# BREW H4R02: Distillation and Distilled Spirits Production

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| **Module Title:** | Distillation and Distilled Spirits Production |
| **Language of Instruction:** | English |

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| **Credits:** | 10 |

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| **NFQ Level:** | 8 |

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| **Module Delivered In** | 1 programme(s) |

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| **Teaching & Learning Strategies:** | This module contains the key concepts of distilling technology at level 8. Learning objectives , learning activities and assessments are constructively aligned . The integration of the practical and theoretical aspects of the module will reinforce deep learning of key concepts , skills and competencies . A variety of active learning strategies will be employed to ensure that the learning objectives are met. Students are expected to engage actively with the material at lectures, in practicals and by independent learning VLE Blackboard Autonomous learning will be developed by use of scaffolded in class and independent 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 |

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| **Module Aim:** | To develop students' knowledge and understanding of the distilling process and operational procedures |

| **Learning Outcomes** | |
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| *On successful completion of this module the learner should be able to:* | |
| LO1 | Describe the fundamentals of the distilling process |
| LO2 | Give an overview of distilling operation procedures and evaluate these procedures in the context of column still operation and continuous and multi-stage distillation |
| LO3 | Investigate the raw materials for the distilling process and distinguish factors influencing flavour development |
| LO4 | Demonstrate appropriate scientific thinking, research and enquiry, communication and team skills |
| LO5 | Demonstrate essential laboratory techniques in a safe and competent manner |
| LO6 | Demonstrate sensory skills to assess new make spirit |

| **Pre-requisite learning** |
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| ***Module Recommendations***<br>*This is prior learning (or a practical skill) that is recommended before enrolment in this module.* |
| No recommendations listed |
| ***Incompatible Modules***<br>*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***<br>*This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.* |
| No requirements listed |

