Food & Drink Advanced Engineer Integrated Degree Apprenticeship Standard,

Level 6:

End-point Assessment Plan

Introduction & Overview

This document sets out the requirements for end-point assessment (EPA) for the food & drink advanced engineer integrated degree apprenticeship standard, level 6. It is written for Universities in their role of end-point assessment organisations (EPAOs), who need to know how EPA for this apprenticeship must operate. It will also be of interest to food & drink advanced engineer apprentices and their employers.

The food & drink advanced engineer integrated degree apprenticeship is a core and options standard. During the EPA apprentices must be assessed against the core knowledge, skills and behaviours (KSBs) and knowledge and skills relating to their chosen option, that is mechanical, automation or production.

In an integrated degree apprenticeship, the degree incorporates on-programme academic and workplace learning and assessment with an independent EPA to test the standard's KSBs. The degree is worth 360 credits, with the EPA accounting for 40 credits.

Full time apprentices will typically spend 5-years on-programme working towards the apprenticeship standard, with a minimum of 20% off-the-job training.

The EPA should only start once the employer is satisfied that the apprentice is consistently working at, or above, the level set out in the standard, the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO.

As a gateway requirement, apprentices must successfully pass 320 on-programme credits, have compiled a portfolio of evidence and have had a project outline agreed with their employer and academic supervisor. In addition, apprentices without English and mathematics at level 2 must achieve level 2 prior to taking their EPA.

The EPA must be completed within a maximum 12-month period, after the apprentice has met the EPA gateway requirements.

Awarding Universities will be responsible for the on-programme and EPA requirements. They must be on the Education & Skills Funding Agency (ESFA) Register of Apprenticeship Training Providers (RoATP). In addition, they must be approved to offer the EPA for this standard and be on the ESFA Register of End Point Assessment Organisations (RoEPAOs).

The EPA consists of 2 distinct assessment methods:

- **Work-based project**, consisting of a report and presentation with questioning
- **Technical interview**, underpinned by a portfolio of evidence

Performance in the EPA will count towards the overall degree classification. Apprentices cannot successfully complete the degree apprenticeship without successfully passing the EPA.

Performance in the EPA will be separately graded and determine the apprenticeship grade of pass, merit, distinction or fail.

End-point Assessment Gateway

Gateway requirements:

- An apprentice's employer must confirm that the apprentice is working at, or above, the level set out in the standard; employers may wish to take advice from the apprentice's University

- An apprentice must hold a portfolio to evidence demonstrating competence against the standard. The portfolio will be used to underpin the EPA technical interview. It may also be used to support the evidence requirements for professional recognition, should the apprentice wish to apply. It must therefore be presented in line with the relevant profession body's guidance. It will typically contain performance review documentation, witness statements, training records/certificates and work products such as risk assessments, reports, meeting records, plans and costings

- An apprentice must have completed 320 on-programme credits and have passed all on-programme modules

- An apprentice without English and mathematics at level 2 on entry, must have achieved this level as a minimum[1]

- An apprentice must have a project outline agreed with their employer and academic supervisor, based on their option specialism within the standard. The outline must detail the project title, scope, key activities/milestones and expected outputs/measures of success. See workplace project for further details of project aim and scope

[1] For those with an education, health and care plan or a legacy statement the apprenticeships English and maths minimum requirement is Entry Level 3. British Sign Language qualification is an alternative to English qualifications for those whom this is their primary language.

End-point Assessment Independent Assessor(s)

Universities, in their role of EPAO, must appoint:

- Independent assessors to mark an apprentice's work-based project and technical interview
- A panel to advise independent assessors

Independent assessors must meet the following requirements:

- Be independent of the on-programme delivery, the apprentice and their employer i.e. there must be no conflict of interest
- Hold an engineering degree and have engineering experience in the food & drink industry or operated as a food & drink engineer at or above the level of the standard
- Have completed an induction covering the requirements of the standard and assessment practice and attend at least one standardisation meeting per year

It is anticipated that the same independent assessor will mark an apprentice's work-based project and technical interview to aide efficiency, however this is not a requirement and Universities may schedule independent assessors to ensure cost effective allocation of resources.

Independent assessors should be sourced from another University, industry or a professional body; or if none of the above options are available the independent assessor can be from the same University but must be independent of the apprentice's on-programme learning and assessment.

Independent assessors will be advised by two panel members, who will be present during the work-based project presentation and technical interview.

The panel members must be:

- A representative from the apprentice's employer; their role is to provide technical engineering input in relation to the apprentice's workplace and the apprentice's work; they may for example be the project sponsor, programme sponsor, the apprentice's line manager, site engineer, head of engineering or operations manager
- A University academic; their role is to provide specialist technical advice on the apprentice's project

Optional:

- An assessor from an engineering professional body; their role is to undertake assessment against Incorporated Engineer professional standard, if the apprentice wishes their EPA to serve the dual purpose of application for professional recognition

The panel members must not have any role in the decision making process. They must not provide information on behalf of the apprentice or influence in the apprentice in any way. Their role is purely is provide information to the independent assessor on request. Independent assessors will solely determine the grade for the work-based project and technical interview.

The independent assessor and panel will collectively provide an audience for the presentation, which is reflective of conditions an engineer would face when presenting a project in the workplace.

The employer representative and University academic are expected to provide their services free of charge. Any payment for professional body representation to assess the apprentice in relation to professional body registration lies outside the requirements of the apprenticeship.

End-point Assessment Methods & Timescales

The end-point assessment consists of 2 distinct assessment methods:

- **Work-based project**, consisting of a report and presentation with questioning
- **Technical interview**, underpinned by a portfolio

Each assessment method will be assessed against the standard's core KSBs and specialist option knowledge and skills as detailed in appendix A.

