



## **Qualifications**

### **Diploma in Distilling**

#### **Module 3**

### **Examination Syllabus 2019**

## Unit 1: Resource Management

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Environment	<ul style="list-style-type: none"> <li>• Sustainability and climate change</li> <li>• Energy conservation               <ul style="list-style-type: none"> <li>○ principle energy consuming activities</li> <li>○ energy reduction strategies</li> </ul> </li> <li>• Water conservation               <ul style="list-style-type: none"> <li>○ purposes for water in brewing operation</li> <li>○ water conservation strategies</li> </ul> </li> <li>• Waste minimisation</li> </ul>
Health and safety	<ul style="list-style-type: none"> <li>• Fundamental considerations               <ul style="list-style-type: none"> <li>○ health and safety in the food and drink industry</li> <li>○ relevant national and local legislation and regulations</li> <li>○ principle of duty of care</li> </ul> </li> <li>• Understanding of workplace hazards and precautions               <ul style="list-style-type: none"> <li>○ techniques for assessing hazards and risks</li> <li>○ safe working practices</li> <li>○ accident investigation and reporting</li> </ul> </li> </ul>
Utilities	<ul style="list-style-type: none"> <li>• Water use and treatment               <ul style="list-style-type: none"> <li>○ different types of water and their uses</li> </ul> </li> <li>• Effluent treatment</li> <li>• Compressed air               <ul style="list-style-type: none"> <li>○ common systems for compressed air production</li> <li>○ components of air distribution systems</li> <li>○ quality requirements for brewing operations</li> </ul> </li> <li>• Managing utilities               <ul style="list-style-type: none"> <li>○ typical utilities usage figures for distilling</li> </ul> </li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Aims of maintenance</li> <li>• Approaches to maintenance</li> <li>• Maintenance tasks               <ul style="list-style-type: none"> <li>○ types and variety of maintenance tasks in distilling</li> </ul> </li> <li>• Organisation               <ul style="list-style-type: none"> <li>○ planning of maintenance activities</li> </ul> </li> <li>• Performance improvement               <ul style="list-style-type: none"> <li>○ principle performance initiatives</li> </ul> </li> </ul>

## Unit 2: Fluid Mechanics

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Principles of fluid mechanics	<ul style="list-style-type: none"> <li>• Forms of fluid and fluid energy</li> <li>• Properties of moving fluids</li> <li>• Friction loss</li> <li>• Pumps               <ul style="list-style-type: none"> <li>○ centrifugal pumps</li> <li>○ positive displacement pumps</li> <li>○ cavitation and net positive suction head (NPSH)</li> </ul> </li> <li>• Valves               <ul style="list-style-type: none"> <li>○ design features and merits of different types of valves</li> </ul> </li> </ul>
Process gases	<ul style="list-style-type: none"> <li>• Carbon dioxide liquefaction</li> </ul>

