

<b>Module Title:</b>	The Brewing Process
<b>Language of Instruction:</b>	English
<b>Credits:</b>	10
<b>NFQ Level:</b>	7
<b>Module Delivered In</b>	<a href="#">1 programme(s)</a>

<b>Teaching &amp; Learning Strategies:</b>	<p>This level 7 module will provide the learner with a broad overview of each topic in the syllabus. The learning objectives, learning activities and assessments are constructively aligned. A variety of active learning strategies, facilitated by the VLE, Blackboard, will be employed: eg lectures, practical's, discussion, site visits, engagement with materials (texts, journals etc.) industry practice materials (case studies, live case examples, industry reports etc.). Learners will be expected to actively engage with module materials (online &amp; offline) and with associated in class and out of class activities. Where appropriate a flipped classroom approach will be used to maximise classroom interaction. The active use of the VLE Blackboard will enhance digital competencies, aid in formative assessment and a provide blended learning approach well as providing a resource repository. Independent learning and reflection will be developed by use of scaffolding in class and supported research and enquiry activities. Research and enquiry skills will be developed in a supported manner via activities that will involve the learner finding, evaluating and organising information from credible sources, analysis and synthesis of new information and communicating new knowledge in the correct discipline appropriate convention. These independent learning activities will also encourage digital literacy, development of communication skills and group and peer learning as appropriate. The practical component, as well as the development of skill mastery, will support the theoretical aspects of the module and promote deep learning via, the formulation of simple and clear hypotheses, structured investigation of simple problems and application of prior knowledge. In addition, practical's will allow students to develop the required safe technical competencies, attitudes and behaviours required. This module will be assessed summatively via a continuous assessment, practical and a terminal exam. Assessment both formative and summative with associated feedback, both digital (via Blackboard / Turnitin) and face to face will be used to motivate, check knowledge as well as assess the attainment of learning outcomes. Strategies will be used to ensure that feedback is attended to and over assessment is avoided. A mix of digital and conventional assessment methods eg MCQ, short answer, video, poster, presentation, assignment, reports will be used. Assessment of the practical component that encourages not only the development of key practical and reporting competencies, but also critical thinking, analysis and group learning will be used via digital and conventional means as appropriate. Integration of learning outcomes will be assessed by a capstone project as well as the practical assessment. The terminal exam is the summative assessment, where an open-book or closed-book examination consisting of closed-ended and open-ended questions will be included to allow assessment of students' application and interpretation of knowledge as well as their analytical and evaluative skills.</p>
--	---

<b>Module Aim:</b>	The aim of this module is to provide students with an understanding of the brewing process including malt processing, mashing and wort separation and boiling
--------------------	---

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Describe the stages involved in the malting process including steeping, germination and kilning and be able to conduct the analyses required to detect malt quality
LO2	Explain the milling process including malt handling procedures, techniques used during grist preparation and the different mill types, evaluate the effects of milling on the composition and quality of the final product
LO3	Articulate the biochemical and physiological reactions during mashing and relate these to enzymes in brewing. Predict wort production from wort composition and separation and explain wort boiling.
LO4	Explain the processes required to remove hop and hop product debris from wort, and examine the processes involved in wort clarification, cooling, dilution and aeration
LO5	Explain in detail the technical and biochemical principles of wort fermentation, beer maturation and storage
LO6	With due regard to health and safety and cGLP, develop the brewery relevant practical, recording, reporting techniques and skills required for the brewing process. Integrate theory to contextualise, and analyse data obtained

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

## Module Content & Assessment

### Indicative Content

#### Barley

Barley intake, storage, drying, separation and grading

#### The malting process

Steeping, steep regimes and air rests; germination, moisture, temperature, biochemical changes, malting loss; kilning, free drying, forced drying, curing, kiln technology, biochemistry of kilning; malt analysis, malt quality, speciality malts

#### Water

Consideration of water chemistry for mashing in brewing and distilling.