Each assessment method will be marked by an independent assessor who will determine the grade.

The EPA will be typically completed over a period of 10 months and a maximum of 12 months. The 12-month maximum period will start once the apprentice's project outline has been agreed with their employer and academic supervisor, in addition to the other gateway requirements as detailed above. The assessment methods can be completed in any order during the maximum EPA period. However, it is anticipated that the work-based project presentation component and technical interview will take place on the same day, to aide efficiency.

The presentation component and technical interview must take place in a controlled environment; a room free from distractions and influence, with sufficient space for all present. It is anticipated a room will be sourced at a University's or employer's premises to minimise cost.

Assessment method 1: Work-based Project (WP)

The work-based project consists of a report and a presentation with questioning on the work completed.

a) Report

Apprentices must produce a report of 8,000 words (+/- 10%), excluding references, appendices and diagrams, based on a work-based project, which relates to their option specialism. The report must include a one-page summary outlining recommendations (included in the word count).

The work-based project must be detailed in a project outline and agreed by the apprentice's academic supervisor and employer as a gateway requirement. Ideally, the project should aid the employer's business. Universities - in their role as EPAO must hold a bank of acceptable projects; however, apprentices must not be limited to these.

All work relating to the project and report write-up, must be completed during the EPA period; excluding preliminary research to inform the project outline.

The aim of the project must be to provide: significant engineering advantage, address an engineering issue, provide engineering benefit(s) or deliver step engineering change(s). The scope must include research, data analysis, stakeholder communications, findings and recommendations.

Example project titles include:

- Identifying patterns to solve recurring design problems in specific contexts in ontology based applications
- Evaluating alternate methods for standardising energy efficiency of distribution transformers, electrical or mechanical sources
- Determining critical design principles for developing successful mobile applications
- Identify areas using thermodynamic principles with the relationship between energy and entropy to maximise delivery of work
- A cost benefit and feasibility analysis of introducing new engineering technology to a food/drink manufacturing process
- An analysis of engineering improvements to existing machinery in the production of a food/drink product (e.g. waste/output improvements)
- Energy saving/efficiency improvement engineering analysis in the production of a food/drink product
- Engineering solutions to improve safety and/or quality in the production of a food/drink product
- Development of a new engineering solution/process technology based on best practice

- Design and development of flexible automation system incorporating hygienic design principles
- New data capture techniques to improve process control and agile manufacturing capability
- Design and implementation of material handling equipment
- Process and machine reliability assessment and improvement

Apprentices must submit their work-based project report by the end of month 9 of the EPA period, at the latest. It must be reviewed by the independent assessor before the presentation with questioning. The presentation with questioning should be scheduled to take place as soon as possible after a work-based project has been reviewed.

b) Presentation, with questioning

Apprentices must prepare and deliver a presentation, based on their work-based project. The presentation will be made to a panel – as detailed above. The independent assessor and panel members must assume the role of internal decision makers. The independent assessor and panel members must be present in person.

The presentation must cover: the project scope, outcomes/achievements, any difficulties faced/lessons learnt and recommendations.

The presentation must last 25 minutes (+/- 10%).

There are no restrictions on how apprentices deliver the presentation or support resources/materials used. However, any equipment requirements for example powerpoint, whiteboard, flip chart facilities must be agreed with the University - in their role of EPAO, at least two weeks in advance of the date of the presentation. It is anticipated that the presentation will typically consist of 5-6 PowerPoint slides, supported by a handout or A1 poster.

Following the presentation, the independent assessor will ask 5 questions based on the project report and presentation; the independent assessor may ask follow up open questions to probe further or seek clarification. Questions and responses must be recorded by the independent assessor.

Example questions may include:

- You have demonstrated your strategic project, in hindsight, what could you have done to further enhance the success of this project?
- Tell me about one of the most difficult (or one of the best) decisions you made during the project. What made it so difficult? What process did you use to make the decision?
- The scope of this role relies heavily on your ability to drive results. What do you believe to be the critical elements behind being a successful engineer?

- Give me an example of a time when you were able to break out of a structured mind-set and explore new or different concepts and ideas.

Universities - in their role as EPAO, must develop of bank of sample questions, although independent assessors will need to tailor the questions according to the evidence presented via the report and presentation.

The duration of the questions and answers must be 30 minutes +/-10%.

The work-based project (report and presentation with questioning) represents 85% of the EPA.

Assessment method 2: Technical interview

Apprentices must complete a technical interview with the panel. The independent assessor must ask 6 questions from a bank of set questions covering the themes of (one per theme):

- The food & drink engineering environment
- Maintenance operations in the food & drink environment
- Leadership in the food & drink environment
- Working with others
- Development of self and others
- Specialist option: Mechanical/Automation/Production engineering

Questions must be open, holistic and competency based in design. The independent assessor may ask follow up questions to probe further or seek clarification. Questions and responses must be recorded by the independent assessor.

Example questions include:

- Tell me about one of the most difficult (or one of the best) decisions you made in the last six months/last year. What made it so difficult? What process did you use to make the decision?
- Give me an example of how you acted with integrity (walked your talk) in your job/ work
- In anticipation of delivering a big challenge, we sometimes offer a little more than we can actually deliver or overstate the capabilities of a product/service. Describe a time when this happened to you. What happened?
- We all have had occasions in which we were working on something and overlooked a small detail. Describe a time that happened to you. What caused this to happen? What did you do to rectify the situation? What was the result?

Universities must develop of bank of questions that must be used by independent assessors.

Apprentices must bring their portfolio of evidence – see above, to the technical interview. The apprentice will be allowed draw on its contents when answering questions.

