AEEE435 - Programmable Logic Controllers and Industrial Applications

Course Title	Programmable Logic Controllers and Industrial Applications				
Course Code	AEEE435				
Course Type	Technical Elective				
Level	BSc (Level 1)				
Year / Semester	3 or 4				
Teacher's Name	Dr Marios Lestas				
ECTS	6	Lectures / week	3	Laboratories / week	
Course Purpose and Objectives	The aim of the course is to familiarize students with the concepts and the principles underlying the field of Programmable Logic Controllers(PLC), to provide students with deep knowledge of the theories and methodologies related to the components and the functions of a PLC and to enable students develop the skills required for their configuration, Installation and programming to perform various tasks.				
Learning Outcomes	By the end of the course, students must be able to: 1. Distinguish the various modules and the different types of peripheral support devices. 2. Identify the components of a PLC and describe their functions. 3. Construct programming functions in both Ladder logic and Function Block Diagram. Describe and analyze the actions in a program. 4. Convert relay ladder schematics to ladder logic programs. 5. Utilize a PLC to interpret sensor and process variable data. Configure programmable logic controllers to perform various functions and tasks. 6. Perform installation practices. Interface inputs and outputs. Identify and troubleshoot problems in hardware and in program structure. .				
Prerequisites	AEEE192, ACOE343	Required	None		
Course Content	• **Introduction to Programmable Logic Controllers:** An Overview to Programmable Logic Controllers. Fundamentals. • **PLC Architecture:** The central processing unit, the input/ output section, the power supply, memory design. Principals of operation. • **PLC programming:** Methods of programming. • **Program Development in Function Block Diagram:** Design and draw simple electrical machine control diagram.				

	• **Program Development in Ladder Logic:** Implement logic functions, latches and counters in ladder logic. Logic diagram symbols and terminology. Data manipulation, math operations. • **I/O connections:** Interfacing the PLC with sensors and control devices, types and technical characteristics of sensors and control devices. • **Applications:** Introduction to automated machine control. Example programs for controlling single cycle operation, start up and shut down safety sequences. • **PLC installation practices:** PLC wiring and troubleshooting. Safety. Monitoring and maintenance.
Teaching Methodology	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the e-learning platform or the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Furthermore, design projects may be assigned to the students, where literature search is encouraged to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem, implement to implement the design and report the results in written or orally.
Bibliography	**Textbook** • Frank D. Petruzella, "Programmable Logic Controllers", 5th Ed. McGraw-Hill Education, 2017. **References** • Frederick D. Hackworth, Jr., John R. Hackworth, "Programmable Logic Controllers: Programming Methods and Applications", Pearson Education, 2003.
Assessment	The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final written exam. The coursework and the final exam grades are weighted 40% and 60%, respectively, and compose the final grade of the course. Various approaches are used for the continuous assessment of the students, such as mid-term written exam, oral exam, quizzes, design assignments, design projects and laboratory experiments. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below: • Assignments 10% • Homework 10%

	• Mid-Term written exams 40% • Design Project 30% • Quizzes 10% Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constrains and revision timetable. The criteria considered for the assessment of each type of the continuous assessment and the final exam of the course are: (i) the comprehension of the fundamental concepts and theory of each topic, (ii) the application of the theory in solving related problems and (iii) the ability to apply the above knowledge in more complex design problems. The above criteria are weighted 30%, 40% and 30%, respectively. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Language	English