#### Hops

Hop biology and cultivation, chemical composition, hop products, hops in the brewing process, analysing hop quality

#### Milling

Malt handling procedures, dry goods, malt dust; techniques used during grist preparation; mill types and operation; effect of milling on composition and quality of beer

#### Mashing

Biochemistry of mashing; mashing techniques and regimens; wort composition, mash separation and wort quality; Darcy's law wort boiling; process and equipment, wort clarification, cooling, dilution, aeration

#### Wort Separation

Operation of lauter tuns, mash filters. Trub removal from hopped wort ex kettle, whirlpool

#### Fermentation

Wort fermentation, flocculation, maturation, centrifugation, clarification, beer filtration, pasteurisation, beer spoilage

#### Carbonation

Carbonation. CO<sub>2</sub> production in breweries. Carbonation of final beer. CO<sub>2</sub> measurement in bottle/kegs.

#### Adjuncts and other cereals

Other cereals (malted and unmalted) and adjunct raw materials. Gluten free raw materials. Alcohol-free and diet beers. Processing aids available for use in the industry. Industrial enzymology, enzymes and malting

#### Sensory analysis of beer

Sensory/flavour evaluation and data handling

#### Practicals

Integrated practical's complementing many aspects of the module will occur. Suggested practical's and not limited to: 1. Milling and mashing regimes/enzyme analysis/pH. 2. Water- effect of water type and ion content 3. Sweet wort separation and composition – sugar and amino acid/total N analysis. 4. Wort boiling, alpha and beta acids measurement in hops, hop conversion, estimation of bitterness/iso-alpha acids, wort clarification. 5. Beer fermentation, oxygen, pitching, monitoring of fermentation/OG-PG/pH/PP/attenuation. 6. Green beer processing: separation, flocculation, centrifugation, clarification. 7. Beer maturation, analysis of VDK's (diacetyl), Glyle. 8. Bright beer polishing/packageging. Estimation of oxygen content/oxygen flavour damage. 9. Packaged beer testing: Haze, colour, gravity, alcohol content, pH, acidity, bitterness, oxygen, carbon dioxide, head space air content. 10. Bacterial and yeast contamination of beer and the brewery environment. 11. Sensory demonstrations/analysis

#### Site Visit(s)

Visit(s) to a Malting Plant, Brewery, Distillery

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. IT Carlow reserves the right to alter the nature and timings of assessments

### Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Other	A mix of appropriate formative and summative assessment accompanied by feedback as appropriate eg MCQ, Short answer questions, oral, short assignment/ Site visit report. In class activities. Group and peer learning.	1,2,3,4,5,6	10.00	n/a

No Project

<b>Practical</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Practical/Skills Evaluation	Strategies will be used for the assessment of the practical component that encourage not only the development of key practical and reporting competencies but also the appropriate scientific thinking, research and enquiry, reflection, analysis, group learning and communication skills will be used via electronic and conventional means as appropriate. The use of prepractical assessment will encourage engagement.	1,2,3,4,5,6	40.00	n/a

<b>End of Module Formal Examination</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Formal Exam	2 hour examination (open-book or closed-book examination consisting of closed-ended and open-ended questions)	1,2,3,4,5,6	50.00	End-of-Semester

<b>Continuous Assessment</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Examination	MCQ, Short Paragraphs, Verbal Assessments	1,2,3,4,5,6	10.00	n/a

No Project
------------

<b>Practical</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Practical/Skills Evaluation	Laboratory write up/ assignments where theory is applied to practical/ video assessment	1,2,3,4,5,6	40.00	n/a

<b>End of Module Formal Examination</b>				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Formal Exam	2 hour examination (open-book or closed-book examination consisting of closed-ended and open-ended questions)	1,2,3,4,5,6	50.00	End-of-Semester

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

**Module Workload**

<b>Workload: Full Time</b>		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	4.00
Laboratory	12 Weeks per Stage	4.00
Independent Learning	15 Weeks per Stage	10.27
Total Hours		250.00

  

<b>Workload: Part Time</b>		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Practicals	12 Weeks per Stage	7.50
Independent Learning	15 Weeks per Stage	7.33
Total Hours		200.00

**Module Delivered In**

Programme Code	Programme	Semester	Delivery
CW_SABRE_B	<a href="#">Bachelor of Science (Honours) in Brewing and Distilling</a>	5	Mandatory