Course Title	Data Acquisition and Automation Systems				
Course Code	ACOE347				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	3rd Year/ 5th Semester				
Teacher's Name	Prof Costas Kyriacou				
ECTS	6	Lectures / week	2	Laboratories / week	2
Course Purpose	The purpose of this course is to provide students with the necessary knowledge and skills related to the use of computing equipment in automation systems and data acquisition systems. Emphasis for the automation systems component of the course is given on industrial automations using PLCs. Emphasis for the data acquisition component of the course is given to the use of LabView.				
Learning Outcomes	1. List and describe the function of the main components of an automation system. 2. Describe and explain the operation and characteristics of two-state sensors and actuators found in automation and process control systems. 3. Describe and compare the programming environments available for PLC programming. 4. Program the PLC using ladder diagrams to control the operation of systems such as a conveyor belt, assembly system, traffic lights etc. 5. Explain what data acquisition is, and distinguish and select between the various systems available for data acquisition applications. 6. Describe the operation and characteristics of various sensors and transducers used in data acquisition systems. 7. Describe the basics of electronic measurements and instrumentation theory with respect to signals, amplification, grounding, noise, conditioning, accuracy and resolution. 8. Explain how analogue signal can be encoded into digital codes, and employ sampling theory in data acquisition applications. 9. Design, build, program and test data acquisition and automation systems using industry standard software such as LabView and hardware such as data acquisition cards.				
Prerequisites	ACOE201 and AEEE238	Co-requisites			
Course Content	• **Automation Systems:** Types of controllers used in automation systems: microprocessors based controllers, computer based controllers, microcontrollers and Programmable Logic Controllers. Characteristics,				

	advantages and disadvantages. Overview of present technology. Types of sensors and actuators used in automation systems. • **Programmable Logic Controllers:** Hardware components of PLCs: CPU, Memory, I/O Interfacing. Programming of PLCs: Use of instruction sets, ladder diagrams and combination logic design techniques. Applications using timers, set/reset, shift, registers, sequential control techniques and analogy input/output. PLC communications. • **Instrumentation Technology:** Elements of measurement systems: transducers, signal conditioners, display/recorder measurement systems. Operation and use of transducers such as strain gauges, thermistors, lvdt's, piezo-electric transducers. • **Data Acquisition Systems:** Signal conditioning. Digital to Analog and Analog to Digital Converters, accuracy and resolution and quantization error of data converters. Sampling and the Nyquist theorem. Digital domain filtering. • **Laboratory Work:** Individual or small group experiments performed on microcomputers, equipped with data acquisition cards and software such as Labview, as well as programmable logic controllers related to real world applications.
Teaching Methodology	The underlining theory of the course is delivered to the students during lecture sessions, through electronic presentations. After acquiring the theoretical background, students carry out laboratory work that includes the implementation of a predefined procedure and the completion of a design task. Typically, a 2-hour lecture session proceeds a 2-hour laboratory session.
Bibliography	• Dag H. Hanssen, ***"Programmable Logic Controllers: A Practical Approach TO IEC61131-3 Using CoDeSys"***, John Wiley & Sons, 2015 • David S. Nyce, ***"Position Sensors"***, John Wiley & Sons, 2016 • National Instruments, ***"Introduction to LabVIEW"***, National Instruments Training, https://www.ni.com/getting-started/labview-basics/
Assessment	• Tests: 30% • Laboratory Work: 50% • Class Project 20%
Language	English