

Module Code:	ENG5AC
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Module Title:	Industrial Automation and PLCs
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Level:	5	Credit Value:	20
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Cost Centre(s):	GAME	<u>JACS3 code:</u>	H131
		<u>HECoS code:</u>	100160

Faculty	FAST	Module Leader:	Dr Z Chen
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Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BEng (Hons) Production Engineering	✓	<input type="checkbox"/>
BEng (Hons) Industrial Engineering Design (Electrical & Electronic)	✓	<input type="checkbox"/>

Pre-requisites
None

Office use only

Initial approval: 11/09/19

Version no: 1

With effect from: 11/09/19

Date and details of revision:

Version no:

Module Aims

The module aims to develop essential knowledge relating to industrial process automation and industrial automation systems, and to facilitate the understanding of principles of programmable logic controller (PLC) and PLC controlled systems and how they interface with field devices to form industrial control systems. It familiarizes students with PLC and SCADA system software, communication methods, and programming techniques.

Intended Learning Outcomes

Key skills for employability

- KS1 Written, oral and media communication skills
- KS2 Leadership, team working and networking skills
- KS3 Opportunity, creativity and problem solving skills
- KS4 Information technology skills and digital literacy
- KS5 Information management skills
- KS6 Research skills
- KS7 Intercultural and sustainability skills
- KS8 Career management skills
- KS9 Learning to learn (managing personal and professional development, self-management)
- KS10 Numeracy

At the end of this module, students will be able to

Key Skills

At the end of this module, students will be able to		Key Skills	
1	Demonstrate critical knowledge of Logic programming methods and functionality of basic, intermediate and developing into the advanced instruction set.	KS3	KS4
		KS6	KS9
2	Establish PLC communications; edit existing, and develop new PLC programmes and design HMI and SCADA whilst considering system performance;	KS3	KS5
		KS6	KS10
3	Evaluate devices and configurations to suit application specifications, development budget constraints, and quality control requirements.	KS1	KS3
		KS6	KS7
4	Develop knowledge and skills on plan and manage process control system design; Integrate PLCs as part of a control system; effectively communicate the design.	KS1	KS2
		KS5	KS7

Transferable skills and other attributes

Information Technology skills
 Programming skills
 Evaluation and analysis skills
 Communication skills
 Decision making
 Research skills

Derogations

Derogations from Academic Regulations are in place for this module for some programmes. Please see the programme specification for further details and to check applicability.

Assessment:

Indicative Assessment Tasks:

By means of a portfolio (Practical work) - several exercises developing knowledge of industrial automation system design, PLC functionality and programming methods. All outcomes will be covered by this assessment.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration or Word count (or equivalent if appropriate)
1	1 to 4	Portfolio	100%	3500 words

Learning and Teaching Strategies:

Lectures - presentation of theory, facts and concepts, relating to instrumentation, in order to convey critical information. Interaction or active learning should be implemented to develop an understanding of principles and concepts and stimulate discussion.

Demonstrations – Laboratory experiments performed in order to demonstrate instrument characteristics.

Specialist knowledge and expertise from industrial partners can and will be disseminated to other students where relevant.

PLC and computer Labs – Use of software in order to enhance the teaching and learning in software development knowledge and skills.

Syllabus outline:

Industrial automation: automation principles and industrial automation project; project scope, objectives, function specifications; initiating, planning, and executing industrial automation projects; industry standard; implementation, testing and evaluation of industrial automation systems.

PLCs for automation: industry standard PLC equipment; principles, structure and architecture; interfacing with field devices; configuration of PLC control systems; sensors and actuators; hardware and software; discrete devices, analogue devices.

Programming for industrial automation: fundamental programming concepts; programme structure; principles of logic programming; algorithms and program design; functions, sub-routines; fundamental data structures; manipulation display and control of data and database; data capture and representation; advance PLC functionality; structured programming.

PLC-based process control system design: assignment of automation tasks; automation system configuration; communication protocols; HMI design; SCADA; ethical, economical, safety, security sustainability issues in automation.

Bibliography:

Essential reading

Rabiee, M (2017) Programmable Logic Controllers: Hardware and Programming, 4th edition, Goodheart-Wilcox Publisher

Other indicative reading

Dunn, W. (2018), Fundamentals of Industrial Instrumentation and Process Control, Second Edition, McGraw-Hill Education

Anderson, N (1997) Instrumentation for Process Measurement and Control, Third Edition, CRC Press

Bolton, W. (2015) Instrumentation and Control, Newnes

IET Study Resources: <http://www.theiet.org/students/resources/index.cfm>