## MUTAH UNIVERSITY
## Faculty of Engineering
## Department of Electrical Engineering

**Course Syllabus**

| Course Code | Course Name | Credits | Contact Hours |
|---|---|---|---|
| 0401556 | Programmable Logic Controllers | 3 | 3T |

| INSTRUCTOR/COORDINATOR | |
|---|---|
| **Name** | Dr. Talal Aljaafreh |
| **Email** | tmjaafreh@mutah.edu.jo |
| **Office Hours** | 1:00-2:00 (Sun, Tues, Thur) |

| TEXTBOOK | |
|---|---|
| **Title** | Programmable logic controllers. |
| **Author/Year/Edition** | Petruzella, Frank D. , 4<sup>th</sup> Edition Tata McGraw-Hill Education, 2010. |

| Other Supplemental Materials | |
|---|---|
| **Title (1)** | Programmable logic controllers: fundamentals and applications. |
| **Author/Year/Edition** | Evans, William Ted. Stipes Pub., 2006. |
| **Title (2)** | Programmable logic controllers |
| **Author/Year/Edition** | Rehg, James A., and Glenn J. Sartori. Prentice Hall, 2009. |

| SPECIFIC COURSE INFORMATION |
|---|
| **A. Brief Description of the Content of the Course (Catalog Description)** |
| Concept and fundamentals Programmable Logic controllers (PLCs), PLC working principles, PLCs components and constructions, Fundamental of logic and Boolean logic, PLC Wiring diagrams and ladder Logic program, PLC Programming (Timers, Counters, Sequencers, Registers), PLC Arithmetic and Instructions (data manipulation, process control, communication, Move and Comparison Instructions), Data Handling, Designing systems and programs, Analog Sensors, PLC industrial applications. Also, this course covers implementation in specific leading PLC systems: Allen-Bradley, Siemens, and OMRON |
| **B. Pre-requisites (P) or Co-requisites (C)** |
| Digital Automatic Control (0401543) **(P)** |
| **C. Course Type (Required)** |

| Required |
|---|
| **SPECIFIC GOALS** |
| **A. Course Learning Outcomes (CLOs)** |
| By the end of this course, the student should be able to:<br><br>**CLO1**:   To provide students with the basic understanding, fundamental and concepts of Programmable Logic controllers [1].<br>**CLO2**: To explain PLCs components, constructions and discuss the various necessary steps for constructing PLCs system. [1].<br>**CLO3:** To provide the students with the knowledge and skills essential to construct and program PLCs for industrial control application[1].<br>**CLO4**: To give students practical information about installing, programming, and maintaining PLC systems [2].<br>**CLO5**: To give students practical information about installing, programming, and maintaining PLC systems [2]. |
| **B. Student  Learning Outcomes (SOs) Addressed by the Course** |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| ✓ | ✓ |  |  |  |  |  |

| **BRIEF LIST OF TOPICS TO BE COVERED** | | |
|---|---|---|
| **List of Topics** | **No. of Weeks** | **Contact Hours** |
| Unit 1: Programmable Logic Controllers (PLCs): An Overview | 1 | 3 |
| Unit 2: PLC Hardware Components | 1.5 | 4.5 |
| Unit 3/4: Number Systems / Codes Fundamentals of Logic | 0.5 | 1.5 |
| Unit 5: Basics of PLC Programming | 1 | 3 |
| Unit 6:  Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs | 2 | 6 |
| Unit 7:  Programming Timers | 1 | 3 |
| Unit 8:  Programming Counter | 1 | 3 |
| Unit 9: Program Control Instructions | 1 | 3 |
| Unit 10/11: Data Manipulation Instructions and Math Instructions | 1 | 3 |
| Unit 12: Sequencer and Shift Register Instructions | 1 | 3 |
| Unit 13: PLC Installation Practices, Editing, and Troubleshooting | 1 | 3 |
| Unit 14: Process Control, Network Systems, and SCADA | 1 | 3 |
| Unit 15: ControlLogix Controllers | 1 | 3 |

| Total | | 14 | 42 |
| --- | --- | --- | --- |

| EVALUATION | | |
| --- | --- | --- |
| **Assessment Tool** | **Due Date** | **Weight (%)** |
| Mid Exam | According to the university calendar | 30 |
| Course Work (Homeworks, Quizzes, Projects, …etc.) | One week after being assigned | 20 |
| Final Exam | According to the university calendar | 50 |

| ABET's Students Learning Outcomes (Criterion # 3) | | |
| --- | --- | --- |
| | **Relationship to program outcomes** | |
| **ABET 1-7** | | **Engineering Student Outcomes** |
| 1 | √ | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics |
| 2 | √ | an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. |
| 3 | | an ability to communicate effectively with a range of audiences. |
| 4 | | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |
| 5 | | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. |
| 6 | | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. |
| 7 | | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. |