The technical interview will typically last 40 minutes +/10%.

This technical interview represents 15% of the EPA.

Apprenticeship Grading

Performance in the EPA will count towards the overall degree classification. Apprentices cannot successfully complete the degree apprenticeship without successfully passing the EPA.

Performance in the EPA will be separately graded and determine the apprenticeship grade of pass, merit, distinction or fail.

Independent assessors will be responsible for grading each assessment method, in accordance with the requirements detailed in this plan. The grading criteria for each EPA method is detailed in Appendix B.

Independent assessor decisions must be subject to moderation (External Examiner review). Grades must not be confirmed until after moderation.

The University – in its role as EPAO must combine the grades for both assessment methods to determine the apprenticeship grade.

Apprentices must pass both assessment methods to gain an EPA/apprenticeship pass, merit or distinction. The table below shows how the grades must be combined to determine the EPA/apprenticeship grade, taking account of the size of each assessment method.

A pass will demonstrate that the apprentice has met all the requirements of the standard. Apprentices achieving a merit or distinction will be demonstrating performance above the minimum requirements of the standard.

Work-based project grade	Technical Interview grade	EPA/apprenticeship grade
Fail	Fail	Fail
Fail	Pass	Fail
Pass	Fail	Fail
Pass	Pass	Pass
Pass	Merit	Pass
Pass	Distinction	Merit
Merit	Pass	Merit
Distinction	Pass	Merit
Merit	Merit	Merit
Distinction	Merit	Distinction
Merit	Distinction	Merit
Distinction	Distinction	Distinction

Work Based Project Grading

- to achieve a pass - pass, merit or distinction criteria must be demonstrated against all KSB statements
- to receive a merit - merit or distinction criteria must be demonstrated against all KSB statements; or, where one or more criteria is demonstrated at a pass, it must be offset by demonstrating distinction criteria against a corresponding number of KSBs in order that a merit can be achieved overall
- To receive a distinction - 75% or more of the KSBs must be demonstrated at distinction, with all other KSBs demonstrated at merit

Technical Interview Grading

- to achieve a pass - pass, merit or distinction criteria must be demonstrated against all KSB statements
- to receive a merit - merit or distinction criteria must be demonstrated against all KSB statements; or, where one or more criteria is demonstrated at a pass, it must be offset by demonstrating distinction criteria against a corresponding number of KSBs in order that a merit can be achieved overall
- To receive a distinction - 75% or more of the KSBs must be demonstrated at distinction, with all other KSBs demonstrated at merit

Re-sits/re-takes

Apprentices will be offered the opportunity to take a re-sit/re-take in line with a University's academic regulations. A re-sit does not require the apprentice to undertake any additional training/learning, whereas a re-take does.

The apprentice and their employer must agree that a re-sit/re-take is an appropriate course of action; they may wish to take advice from the apprentice's University. Both assessment methods must be passed in the same 12-month period, otherwise the EPA must be re-sat/re-taken in full.

Re-sits/re-takes will not be offered to apprentices wishing to move from pass to merit or distinction or merit to distinction.

Apprentices who re-sit/re-take will only be able to achieve a pass for that assessment method, unless the University confirms that there were exceptional circumstances beyond the control of the apprentice that resulted in the fail.

The University – in its role as EPAO must ensure that a different work-based project and technical interview are used in the case of a re-sit/re-take.

University/End-point Assessment Organisations Internal Quality Assurance

Internal quality assurance refers to the requirements that a University in their role as EPAO must have in place to ensure consistent, reliable, accurate and valid assessment decisions.

EPAOs for this standard must undertake the following:

- Appoint independent assessors and panel members that meet the requirements as detailed in this plan – see above
- Produce assessment tools and supporting materials for the EPA that follow best assessment practice, including a sample bank of projects, sample presentation question bank, technical interview question bank and assessment outcome recording documentation. Universities must develop of project and question banks of sufficient size to mitigate predictability and review them regularly to ensure they are fit for purpose. It is recommended that representative employers contribute to the development of project/question banks; where they do this they must put measures in place to ensure question security.
- Provide induction training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- Operate regular standardisation events that enable assessors to attend a minimum of one event per year
- Operate moderation (external examiner review) of assessment activity and decisions, through examination of documentation and/or observation of activity, with a minimum of 10% percent of each independent assessors' assessments moderated

External Quality Assurance

The Institute for Apprenticeships is exploring whether QAA can undertake external quality assurance for this standard, arrangements will be confirmed by August 2018.

Professional Body Recognition

Completion of the apprenticeship is designed to be recognised by the relevant professional institutions as contributing towards the appropriate level of professional registration (Incorporated Engineer). However, it is recognised that additional experiential evidence may be required.

Implementation

Affordability: It is anticipated that the EPA will represent approximately 12% of the funding band for this apprenticeship, based on the proportion of the degree that constitutes EPA and quotes provided.

Volumes: It is anticipated that there will be 100 starts per year on this apprenticeship.

Universities will need to develop integrated degree programmes that meet the requirements of this plan, including EPA tools, processes and procedures.

