La **dedicación de 100-120h** (4 ECTS) a la asignatura se dividen en las siguientes actividades formativas:

- Clases presenciales teóricas: 14,5 horas
- Clases presenciales prácticas, laboratorios o talleres: 19,5 horas
- Trabajos dirigidos: 50 horas
- Tutorías: 2 horas
- Estudio personal: 30 horas
- Evaluación: 3,5 horas

METODOLOGÍAS DOCENTES

- Clases expositivas
- Clases en salas de informática
- Clases en laboratorio
- Trabajo individual o en grupo, resolución de problemas e informes de laboratorio
- Entrevista personal con el profesor de la asignatura
- Realización de pruebas evaluadas

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The fundamentals of **Fluid Power** (**Pneumatics** & **Oil Hydraulics**) are provided by combining theoretical lectures and practical sessions. There are two classes per week. Normally, week's first class is employed for lecturing on the main topics of *Pneumatics* and/or *Oil Hydraulics*, which are subsequently worked out in the practical session planned for the second class.

In the practical sessions, students carry out simple assemblies on panels, analyze circuits on the computer or do practical exercises on component sizing. The students have the scripts of the practical exercise at their disposal and must read them before going to the session. After finishing the practical sessions dedicated to Oil hydraulics, the solutions of the exercises are published so that the students can self-correct the work they have done during the session. It is estimated that each student has to spend 0.5 hours reading the script for each exercise and another 0.5 hours correcting the work done during it.

The main work that students develop is a project on **Pneumatics** in which they design and build a machine that performs a process automation by means of pneumatic actuators. Forming groups of 5 or 6 members, students carry out the project, reaching the milestones and making the deliveries that are defined in the Pneumatics Project Plan. This work is carried out mainly outside of class hours. Each group may have, if required, a weekly tutoring with the teachers in which they can share all the doubts and problems that may arise. It is estimated that each student must devote a total of 50 hours in this work.

Regarding **Oil Hydraulics**, students are evaluated by three short exams that they take during the course. The exams are computer-based and consist of short calculation or multiple choice questions about the concepts worked on the practical exercises. Students will have the oportunity to do self-evaluation exercises before each exam. It is estimated that the time that the student needs to prepare each exam is 2 hours.

EVALUACIÓN

CONVOCATORIA ORDINARIA

- **Evaluaciones parciales y finales**: 50%
- **Trabajos individuales y/o en equipo**: 50%

The final mark obtained by the student in the **ordinary examination** is calculated as a result of evaluating their work in the following aspects:

Pneumatics Project (**50%** of the final mark)

A part (**40%**) of the mark achieved in the Pneumatics Project is common to all the members of the group. Namely:

- **Deliverables** related to the milestones of the project: **20%** of the final mark.
- **Final report** of the project: **10%** of the final mark.
- Proper functioning of the **process automation**: **10%** of the final mark.

Each component of the group has specific **responsabilities in the project**. The successful fulfillment of these responsibilities accounts for the remaining part of the mark (**10%**).

Important notice: In the event that a student withdraws from working on the project with their peers as expected, they will receive a mark of 0% in the Pneumatics Project.

Exam on Pneumatics (**10%** of the final mark)

Students take an exam at the end of the course in which they are asked basic questions related to:

- Types of pneumatic valves and actuators

- Symbols and nomenclature employed in pneumatic circuit diagrams
- Selection of linear actuators: piston size, maximum speed and air consumption

*A minimum mark of **4/10** is required in this exam to pass the subject in the ordinary examination.

Exams on Oil Hydraulics (**35%** of the final mark)

Students take 3 exams on Oil Hydraulics that are carried out in class during the course. The 3 exams have the same weight in the final mark.

*A minimum average mark of **4/10** is required in these exams to pass the subject in the ordinary examination.

Work in Practical Sessions (**5%** of the final mark)

It is expected that students attend the practical sessions and carry them out appropriately. Not attending or displaying indifferent behavior in a practical session will result in the student losing half of the grade. Doing so in two practical sessions will result in the loss of the entire grade.

CONVOCATORIA EXTRAORDINARIA

- **Evaluaciones parciales y finales**: 50%
- **Trabajos individuales y/o en equipo**: 50%

In the **extraordinary examination**, the student will obtain his/her mark by taking a written exam on the date determined in the official calendar. The exam will include the part(s) of the subject in which the student hasn't reached the minimum required mark. The final mark in the extraordinary examination will be calculated in the same fashion as in the ordinary examination, maintaining the marks of the part(s) that the student has passed: Pneumatics Project (50%), Pneumatics (15%) and Oil Hydraulics (35%).

HORARIOS DE ATENCIÓN

Office hours to attend students are established on **Thursdays** and **Fridays** from **12:00** to **13:30**. However, students can send an email to the lecturer (Gorka Sánchez: gsanchez@tecnun.es) or to the laboratory technician (Juan Villarón: jvillaron@tecnun.es) to be attended out of these hours if necessary.

BIBLIOGRAFÍA

Bibliografía básica:

Neumática

- Serrano Nicolás, A., Neumática. Quinta edición. Thomson-Paraninfo, 2003.
- Introducción en la Neumática, Manual de Estudio. FESTO, 1991. Localizalo en la biblioteca
- FESTO, Introducción a la Electroneumática. 1990. Localizalo en la biblioteca

Oleohidráulica

- Mannesmann Rexroth, Training Hidráulico, Vol. 1: Fundamentos y componentes de la Oleohidráulica. 1981 y 1991. Localízalo en la biblioteca
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- de las Heras, S., Instalaciones Neumáticas. Editorial UOC, 2003.

Oleohidráulica

- Groote, J. P., Tecnología de los circuitos hidráulicos. Ediciones CEAC, 1986.
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