ZBRE C3102: Brewery and Distillery Engineering

Module Title:	Brewery and Distillery Engineering
Language of Instruction:	English

Credits:	10

NFQ Level:	7

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	Module will be delivered through lectures, tutorials, and practical sessions.

Module Aim:	To give the students an understanding of the Operations Technology of Industrial Control Systems that control modern breweries and distilleries.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Classify sensors, actuators and other key instrumentation used in the brewing and distilling process
LO2	Program PLC's through Ladder Logic to control various mechanical devices and processes.
LO3	Discriminate between DCS and SCADA systems and discover there role within the Perdue model for ICS.
LO4	Appraise the risk posed by cyber attack on the Operations Technology of the ICS controlling modern breweries and distilleries.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Control Systems Definition, description and aims of process control • The Control Loop - Objectives of Automatic Control, - Block Diagrams, - Components of Sample Systems, - On/ Off control, - Open and Closed-Loop Control, - Feedback in Control Systems, - Process Disturbances, - Control Definitions. • Process Characteristics - Process Load, - Supply and Demand Load. Relationship, - Process Lags, - Capacitance, - Resistance, - Dead Time, - Process Gain, - Process Reaction Curve, - Process Dymanic Characteristics. • Control Valves - Common Valve and Actuator Types, - Ancillary Equipment, - Control Valve Performance, - Valve selection and Sizing. • Modes of Control - On-Off Control, - Proportional Control, - Proportional + Integral Control, - Proportional + Derivative Control, PID (3 Term) Control, - Controller Selection, Zeigler-Nichols Open and Closed Loop Tuning Methods.
SCADA • Distributed Control Systems (DCS), Supervisory Control And Data Acquisition (SCADA) systems for monitoring and controlling processes. • System Architectures and Topologies, Perdue Model. • • Hardware – Master Stations, RTUs, PLCs as RTUs. • Software – Features and Protocols, Communication Architectures. • FieldBus, LAN and Wireless Communications.
PLC Programming • IEC-61131 languages. • Ladder Logic. • Instruction Lists. • Structured Text. • Function Block Diagram. • Sequential Function Chart.
ICS Security • Cybersecurity risk • Vulnerabilities, risks and threats, Ransom attack. • Threat mitigation, Incident Response. • IEC62443.

Assessment Breakdown	%
Continuous Assessment	75.00%
Practical	25.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Written Report	Assignment – Sensors, Actuators and Controllers	1	15.00	n/a
Written Report	Assignment – Industrial Control Systems	2,3	15.00	n/a
Written Report	Assignment – Cybersecurity risk to ICS	4	15.00	n/a
Short Answer Questions	Computer based test – Industrial Control - test A	1,2	15.00	n/a
Short Answer Questions	Computer based test – Industrial Control - test B	3,4	15.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Programming of PLC's using simulation software.	2	25.00	n/a

No End of Module Formal Examination

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Written Report	Assignment – Sensors, Actuators and Controllers	1	15.00	n/a
Written Report	Assignment – Industrial Control Systems	1,2	15.00	n/a
Written Report	Assignment – Cybersecurity risk to ICS	4	15.00	n/a
Short Answer Questions	Computer based test – Industrial Control - test A	1,2	15.00	n/a
Short Answer Questions	Computer based test – Industrial Control - test B	3,4	15.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Programming of PLC's using simulation software.	2	25.00	n/a

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	5.00
Lab/Lecture	12 Weeks per Stage	3.00
Independent Learning	15 Weeks per Stage	10.27
	Total Hours	250.00

Workload: Part Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	Every Week	5.00
Lab/Lecture	Every Week	3.00
Independent Learning	Every Week	13.00
	Total Hours	21.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SABRE_B	Bachelor of Science (Honours) in Brewing and Distilling	5	Mandatory