Appendix A – Knowledge, Skills and Behaviours to be assessed by assessment method

Key	
Work-based Project	**WP**
Interview	**I**

Knowledge

		WP	I
K1	How future product and process design and commissioning is impacted by legislative, regulatory and ethical requirements, including hygiene and food safety, employee health & safety law and environmental considerations	X	
K2	How to lead and nurture others to articulate reliability optimisation strategies, prevent failures through effective maintenance techniques and develop life cycle plans for key assets	X	X
K3	Systems approach adopted, both in equipment design and optimisation	X	
K4	Techniques and tools to research, analyse, interpret and evaluate information and concepts; how to utilise ideas from existing systems and new applications to improve or change processes	X	
K5	Principles and practices of hygienic design and cleaning systems appropriate to a food and drink environment		X
K6	The role and impact of food and drink engineering within the wider business context, needs of internal and external stakeholders and the wider legal, environmental, technical and economic environment	X	
K7	Financial aspects required to justify, develop and commission new process or equipment	X	
K8	Strategic leadership, project management techniques, theory and practice required to deliver change processes within a food and drink environment	X	
K9	Inter-relationships between food ingredients, product and packaging materials and their effects on food safety, quality and performance of food processing and packaging design and improvement		X

Skills:

S1	Demonstrate the ability to evaluate new techniques or technologies, and to recognise if these have value within their own food and drink environment	X	
S2	Apply appropriate theoretical and practical methods to design, develop and commission engineering solutions within a food and drink environment	X	
S3	Align engineering developments with wider business considerations including finance, commercial management, product innovation and sustainability	X	X

S4	Define, articulate and justify the business case for food & drink engineering investment	X	
S5	Implement preventative and condition based maintenance procedures using a range of reliability strategies across engineering, use technical risk assessments to improve reliability, maintainability and availability		X
S6	Use problem solving techniques and Continuous Improvement techniques to deliver change and improvement programmes in a food and drink process designed to advance business performance	X	
S7	Drive business environmental objectives through engineering solutions which advance and protect the business and industry reputation		X
S8	Effectively research a number of different approaches to identify the right solution	X	
S9	Network across factories and suppliers to identify best practice	X	
S10	Lead, motivate and influence people within a project management matrix; articulating organisational purpose and values to create an inclusive, high performance work culture	X	
S11	Exchange information and provide advice to technical and non-technical colleagues		X

Behaviours:

B1	Leadership in safe working: takes a disciplined and responsible approach to avoid risk through application of technical skills, exercises management and mitigation strategies	X	
B2	Ownership of work: takes responsibility for recommending the implementation of new practices, ensuring integrity of processes and raising site standards	X	
B3	Pride in work: embraces new ways of thinking and encourages others to do the same, displays a positive mind set demonstrated by willingness to learn, displays proactive approach and ability to act on their own initiative	X	
B4	Self-development: always gives their best, sets themselves challenging targets, confident decision maker, has ambition to continuously improve self		X
B5	Integrity and respect: leads by example, acts as a role model and motivates others through actions and behaviour, shows respect for others and provides time and support		X
B6	Leadership: committed to lead, manage and coach others effectively; works well with different functions and operations		X
B7	Problem solving: willingness to take on new problems; maintains quality of thinking and creativity under pressure	X	

B8	Responsiveness to change: flexible to changing working environment and demands; resilient under pressure	X	
B9	Company/industry perspective: demonstrates curiosity to foster new ways of thinking and working; seeks out opportunities to drive forward change and improvements for the business	X	

Mechanical option (knowledge and skills)

Knowledge			
MK1	The range of mechanical principles that underpin the design and operation of mechanical engineering systems	X	
MK2	Tribology and its application to food processing equipment		X
MK3	The use of computer modeling and simulation techniques to predict the behavior of engineering-based technologies		X
MK4	Computer aided design (Finite Element Analysis)		X
Skills			
MS1	Design mechanical systems, analyse the performance of components, mechanisms and systems	X	
MS2	Conduct failure risk investigations and apply Reliability engineering techniques to prevent or reduce the likelihood or frequency of failures		X

Automation option (knowledge and skills)

Knowledge			
AK1	The range of electrical and control engineering principles that underpins the design and operation of electrical engineering systems	X	
AK2	Automation techniques, robotics and materials handling		X
AK3	Manufacturing execution systems	X	
Skills			
AS1	Control the operation of measuring instruments that are used in design and configuration of automated systems	X	

AS2	Model a diverse range of dynamic systems and design controllers for these systems	X	
AS3	Conduct failure risk investigations and apply Reliability engineering techniques to prevent or reduce the likelihood or frequency of failures	X	

Production option (Knowledge and skills)

Knowledge			
PK1	Process capability and thermodynamic analysis	X	
PK2	Mass and heat balances, including material yield (lower order)	X	
PK3	System performance, for example line performance, production efficiency, V-curve and loss analysis	X	
PK4	Production engineering practices and the management challenges related to production	X	
Skills			
PS1	Design key elements of a production line		X
PS2	Apply continuous improvement, problem solving and trouble shooting skills to increase efficiency in food production	X	

Appendix B – Grading criteria by assessment method

The table below details the grading criteria for both assessment methods.

It is based on the following principles:

- pass criteria shows the apprentice is demonstrating competence against the KSB statement; merit and distinction criteria build on the pass criteria
- to achieve a pass for an individual assessment method - pass, merit or distinction criteria must be demonstrated against all KSB statements
- to receive a merit - merit or distinction criteria must be demonstrated against all KSB statements; or, where one or more criteria is demonstrated at a pass, it must be offset by demonstrating distinction criteria against a corresponding number of KSBs in order that a merit can be achieved overall
- To receive a distinction - 75% or more of the KSBs must be demonstrated at distinction, with all other KSBs demonstrated at merit

End-point assessment method and KSB reference as shown in annex A	Distinction	Merit	Pass	Fail
Work Based Project				
K1	A full understanding of food legislation and regulation with no errors, demonstrating knowledge of the systems that seek to ensure regulatory compliance and the implications of non-compliance.	Understanding of food legislation and regulation across a range of processes and sectors in the food industry. Demonstrates knowledge of the systems that seek to ensure regulatory compliance.	Understanding of food legislation and regulations within own organisation and processes in the food and drink industry.	Fails to provide examples which illustrate an understanding of food legislation and regulations within own organisation and processes in the food and drink industry.

