

<b>Centre</b>	<b>University College of Engineering of Vitoria-Gasteiz</b>
<b>Name of subject</b>	<b>26053 – Pneumatic and Oil Hydraulic Systems</b>
<b>Qualification</b>	<b>Degree in Mechanical Engineering</b>
<b>Type</b>	<b>Elective</b>
<b>Credits</b>	<b>6 ECTS</b>
<b>Year</b>	<b>4</b>
<b>Term(s)</b>	<b>2nd</b>
<b>Department</b>	<b>Nuclear Engineering and Fluid Mechanics</b>
<b>Language</b>	<b>English and Spanish</b>

## Outcomes / Objectives

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Compressed air facilities. Pneumatics. Oil hydraulics.

## Syllabus

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Introduction to pneumatic and oil hydraulic systems. Analysis of the fundamental properties of fluids: air and oils, and revision of the fundamental laws and equations of fluid mechanics applicable to pneumatic and oil hydraulic systems.

Pneumatic energy characteristics and applications. The definition of pneumatics is introduced and the properties and applications of compressed air analysed. Compressed air facilities. Analysis of the different types of compressors and their fields of application, selection criteria and dimensioning. Compressed air treatment. Design and calculation of compressed air distribution networks. Actuators, valves and pneumatic accessories. ACTUATORS: the different types of pneumatic motors are defined and analysed. Linear motors: single-acting and double-acting cylinders. Special cylinders. Construction details of a cylinder. Selecting cylinders. Buckling. Bending. Damping. Fasteners. Commercial catalogues. Rotary engines and rotary actuators. Construction characteristics. Calculation variables. VALVES: valves are classified according to their function, and manifold valves and their functional characteristics are studied. The characteristics of poppet valves, slide valves, rotary disc valves are also analysed, as well as valve operation: pilot-operated valves, electrovalves. Stop valves, pressure regulators, flow valves, shut-off valves and proportioning valves are also considered, indicating their symbology and valve selection criteria. Nominal flow rate. The following ANCILLARY EQUIPMENT is studied: position sensor, passage detectors, pneumatic switches, pressure amplifiers, vacuum ejectors, signal converters and pipe and pipe fittings. Pneumatic maintenance. Preventive, predictive and autonomous maintenance of pneumatic circuits. Characteristics and application of oil hydraulic energy. The fundamental characteristics of oil hydraulics are analysed along with its applications, operation principles, basic circuits and their symbolic representation. Generation of pressurised oil: oil hydraulic pumps. Analysis of the different types of pumps used in oil hydraulics: external gear pumps, internal gear pumps, fixed displacement vane pumps, variable displacement vane pumps, radial piston pumps, axial piston pumps and rotary hydraulic motors. Oil hydraulic equipment. Study of actuators, valves and ancillary equipment. Oil hydraulic maintenance. Preventive, predictive and autonomous maintenance of oil hydraulic circuits. Oil hydraulic systems.

Differential circuit analysis, study of a hydraulic system with serial valves and with parallel valves. Sequence valve circuits. Description of a hydraulic press circuit. Other circuits. Proportional technique. Study of the design, characteristics and operation of the 5/3-way proportional flow valve. Open loop cylinder displacement speed control. Cylinder pressure control. Cylinder position control.

## Methodology

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### Teaching Method

#### Face-to-Face Teaching Hours

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
20		10	20	10				

#### Student Hours of Non Face-To-Face Activities

Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
30		15	30	15				

## Compulsory materials

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Course notes prepared by the Dept. of Nuclear Engineering and Fluid Mechanics of the University College of Engineering of Vitoria-Gasteiz

## Bibliography

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### Basic Bibliography

- Prontuario de Hidráulica Industrial. Jose Roldan Vitoria Ed.: Paraninfo
- Cálculo y Diseño de Circuitos en aplicaciones Neumáticas. Salvador Millán. Biblioteca Técnica. Oleohidráulica.
- Conceptos Basicos. E. Carnicer Royo. Paraninfo

### In-depth Bibliography

- Neumática en Bucle Cerrado. Festo Didactic. J. Gerhartz, d. Schollz
- Posicionamiento Servoneumatico. Festo Didactic .A. Zimmermann
- "Dispositivos neumáticos" W.Deppert/K.Stoll"
- Aire comprimido: Neumática convencional" E. Carnicer
- "Manual de Oleohidráulica" Ed. Blume

### Magazines

- Aprender Practicando. Festo Didactic.

### Websites

- [www.festo.com](http://www.festo.com)
- [www.smc.com](http://www.smc.com)
- <http://www.ascojoucomatic.es/>
- [www.norgrenmartonair.es](http://www.norgrenmartonair.es)