# BREW H4R02: Distillation and Distilled Spirits Production

## Module Content & Assessment

| Indicative Content |
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| **Fundamentals of Distillation**<br>Origins/history of distillation. The distillery brewhouse, corn cooking, starch gelatinization and solubilisation. Use of enzymes; Measurement of alcohol strength, theory of distillation, boiling, evaporation, volatility of alcohol, water and congeners. Alcohol/water relationship, latent heat of evaporation. Congeners and impurities. Batch vs continuous distillation, batch pot still distillation: operation/reflux/entrainment. Condenser design and operation – shell and tube condensers, worm condensers. Condensation, latent heat and spirit character/strength. Tail pipes, spirit collection and receivers. Role of copper in potable spirit distillation. Copper stills/condensers. Link between spirit quality, cleaning and copper wear. Copper salts in new-made spirits. Column distillation – two column systems. Basics of column still operation, continuous steady state operation. Steam supply, feedstock input, theory of column still operation, rectifying/stripping. Commercial two-column still systems. Neutral spirit production (gin and vodka) and the use of three-column stills to produce flavour-free alcohol. Batch versus Continuous Distillation Basic operation of batch distillation, multi-stage distillation. Material balance of water and alcohol. Heads and tails. Operating stills during production periods. Batch distillation using pot stills with plates. Triple distillation in pot stills. Cut points to control flavour. High volatility and low volatility congeners, removal of unwanted congeners, distillation end points. Collection of distillate: Design/operation of various spirit safes. Foreshots testing. The spirit to feints cut. Feints to foreshots receiver. Column distillation: Operation of a commercial two-column distillation system. Stripper, rectifier columns, fusil oil removal. Control and balance of two-column operations, the use of copper, plate design and maintenance, column plates and still operation. Column vs pot stills. Batch distillation using column stills. Non-Coffey (NC) versus Coffey stills. Control of product rectification in Coffey stills. The two column 'modified Barbet' still. Design and operation of continuous stills for neutral spirit, hydroextractive distillation. |
| **Raw materials**<br>Raw Materials for Spirits Production Grapes: Cultivation/varieties. Composition of must. Grape harvesting, pressing, must production. Composition and structure of grapes, ripening, sugar content, acidity. Must treatment: removal of solids, sufliting, addition of yeast nutrients/Free Amino Nitrogen/diammonium phosphate. Molasses: As a raw material for distilling. Types: sugar cane/sugar beet. Composition, harvesting, refining, juice extraction. Production of molasses. Analysis: chemical and microbiological. Molasses pre-treatment ('mashing'), addition of yeast nutrients/pH adjustment. Sterilizing of molasses |
| **Brandy, Whiskey and Rum distillation**<br>Whiskey/cereal distillation Types of whiskey, whiskey flavour. Terminology. Continuous (column) distillation for grain whiskey and Grain Neutral Spirit. Pot distillation for malt whiskey. The distillation process for malt whiskey. Design of the still house, wash receiver, wash pre-boiler, still body, still head and reflux, purifiers. Malt distillery still house operation. Grape brandy distillation Grape brandies, fruit brandies. Brandy flavour and blending. Brandy rectification. Grape distillation for neutral spirit. Operation of batch (pot) still for brandy production. Simple batch distillation of brandy/Cognac pot still system. Armagnac continuous column stills. Rum distillation Different kinds of rum: Light rums and heavy rums. Rum flavour, rectification of rum and neutral spirit produced from molasses. The use of high alcohol-producing strains for the latter |
| **Fermentation**<br>Rum fermentation: Light rum, similar to neutral spirit. High alcohol-producing yeast strains, high fermentation temperatures. Heavy rum: High levels of esters and butyric acid. Flavour production during fermentation, flavour production by wild yeasts/bacteria/selected Saccharomyces species. Use of Schizosaccharomyces pombe and Clostridium saccharobutyricum. Effect of temperature, pressure and fusel alcohol levels on ester production. Cereals Malt, barley and other cereals – as in brewing. |
| **Practicals**<br>1. Wine fermentation. 2. Rum fermentation and chemical analysis of molasses. 3. Effect of nutrient addition on yeast growth in molasses and wine must. 4. Effect of must treatment such as sulfiting on wine production/quality. 5. Flavour analysis (GC) of beer, wine and distilled fermentation products. 6. Comparing yeast propagation with commercial dried yeast products for pitching beer, wine and rum fermentations. 7. Comparing 'natural' fermentations with propagated yeast inoculation. |
| **Distillation Practicals**<br>1. Construction of a ethanol / water vapour equilibrium chart 2. New Make Spirit from a Multi-stage Pot Still 3. Pot Stills Fitted With Plates 4. The effects of copper on the flavour of new make spirit |

| Assessment Breakdown | % |
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| Continuous Assessment | 10.00% |
| Practical | 30.00% |
| End of Module Formal Examination | 60.00% |

| Special Regulation |
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| 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* |
|---|---|---|---|---|
| Examination | Short exam | 1,2,3 | 10.00 | n/a |

No Project

**Practical**

| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
|---|---|---|---|---|
| Practical/Skills Evaluation | Laboratory work | 4,5 | 30.00 | n/a |

| **End of Module Formal Examination** | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Formal Exam | Final examination | 1,2,3,4,5,6 | 60.00 | End-of-Semester |

| **Continuous Assessment** | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Examination | n/a | 1 | 10.00 | n/a |

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| No Project |

| **Practical** | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Practical/Skills Evaluation | n/a | 2,3,4,5 | 30.00 | n/a |

| **End of Module Formal Examination** | | | | |
|---|---|---|---|---|
| *Assessment Type* | *Assessment Description* | *Outcome addressed* | *% of total* | *Assessment Date* |
| Formal Exam | n/a | 1,2 | 60.00 | End-of-Semester |

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

# BREW H4R02: Distillation and Distilled Spirits Production

## Module Workload

| Workload: Full Time | | |
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| *Workload Type* | *Frequency* | *Average Weekly Learner Workload* |
| Lecture | 12 Weeks per Stage | 3.00 |
| Laboratory | 12 Weeks per Stage | 3.00 |
| Independent Learning | 15 Weeks per Stage | 11.87 |
| | Total Hours | 250.00 |

## Module Delivered In

| Programme Code | Programme | Semester | Delivery |
|---|---|---|---|
| CW_SABRE_B | Bachelor of Science (Honours) in Brewing and Distilling | 7 | Mandatory |