K2	Leads the development of and articulates reliability optimisation strategies using Reliability Centred Maintenance to prevent failures through effective maintenance techniques and develops life cycle plans for key assets.	Develops and articulates reliability optimisation strategies to prevent failures through effective maintenance techniques.	Able to articulate basic reliability optimisation strategies to minimise failures using planned maintenance techniques.	Fails to demonstrate simple optimisation strategies and maintenance techniques.
K3	Utilises a whole systems approach to all equipment design and optimisation activities.	Adopts a systems approach, both in equipment design and optimisation.	Demonstrates a systems approach to equipment design or optimisation.	Fails to utilise a systems approach to either equipment design or optimisation.
K4	Utilises a wide range of techniques and tools to interpret information and analyses their benefits to improve or change processes.	Utilises a range of techniques and tools to analyse and interpret information and concepts to improve or change processes.	Utilises techniques and tools to analyse and interpret information and concepts to improve the processes.	Utilises no more than one technique to evaluate new concepts or changes.
K6	Provides examples which demonstrate the role of food and drink engineers within the wider business and which consider internal and external stakeholders	Provides an example of the role of food and drink engineers within the wider business and considers internal and external stakeholders together with the legal,	Provides an example illustrating understanding and consideration of the business, other stakeholders, legal	Provides no or poorly considered understanding and consideration of the business, other stakeholders, the legal

	together with legal, environmental, technical and economic environment.	environmental and the technical and economic environment.	issues and the environment.	issues and the environment.
K7	Includes appropriate financial and business benefits to justify, develop and commission new process or equipment, on time, under budget and exceeding predicted performance.	Includes appropriate financial considerations to justify, develop and commission new process or equipment, on time and within budget.	Includes financial considerations to justify, develop and commission new process or equipment within budget.	Includes inadequate financial considerations to justify new process or equipment.
K8	Strategic leadership, project management techniques, theory and practice utilised throughout the project to deliver change processes within a food and drink environment.	Utilises project management techniques, theory and practice to deliver change processes within a food and drink environment, completed early and on budget.	Uses project management techniques and practice to deliver change processes on time.	Project management techniques are inadequate and lead to delayed change processes within a food and drink environment.
S1	Demonstrates the evaluation of a wide range of new techniques or technologies and their value within their own food and drink environment and business.	Demonstrates the ability to evaluate new techniques or technologies, and provides partial justification of their value within their own food and drink environment.	Demonstrates the ability to evaluate a limited number of techniques and provides partial justification of their value within their own	Fails to evaluate new techniques or their value within their own project.

			food and drink environment.	
S2	Describes a full theoretical understanding of techniques to design, develop and commission engineering solutions within their business.	Applies appropriate theoretical and practical methods to design, develop and commission engineering solutions within a food and drink environment.	Applies limited and basic theoretical and practical methods to design, develop and commission engineering solutions within a food and drink environment.	Fails to utilise appropriate and correct theoretical methods to design, develop and commission engineering solutions.
S3	Provide examples and illustrations of engineering developments, which have been aligned with wider business considerations including finance, commercial management, product innovation and sustainability.	Provides an example and illustration of an engineering development, which has been aligned with wider business considerations including finance, product innovation and sustainability.	Provides an example and illustration of an engineering development, which has been aligned with wider business considerations and sustainability.	Unable to provide an example and of an engineering development, which has been aligned with wider business considerations or sustainability.
S4	Defines, articulates and justifies a viable business case for food & drink engineering investment with payback justification.	Articulates an effective business case for food & drink engineering investment.	Articulates a basic business case for food & drink engineering investment.	Articulates an inadequate, or fails to provide a business case for food & drink engineering investment.
S6	Describes effective structured problem	Describes a range of problem solving and	Describes limited structured problem	Fails to use structured problem solving

	solving and continuous improvement techniques in the delivery of change and improvement programmes which advance business performance.	continuous improvement techniques to deliver change and improvement programmes in a food and drink process.	solving and continuous improvement techniques to deliver change and improvement programmes in a food and drink process.	techniques to deliver change and improvement programmes.
S8	Illustrates research into a number of different and valid approaches and identifies the selection of the optimum solution.	Illustrates effective research of a range of different approaches and identifies the best solution.	Conducts research into a restricted number of approaches with limited justification for the selection of the identified solution.	Ineffective research of alternatives and fails to identify the ideal solution.
S9	Demonstrates, with examples, the networks developed across both factories and suppliers to identify best practice.	Demonstrates, with examples, the networks developed across either factories or suppliers to identify best practice.	Provides limited development of networks across either factories or suppliers to identify alternatives.	Fails to illustrate effective networks and poor understanding of best practice.
S10	Demonstrates the ability to lead, motivate and influence people within a project management matrix; articulating organisational purpose and values to create an inclusive, high performance work culture.	Demonstrates the ability to work with all staff within a project management matrix; understanding the organisational purpose and values to support a high performance work culture.	Demonstrates a limited ability to work with staff within a project management matrix; with basic understanding of the organisational purpose and values to support an effective work culture.	Fails to work with all staff within a project management matrix; inadequate skill to support an effective work culture.

