Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Hydraulic and Pneumatic Automation Technologies
Course code	47507
Scientific sector	ING-IND/08
Degree	Master in Industrial and Mechanical Engineering
Semester	I
Year	*II*
Academic year	2021/22
Credits	5
Modular	No

Total lecturing hours	28
Total lab hours	
Total exercise hours	18
Attendance	Not compulsory
Prerequisites	
Course page	https://www.unibz.it/en/faculties/sciencetechnology/master-industrial-mechanical-engineering/course-offering/

Specific educational objectives	The course of Hydraulic and Pneumatic Automation Technologies is an elective course in the context of the Master in Industrial and Mechanical Engineering, study plan in Mechanics and Automation. The course is the scientific sector of fluid machines and it consists of 32 hours of frontal lectures and 14 hours of exercises. The lectures introduce the fundamental concepts and the working principles of the main hydraulic and pneumatic components. The specific educational objectives consist in showing the specific function of each component and valve, to give the correct interpretation of Iso schemes of hydraulic or pneumatic circuits and to help in choosing components suited to their required use. The exercises are intended to present practical problems with the aim to give the students the adequate knowledge to project real working circuits.

Lecturer	Carlo Maria Rozzi de Hieronymis
Scientific sector of the lecturer	ING-IND/08
Teaching language	English
Office hours	15
Teaching assistant (if any)	
Office hours	
List of topics covered	The course will deal with the following topics.

	General principles. Hydraulic energy transmission. Head and fluid loss. Hydraulic fluid classification. Graphic symbols and standardisation. Hydraulic open and closed circuits. Pumps and engines with pistons, vane, gears. Hydraulic jacks. Geometrical displacement. Formulas for performances computation. Pressure regulation valves. Pressure reduction valves. Sequential valves. Flow regulation valves. Flow limitation valves. Flow dividers. Over-centre valves. Direction regulation valves. Non-reversal valves. Rotary and case distributors. Feeding groups. Utilizing groups. Parallel, in series and mixed circuits. Circuits for sequences. Hydrostatic transmissions. Load sensing systems. Fitting elements for circuits. Compressors. Compressor and tank choice. Pneumatic jacks and hammers. Pressure, flow, direction regulation valves. Analytical and graphic computation examples.
Teaching format	The course consists of classroom lectures in which the topics are presented by the lecturer. There are also practical lessons that will give practical examples of the application of the theoretical topics. Course topics will be presented through presentations. Teaching material will be given to the students; required additional material will be provided by the Professor.

Learning outcomes	The learning outcomes referred to the Dublin Descriptors: **Knowledge and understanding** The course allows the students to acquire advanced knowledge on the main hydraulic and pneumatic components and their specific function and application. The topics discussed will provide the basis for a thorough understanding of the main phenomena of mechanical transmission through fluid-dynamic circuits **Applying knowledge and understanding** The student will be able to interpret the operation and the potential of a hydraulic or pneumatic circuit and to acquire the know-how to determine the convenience of using a component or an entire plant in relation to end uses. Professional capabilities will be obtained through the ability to model and design hydraulic or pneumatic circuits **Making judgments** The student should acquire the ability to evaluate the functionality of a hydraulic or pneumatic circuit and the capacity to choose the type of components of a hydraulic or pneumatic circuit based on the application sector **Communication skills** The student should acquire the proper technical language used to present the design choices and solutions

	Learning skills The student should acquire lifelong learning skills through the possession of the tools for the acquisition of technical information on hydraulics and pneumatics and to update knowledge

Assessment	The assessment for the final mark consists of two tests: - Discussion of a project based on a given real machine developed by the graduates - Oral examination and / or deepening of the written test themes
Assessment language	English
Evaluation criteria and criteria for awarding marks	The student must demonstrate to have acquired the physical principles and theoretical-evaluation considerations underlying the configurations and operation of components and systems in the hydraulic and pneumatic technical field. In order to get a positive final mark, the student must demonstrate that there are no gaps in the basic knowledge presented in the course. The maximum evaluation is achieved by demonstrating in-depth knowledge of course content. The written and the oral exam have the same weight in the final mark calculation.

Suggested readings	- Speich H., Bucciarelli A., Manuale di Oleodinamica - Tecniche Nuove - Forneris G., Rozzi de H. C., Hydraulics in industrial and mobile applications - Assofluid
Supplementary readings	- OP Oleodinamica e pneumatica – Tecniche Nuove