BREW H3101: Brewery and Distillery Engineering

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

Credits:	10

NFQ Level:	7

Module Delivered In	No Programmes

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

Module Aim:	To give the students an understanding of the physical principles underlying brewing and distilling with emphasis on the underlying principles of Fluid Dynamics and Thermodynamics.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe the nature, structure and properties of fluid and heat in the context of brewing and distilling
LO2	Solve problems in dynamics, fluid dynamics and thermodynamics involving physical laws
LO3	Application of key analytical instrumentation used in the brewing and distilling process
LO4	Program PLC's in Ladder Logic to control various Mechanical Machines and processes (software simulations).

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

Module Content & Assessment

Indicative Content
Principles of Heat Transfer & Heat Exchangers • Newton's law of cooling • Fourier's law of conduction • Conductance of solid layers • Conductance of boundary layers • Heat losses & gains from surfaces, • Log Mean Temperature Difference • Heat exchangers
Refrigeration & Cooling • Introduction to refrigeration cycles & evaporative cooling • Cooling towers
Carbonation Carbonation: Solubility and equilibrium of gases, rate of carbonation. Decarbonation. Nitrogenation
Filtration, sedimentation, flocculation Filtration: methods/mechanisms, filtration media and filter aids, resistance to flow, filtration theory, prediction of filter performance, filtration equipment, filter press/ mash filter, lauter tun, pressure leaf filter. Other filtration systems. Sedimentation – principles. Flocculation by gravity, effect of yeast type, divalent cations and filter aids
Centrifugation, conveyors Continuous centrifugation – theory. Types of continuous centrifuge: plate separators, nozzle centrifuge, opening bowl centrifuge, decanters, sieve centrifuges. Materials handling Bulk storage, cleaning and grading. Conveyors and conveying: Screw conveyers, belt conveyers, bucket elevators, continuous flow conveyers, pneumatic conveyers, other conveyer systems. Conveyor control systems
Milling Milling: milling techniques, mill capacity, mill roll setting, energy requirements of milling
Process Instrumentation 2 Operational principles of analytical process instrumentation, calibration requirements and factors determining the choice of appropriate instruments including • Process gas analysers - Oxygen Analyser - NDIR (CO/CO2) analysers • Process liquid analysers - pH Analysers - Electrical Conductivity analysers - Humidity Analysers - Density Analysers - Viscosity Analysers - Dissolved Oxygen CO2 Analysers - Oxygen Headspace Analyser • Process Sampling systems for off-line analysers - Liquid Sampling Systems - Gas Sampling Systems
Control Systems 2 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 Supervisory Control And Data Acquisition (SCADA) systems for monitoring and controlling processes, System Architectures and Topologies, Hardware – Master Stations, RTUs, PLCs as RTUs. Software – Features and Protocols, Communication Architectures. FieldBus, LAN and Wireless Communications
Practical n/a

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	40.00%
End of Module Formal Examination	50.00%

Special Regulation
Students must achieve a minimum grade (35%) in both the practical/CA and final examination.

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Multiple Choice Questions	Written class tests and or online assessment may be employed to encourage individual learning.	1,2	10.00	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.	4	40.00	End-of-Semester

End of Module Formal Examination				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	A final written examination will assess the extent to which the student has achieved the module learning outcomes.	1,2,3	50.00	End-of-Semester

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

Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	2.00
Laboratory	30 Weeks per Stage	2.00
Independent Learning	30 Weeks per Stage	2.00
	Total Hours	180.00