B1	Provides leadership in safe working and takes a disciplined and responsible approach to avoid risk through application of technical skills, exercises management and mitigation strategies.	Adopts effective and safe working: takes a responsible approach to avoid risk through application of technical skills, recognises appropriate mitigation strategies.	Adopts effective and safe working: avoids risk through application of technical skills, utilises basic mitigation strategies.	Needs support to adopt effective and safe working, utilises minimal or requires advice on appropriate mitigation strategies.
B2	Demonstrates with examples, the ownership of their work: illustrates the taking of responsibility for recommending the implementation of new practices, ensuring integrity of processes and raising site standards.	Demonstrates with an example, the ownership of their work: illustrates the process of recommending the implementation of new practices, ensuring integrity of processes and raising standards.	Demonstrates with an example, the ownership of their work: illustrates the process of recommending the results, ensuring integrity of processes and standards.	Does not demonstrate the ownership of their work, nor illustrates the process of recommending the results, and unable to maintain the integrity of processes and standards.
B3	Through examples, demonstrates pride in work and high work standards. Examples show how they embrace new ways of thinking and encouragement of others to do the same. Examples illustrate a	Provides an example to demonstrate pride in their work and high work standards. Example shows how they embrace new ways of thinking and encouragement of others to do the same. Example illustrates a positive mind	Provides an example to demonstrate pride in their work and high work standards. Example shows how they embrace new ways of thinking. Example illustrates a positive	Does not provide an example to demonstrate pride in their work and high work standards. Example does not illustrates a positive mind set nor a willingness to learn.

	positive mind set with demonstrations of a willingness to learn, displays proactive approach and ability to act on their own initiative.	set and a willingness to learn, displays proactive approach.	mind set and a willingness to learn.	
B7	Using examples, able to illustrate problem solving capability: demonstrates a willingness to take on new problems; describes how quality of thinking and creativity was maintained under pressure.	Uses an example to illustrate their problem solving capability: demonstrates an approach to tackling new problems; describes how quality of thinking was maintained under pressure.	Uses an example to illustrate their problem solving capability: demonstrates an approach to tackling problems; describes the challenge of working under pressure.	Unable to provide any examples to illustrate their problem solving capability: Does not demonstrate ability to tackle problems;
B8	Demonstrates an active and responsiveness to change, leads and supports a changing working environment, works under pressure delivering error free output.	Demonstrates responsiveness to change, is flexible to a changing working environment and is resilient under pressure.	Slow to adopt change: demonstrates limited flexibility capability to changing working environment and periods of pressure.	Is resistant to change and needs support to work in demanding periods.

B9	Demonstrates a leadership role in fostering new ways of thinking and working; seeks out opportunities and works with colleagues to drive forward change and improvements for the business.	Demonstrates a curiosity to foster new ways of thinking and working; seeks out opportunities to drive forward change and improvements for the business.	Demonstrates a limited curiosity to foster new ways of working; When encouraged, seeks out opportunities to evaluate change for the business.	Does not demonstrate any curiosity to develop new ways of thinking and working; Does not seeks out opportunities to drive forward improvements for the business.

Mechanical Option	**Distinction**	**Merit**	**Pass**	**Fail**
MK1	Demonstrates the use and application of Level 6 BEng Mechanical Engineering principles, in the design and operation of mechanical engineering systems.	Utilises Level 5 of BEng Mechanical Engineering principles, to underpin the design and operation of mechanical engineering systems with the main project focus utilising Level 6 techniques.	Utilises Level 5 of BEng Mechanical Engineering principles to underpin the design and operation of mechanical engineering systems.	The range of mechanical engineering principles used in the design and operation of mechanical engineering systems do not exceed Level 4 standard.
MS1	Designs mechanical systems, analyses the performance of components, mechanisms and systems utilising CAD,	Designs mechanical systems, analyses the performance of components, mechanisms and systems utilising CAD and experimental evaluation.	Designs mechanical systems, and evaluates the performance using practical experiments.	Produces designs which do not meet the criteria set in the project specification.

	FEA techniques and experimental evaluation.			

Automation Option	Distinction	Merit	Pass	Fail
AK1	Demonstrates the use and application of Level 6 electrical and control engineering principles in the design and operation of electrical engineering systems.	Demonstrates the use and application of Level 5 electrical and control engineering principles in the design and operation of electrical engineering systems with the main project focus utilising Level 6 techniques.	Utilises Level 5 electrical and control engineering principles in the design and operation of electrical engineering systems.	The range of electrical and control engineering principles in the design and operation of electrical engineering systems do not exceed Level 4.
AK3	Demonstrates the application of Manufacturing Execution System techniques to manage all of the following elements: Equipment downtime (or OEE); Product Quality; Materials and product tracking; Order & production analysis; Waste; Inventory.	Demonstrates the application of Manufacturing Execution System techniques to manage at least 4 of the following elements: Equipment downtime (or OEE); Product Quality; Materials and product tracking; Order & production analysis; Waste; Inventory.	Demonstrates the application of Manufacturing Execution System techniques to manage at least 3 of the following elements: Equipment downtime (or OEE); Product Quality; Materials and product tracking; Order & production analysis; Waste; Inventory.	Demonstrates the application of Manufacturing Execution System techniques to manage 2 or less of the following elements: Equipment downtime (or OEE); Product Quality; Materials and product tracking; Order & production analysis; Waste; Inventory.

