Subject Description Form

Subject Code	ISE2122
Subject Title	Control and Automation
Credit Value	3 Academic Credits
Level	2
Exclusion	IC2122
Objectives	This subject provides students with 1. The necessary skills and principles which underpin a range of automation systems for industrial application. 2. The knowledge of the control and input/output devices in an automation system including sensors, transducers, actuators, controllers and vision systems and their applications in industry; 3. The control concepts used in automation systems with the emphasis on system design and integration. 4. The key concepts of manufacturing systems integration.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. identify the technology options for automating manufacturing process b. apply the knowledge, skills, and modern engineering tools for industrial system control; c. select and integrate appropriate components and/or functional modules to perform specify automation tasks.

Subject Synopsis/ Indicative Syllabus	1. Overview of Industrial Automation Need for automation, Automation Development; Examples of automation systems 2. Sensors and interfacing Industrial sensors, digital and analog sensors and Machine vision; 3. Actuators and Mechanisms Electrical actuators and associate control, mechanical power transmission elements and Fluid power actuators; 4. Architecture of intelligent machines Control system design classification, Programmable controllers and HMI design, industrial networking; 5. Application of numerical controlled machines and Industrial Robot Numerical control systems; programming methods and languages; Robot configurations, Robot Kinematics and control; 6. System Integration Organization of integrated manufacturing system and flexible manufacturing methods.
Learning Methodology	Lectures will emphasize the concepts and applications of the principles and key issues, using an interactive approach. Tutorials are given to clarify issues may arise from the lectures. Laboratories and hands-on practices will be conducted in order to consolidate the concepts.

Assessment Methods in Alignment with Intended Learning Outcomes

Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed		
		a	b	c
Laboratory Exercise	30		✓	✓
Tutorial	10	✓	✓	
Examination	60	✓	✓	✓
Total	100			

Student Study Effort Required

Class Contact	
▪ Lecture/Seminar	18 Hrs.
▪ Tutorial	2 Hrs.
▪ Laboratory	18 Hrs.
Other Study Effort	
▪ Preparation Work on report/tutorial	50 Hrs.
▪ Self Study	30 Hrs.
Total Study Effort	**118 Hrs.**

Reading List and References	1. G. Boothroyd, *Assembly Automation and Product Design*, Second Edition (Manufacturing Engineering and Materials Processing), CRC Press, 2005 2. M. Groover, *Automation, Production Systems, and Computer-Integrated Manufacturing (3rd Edition)*, Pearson/Prentice Hall, 2008 3. J. Hooper, *Basic pneumatics: an introduction to industrial compressed air systems and components*, Carolina Academic Press, 2003 4. L. Krivts, *Pneumatic actuating systems for automatic equipment: structure and design*, CRC Press Taylor & Francis Group, 2006 5. John S. Cundiff, *Fluid power circuits and controls: fundamentals and applications*, CRC Press, 2002 6. T. Kissell, *Industrial electronics: applications for programmable controllers, instrumentation and process control*, Prentice Hall, 2003 7. James A. Rehg, Glenn J. Sartori., *Programmable logic controllers*, Prentice Hall, 2009 8. F. Frank *Embedded system design: a unified hardware/software introduction*, John Wiley & Sons, 2002 9. *Marks' Standard Handbook for Mechanical Engineers (2007)*, 11th edition, New York, McGraw-Hill 10. Ronald A. Walsh, *Electromechanical design handbook*, McGraw-Hill, 2000.