

| IE 337: Automatic control systems     |   | 3(3,1,1)   |                       |
|---------------------------------------|---|--|-----------------------|
| <b>Catalog Data</b>                   | Process control fundamentals using programmable logic controllers   |  |                       |
| <b>Prerequisite</b>                   | Math 204, GE211   |  |                       |
| <b>Co requisite</b>                   |   |  |                       |
| <b>Level</b>                          |   |  |                       |
| <b>Textbook</b>                       | * Modern Control Systems, R.C. Dorf, Addison Wesley.<br>* Logical Design of Automation System, Sunder B. Friedman, Prentice Hall.   |  |                       |
| <b>Reference</b>                      | *Automatic Control Systems, B.C. Kuo, Prentice-Hall, Inc.<br>*PC-Based Instrumentation and Control, Mike Tooley, Newnes, An Imprint of Butterworth-Heinemann Ltd. (1991).<br>*Manufacturing Automation Using PLC, Ali M Alsamhan, Saied M Darwish, Grant 16/424 of Research center College of Engineering, King Saud University<br>*David W. Pessen, Industrial Automation, Circuit Design & Components” , A Wiley-Interscience Publication, John Wiley & Sons, 1989. |  |                       |
| <b>Course Learning Outcomes (CLO)</b> | Design an automated system to meet defined industrial operations using PLC [c]<br>Practicing and understanding Relay Ladder logic to programing PLC using experiments [b]   |  |                       |
| <b>Topics (classes)</b>               | 1.  | Introduction to factory automation                       | 4 classes- week 1     |
|                                       | 2.  | Programmable logic controller and relay ladder logic     | 5 classes-week 2      |
|                                       | 3.  | Numbering systems  | 1 classes- week 3     |
|                                       | 4.  | Fundamentals of computer logics                          | 5 classes- week 4     |
|                                       | 5.  | Logic sensors and actuators                              | 5 classes- week 4-5   |
|                                       | 6.  | Pneumatic sensors, actuators and control methods         | 5 classes- week 6     |
|                                       | 7.  | Relay ladder logic design of common machine sequences    | 10 classes- week 7-8  |
|                                       | 8.  | PLC timers, counters, registers and analog input/outputs | 10 classes- week 9-10 |
|                                       | 9.  | Illustrated industrial automation applications           | 5 classes- week 10    |
|                                       |   | <b>Total Classes (10 weeks)</b>                          |                       |
| <b>Lab. work</b>                      | 1   | Logic gate networks using programmable logic controller  | 3 Lab                 |
|                                       | 2   | Electrical proximity sensors and actuators.              | 1 Lab                 |
|                                       | 3   | Pneumatic actuators, sensors and logic network           | 1 Lab                 |
|                                       | 4   | Relay ladder logic of common control sequence            | 3 Lab                 |
|                                       | 5   | Timer, counter, analog input /outputs                    | 3 Lab                 |
| <b>Equipment</b>                      | PLC programming using relay ladder logic.   |  |                       |
| <b>Estimated Category Content</b>     | Engineering Science: 2 credit hours (60%)<br>Engineering Design: 1 credit hour (40%)<br>20 Marks 1 <sup>st</sup> midterm examination + 20 Marks 2 <sup>nd</sup> Midterm examination, 20 Marks Lab work. Total 60 Marks semester work, 40 Marks Final Exam.  |  |                       |
| <b>Prepared by</b>                    | Prof Ali M Alsamhan, Dr Bashir Salah  |  |                       |
| <b>Exam. Date</b>                     | Mid-1 (end week 6) Mid-2 (end week 9) – [ 8/10/2022 – 29/10/2022 1 <sup>st</sup> semester 2022]   |  |                       |