AS1	Integrates instrumentation into the design and configuration of automated systems and provides performance analysis of the instrumentation and its contribution to the automated system.	Integrates instrumentation into the design and configuration of automated systems and provides analysis of the performance of the automated system.	Defines the contribution of instrumentation in the performance of automated systems.	Fails to describe instrumentation equipment and their contribution to automated systems.
AS2	Design controllers for a food processing system utilising open loop, PID and linear control systems.	Design controllers for a food processing system utilising 2 of the following: open loop; PID; and linear control systems.	Design controllers for a food processing system utilising 1 of the following: open loop; PID; and linear control systems.	Fail to utilise any of the following to implement a control system for a food process: open loop; PID; and linear control systems.
AS3	Demonstrates the application of reliability engineering techniques to prevent or reduce the likelihood or frequency of failures using Reliability Centred Maintenance strategy and Failure Mode Effects and Criticality Analysis; takes a systematic approach to defining routine and predictive	Demonstrates the application of reliability engineering techniques to prevent or reduce the likelihood or frequency of failures using Reliability Centred Maintenance strategy and Failure Mode Effects and Criticality Analysis. Takes a systematic approach to defining routine and	Demonstrates the application of reliability engineering techniques to prevent or reduce the likelihood or frequency of failures using Reliability Centred Maintenance strategy and Failure Mode Effects and Criticality Analysis. Takes a systematic approach to defining either routine	Fails to demonstrate the application of reliability engineering techniques to prevent or reduce the likelihood or frequency of failures using Reliability Centred Maintenance strategy and Failure Mode Effects and Criticality Analysis.

	maintenance techniques; identifies resulting performance improvement.	predictive maintenance techniques.	or predictive maintenance techniques.	

Production Option	Distinction	Merit	Pass	Fail
PK1	Process capability and thermodynamic analysis applied to the target system providing a stable process with known process capability based on statistical analysis.	Process capability and thermodynamic analysis applied to the target system providing a stable process with known variability based on control charts and statistical analysis.	Process capability and thermodynamic analysis applied to the target system providing a stable process with known variability.	Fails to apply either process capability or thermodynamic analysis to the process under investigation.
PK2	Demonstrates mass and heat balances principles to the manufacturing system with greater than 85% materials yield	Application of mass and heat balances principles to the manufacturing system with greater than 75% materials yield	Application of mass and heat balances principles to the manufacturing system with less than 65% materials yield	Inaccurate demonstration of mass and heat balance principles to the manufacturing system with less than 50% materials yield
PK3	Investigates and evaluates production system performance by assessing line performance, production efficiency, V-curve and loss analysis.	Investigates and evaluates production system performance by assessing 3 of the following: line performance; production	Investigates and evaluates production system performance by assessing 2 of the following: line performance; production efficiency;	Investigates and evaluates production system performance by assessing 1 or less of the following: line performance; production efficiency;

		efficiency; V-curve and loss analysis.	V-curve and loss analysis.	V-curve and loss analysis.
PK4	Demonstrates the application of production engineering and production management principles to the manufacturing system incorporating materials management, production planning and manufacturing management.	Demonstrates the application of production engineering and production management principles to the manufacturing system incorporating two of the following: materials management; production planning; and manufacturing management.	Demonstrates the application of production engineering and production management principles to the manufacturing system incorporating at least one of the following: materials management; production planning; and manufacturing management.	Fails to demonstrate the application of production engineering and production management principles to the manufacturing system.
PS2	Applies continuous improvement, problem solving and troubleshooting techniques to increase efficiency in food production by 40%.	Applies continuous improvement, problem solving and troubleshooting techniques to increase efficiency in food production by 25%.	Applies continuous improvement, problem solving and troubleshooting techniques to increase efficiency in food production by 10%.	Fails to make a positive improvement in efficiency in food production by the application of continuous improvement, problem solving and troubleshooting techniques.

End-point assessment method and KSB reference as shown in annex A	Distinction	Merit	Pass	Fail
Technical Interview				
K2	Able to describe the principles and practical techniques utilised to lead and nurture others to articulate reliability optimisation strategies, prevent failures through effective maintenance techniques and develop life cycle plans for key assets.	Describes a range of principles and practical techniques utilised to lead and nurture others to articulate reliability optimisation strategies, prevent failures through effective maintenance techniques for key assets.	Describes a range of principles and practical techniques utilised to articulate reliability optimisation strategies and reduce failures through effective maintenance techniques for key assets.	Fails to describe principles and practical techniques for reliability optimisation strategies and reduce failures through maintenance techniques for key assets.
K5	Able to describe the evaluation of a wide range of hygienic design principles and cleaning systems practices to design and implement high performance systems and equipment.	Describes a range of hygienic design and cleaning systems, principles and practices to design and implement new systems and equipment.	Illustrates a basic set of hygienic design and cleaning systems, principles and practices to design and implement new systems and equipment.	Fails to describe effective hygienic design and cleaning systems in the design of new systems and equipment.

K9	Able to describe a full consideration made to the relationship between ingredients, product and packaging materials and their effects on food safety, quality and performance at every stage of the project.	Describes the inter-relationships between food ingredients, product and packaging materials and their effects on food safety, quality and performance of food process improvement.	Illustrates a basic understanding of the relationships between food ingredients and product and their effects on food safety, quality and performance of food processing.	Demonstrates an inadequate understanding of the inter-relationship of food ingredients, product and their effects on food safety.
S3	Able to describe engineering developments and their contribution to the wider business considerations including finance, commercial management, product innovation and sustainability.	Describes engineering developments and their contribution to the wider business considerations including 3 of the following: finance; commercial management; product innovation; and sustainability.	Describes engineering developments and their contribution to the wider business considerations including 2 of the following: finance; commercial management; product innovation; and sustainability.	Unable to describe engineering developments and their contribution to the wider business considerations.
S5	Able to describe the implementation of preventative and condition based maintenance procedures	Describes the implementation of preventative and condition based maintenance procedures	Describes the implementation of preventative maintenance procedures using a	Unable to describe the implementation of preventative maintenance procedures using a

	using a range of reliability strategies across engineering, use technical risk assessments to improve reliability, maintainability and availability.	using a range of reliability strategies across engineering, use technical risk assessments to improve reliability and maintainability.	range of engineering reliability strategies, use technical risk assessments to improve reliability.	range of engineering reliability strategies, use technical risk assessments to improve reliability.
S7	Describes the ability to drive business environmental objectives through engineering solutions, which advance and protect the business and industry reputation.	Describes business environmental objectives through engineering solutions which enhance the business and industry reputation.	Describes business environmental objectives through solutions, which enhance the business.	Unable to describe environmental objectives which enhance the business.
S11	Able to describe with examples the successful exchange of information with staff across the organisation and the ability to provide advice to technical and non-technical colleagues.	Able to describe with an example the successful exchange of information with staff in other parts of the organisation and the ability to provide advice to technical and non-technical colleagues.	Able to describe with an example the successful exchange of information with technical staff in other parts of the organisation.	Unable to describe with any examples, the successful exchange of information with technical staff in other parts of the organisation.