## Unit 3: Heat Transfer

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Principles of heat transfer	<ul style="list-style-type: none"> <li>• Forms of heat energy               <ul style="list-style-type: none"> <li>○ definition of specific heat</li> <li>○ latent heat and exothermic heat</li> <li>○ calculations of energy change</li> </ul> </li> <li>• Heat transfer mechanisms               <ul style="list-style-type: none"> <li>○ conduction, convection and radiation</li> <li>○ calculation of the overall heat transfer coefficient</li> <li>○ effects of fouling and scaling</li> </ul> </li> <li>• Heat exchanger sizing               <ul style="list-style-type: none"> <li>○ concept of the heat balance and heat transfer across a temperature gradient</li> <li>○ co-current and counter-current flow in a heat exchanger</li> </ul> </li> <li>• Plate heat exchanger designs               <ul style="list-style-type: none"> <li>○ construction, components and configuration of a heat exchanger</li> <li>○ importance of fouling/scaling problems</li> <li>○ CIP techniques</li> <li>○ heat exchanger calculations</li> <li>○ heat exchanger applications in distilling</li> </ul> </li> <li>• Jacketed vessels</li> <li>• Shell and tube heat exchangers               <ul style="list-style-type: none"> <li>○ shell and tube heat exchanger designs and configurations</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ applications in distilling</li> <li>● Insulation <ul style="list-style-type: none"> <li>○ function of insulation</li> <li>○ choice of materials</li> </ul> </li> </ul>
Steam	<ul style="list-style-type: none"> <li>● Steam properties <ul style="list-style-type: none"> <li>○ reasons for using steam</li> <li>○ temperature-energy relationship as illustrated in the Mollier chart</li> <li>○ steam tables</li> <li>○ specific heat of liquid water</li> <li>○ latent heat of vaporisation</li> </ul> </li> <li>● Steam raising and distribution <ul style="list-style-type: none"> <li>○ boiler design</li> <li>○ pipe sizes, arrangements and design velocities</li> <li>○ insulation</li> <li>○ steam traps</li> <li>○ control valves, reducing valves and relief valves</li> <li>○ legal requirements in having a properly designed, safe system with the correct protection measures</li> </ul> </li> <li>● Principal steam applications</li> </ul>
Refrigeration	<ul style="list-style-type: none"> <li>● Refrigeration theory <ul style="list-style-type: none"> <li>○ definition of refrigeration</li> <li>○ concept of pressure/temperature equilibrium in relation to the vapour-compression refrigeration process</li> <li>○ refrigeration cycle</li> <li>○ function of evaporator, compressor, condenser and expansion valve</li> </ul> </li> <li>● Refrigeration practice and the refrigeration cycle</li> <li>● Principal plant items <ul style="list-style-type: none"> <li>○ compressors</li> <li>○ condensers</li> <li>○ evaporator and expansion devices</li> </ul> </li> <li>● Primary refrigerants <ul style="list-style-type: none"> <li>○ purpose, design and choice</li> <li>○ available refrigerant types and costs</li> <li>○ physical and chemical properties</li> </ul> </li> <li>● Secondary refrigerants <ul style="list-style-type: none"> <li>○ purpose, design and choice</li> <li>○ chemical properties</li> <li>○ safety and environmental concerns</li> </ul> </li> <li>● Refrigeration applications</li> <li>● Reasons for use</li> </ul>

## Unit 4: Process Control and Instrumentation

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Process control	<ul style="list-style-type: none"> <li>• Basic control elements               <ul style="list-style-type: none"> <li>○ sensors, controllers and actuators</li> </ul> </li> <li>• Basic on/off control               <ul style="list-style-type: none"> <li>○ timers, thermostats, pressure switches, proximity switches and others</li> </ul> </li> <li>• Sequence control               <ul style="list-style-type: none"> <li>○ description of programmable logic controller (PLC)</li> <li>○ examples of plc applications</li> </ul> </li> <li>• Aim of process control</li> <li>• Principles of process control</li> <li>• Control arrangements</li> <li>• Typical control systems</li> <li>• Actuation</li> <li>• Control system arrangements               <ul style="list-style-type: none"> <li>○ self-actuating controllers</li> <li>○ individual electronic analogue controls</li> <li>○ small local computer control</li> <li>○ Supervisory Control and Data Acquisition (SCADA), Management Information Systems (MIS) and other large digital systems</li> <li>○ comparative costs</li> </ul> </li> </ul>
Instrumentation	<ul style="list-style-type: none"> <li>• Factors determining the choice of sensors</li> <li>• Typical conventional sensors               <ul style="list-style-type: none"> <li>○ including pressure, volume flow, temperature, mass flow level and vessel contents</li> </ul> </li> <li>• Typical analytical sensors               <ul style="list-style-type: none"> <li>○ including CO<sub>2</sub>, O<sub>2</sub>, optical devices, pH, density and alcohol content</li> </ul> </li> </ul>

## Unit 5: Materials of Construction

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Classification and properties	<ul style="list-style-type: none"><li>• Carbon and low alloy steels</li><li>• Stainless steels</li><li>• Other metals including copper (and alloys), aluminium and cast iron</li><li>• Plastics and glass</li></ul>
Applications and limitations	<ul style="list-style-type: none"><li>• Advantages and disadvantages</li><li>• Applications</li></ul>

## Unit 6: Packaging

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Blending	<ul style="list-style-type: none"><li>• Basic principles of spirits blending prior to packaging</li></ul>
Bottling	<ul style="list-style-type: none"><li>• Chill Filtration</li><li>• Packaging materials – primary, secondary and tertiary</li><li>• Packaging line design</li><li>• Packaging line operation</li></ul>