	Identifies the challenges in effective communication.			
B4	Describes with examples, their own self-development: to always give their best, sets themselves challenging targets, confident decision maker, has ambition to continuously improve self.	Describes with examples, their own self-development: to always give their best, sets themselves challenging targets, confident decision maker.	Describes, their own self-development: to always give their best, sets themselves new targets and able to make decision.	Unable to describe their own self-development: does not demonstrate giving their best, nor setting themselves new targets.
B5	Using examples, able to describe their professional integrity and respect for colleagues: description illustrates ability to lead by example; acts as a role model; and motivate others through actions and behaviour; shows respect for others; and provides	Uses an example, to describe their professional integrity and respect for colleagues: description illustrates three of the following attributes: ability to lead by example; acts as a role model; and motivate others through actions and behaviour; shows respect for others; and	Uses an example, to describe their professional integrity and respect for colleagues: description illustrates two of the following attributes: ability to lead by example; acts as a role model; and motivate others through actions and behaviour; shows	Unable to give an example of their professional integrity and respect for colleagues: description does not illustrates any of the following attributes: ability to lead by example; acts as a role model; and motivate others through actions

	time and support for team members.	provides time and support for team members.	respect for others; and provides time and support for team members.	and behaviour; shows respect for others; and provides time and support for team members.
B6	Using examples, able to describe their leadership qualities: commitment to lead, manage and coach others effectively; illustrates their ability to work well with different business functions and operational staff.	Gives an example of their ability to be a leader with commitment to lead, manage and/or coach others effectively; illustrates their ability to work well with different business functions and/or operational staff.	Gives an example of their ability to be a leader with commitment to manage others effectively; illustrates their ability to work well with different business functions.	Unable to give an example of their leadership qualities. Illustrates limited ability to work well with different business functions.

Mechanical Option	**Distinction**	**Merit**	**Pass**	**Fail**
MK2	Able to describe tribology and its application to food processing equipment. Identifies with examples the principles of friction,	Describes tribology and its application to food processing equipment. Identifies with examples two of the core principles: friction;	Describes tribology and its application to food processing equipment. Identifies with examples one of the core principles: friction;	Unable to describe tribology and its application to food processing equipment. Unable to give examples for any of

	lubrication and wear and their contribution to efficient and reliable equipment.	lubrication; and wear, and their contribution to reliable equipment.	lubrication; and wear, and its contribution to reliable equipment.	the core principles: friction; lubrication; and wear, and their contribution to reliable equipment.
MK3	Describes the use of computer modeling and simulation techniques to predict the behaviour of food engineering-based technologies. Gives an example of a modelling activity and describes the attributes of the modelling software and the improvements gained through the modelling and simulation process.	Describes the use of computer modeling and simulation techniques to predict the behaviour of engineering-based technologies. Describes the improvements gained through the modelling and simulation process.	Describes the use of computer modeling and simulation techniques to predict the behaviour of engineering-based technologies.	Unable to describe the use of computer modeling and simulation techniques to predict the behaviour of engineering-based technologies.
MK4	Able to describe an example of a food process or item of equipment which has been designed and	Describes an example of a food process or item of equipment which has been designed and analysed using Computer	Describes an example of a food process or item of equipment which has been designed and analysed	Unable to describe an example of a food process or item of equipment which has been designed and

	analysed using Computer aided design and Finite Element Analysis. Results of the analysis explained and improvements identified.	aided design and Finite Element Analysis. Results of the analysis explained.	using Computer aided design and Finite Element Analysis.	analysed using Computer aided design and Finite Element Analysis.
MS2	Able to give examples of failure risk investigations conducted and applications of reliability engineering techniques. Examples demonstrate prevention or reduction in the likelihood or frequency of failures.	Describes an example of failure risk investigation conducted and an application of reliability engineering techniques. Example should demonstrate a reduction in the likelihood or frequency of failures.	Describes an example of failure risk investigation conducted and an application of reliability engineering techniques.	Unable to describe an example of failure risk investigation conducted nor an application of reliability engineering techniques.

Automation Option	**Distinction**	**Merit**	**Pass**	**Fail**
AK2	Able to describe with specific examples, automation techniques, robotics and materials	Describes with an example, automation techniques, robotics and materials handling in	Describes, automation techniques, robotics and materials handling in food manufacture.	Unable to describe, automation techniques, robotics or materials handling

	handling in food manufacture. Describes the planning, technical specification, implementation and benefits accrued by the system.	food manufacture. Describes the planning, technical specification, and implementation of the system.	Describes the implementation of the system.	in food manufacture. Unable to describe the implementation of a sample system.

Production Option	**Distinction**	**Merit**	**Pass**	**Fail**
PS1	Able to describe the design of the principle element of the target production line, the design process, evaluation, justification and selection of the adopted design and its key attributes.	Describes the design of the main element of the target production line, the design process, evaluation, and selection of the adopted design and two of its attributes.	Describes the design of one element of the target production line, the design process, evaluation, and selection of the adopted design.	Unable to describe the design of one element of the target production line, the design process, and selection of the adopted design.