**Institute for Apprenticeships
& Technical Education**

End-point assessment plan for Through Life Engineering Services Specialist Integrated Degree

Apprenticeship standard reference number	Apprenticeship standard level	Integrated end-point assessment
ST0740	7	Yes

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the Through Life Services Specialist (TES-S) Integrated Degree apprenticeship standard. It is for Universities in their role as end-point assessment organisations (EPAOs) who need to know how EPA for this apprenticeship must operate. It will also be of interest to TES-S apprentices, their employers and training providers.

Full time apprentices will typically spend 24-months on-programme (before the gateway) working towards the occupational standard, with a minimum of 20% off-the-job training. All apprentices must require and undertake a minimum of 12-months on-programme training.

In an integrated degree apprenticeship, the degree incorporates on-programme academic and workplace learning and assessment with an independent EPA to test the occupational standard's knowledge, skills and behaviours (KSBs). The degree is a Master of Science (MSc) in Through Life Engineering; the level of credits may vary across universities from 180 to 200 credits with the EPA assessed elements contributing between 35-40% of the total.

The EPA must only start, and the EPA be arranged, once the pre-requisite gateway requirements for EPA have been met and they can be evidenced to an EPAO. The apprentice's employer must be satisfied that the apprentice is consistently working at or above the level set out in the occupational standard. Apprentices must have completed and passed all credit carrying modules of the MSc in Through life Engineering – other than the final module (which will form the EPA assessment), had a project outline agreed by their EPAO and compiled a portfolio of evidence. For level 3 apprenticeships and above, apprentices without English and mathematics at level 2 must achieve level 2 prior to taking their EPA[1].

The EPA will typically be completed within a six-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 apprenticeship standard and be on the ESFA Register of the End-Point Assessment Organisations (RoEPAOs).

The EPA consists of three discrete assessment methods as outlined in the Figure 1 and Table 1.

Assessment method 1: project report

This assessment method will assess the apprentice's ability to generate a viable service improvement proposal, which focuses on technical elements that can yield efficiency improvements on an existing project. As an example, this may enable to optimise a product for service. It will assess the apprentice's depth of understanding and capability in developing an improvement to one or more elements of an existing service offering. It will assess the apprentice's ability to work at a detailed or task level.

Assessment method 2: proposal executive summary, presentation and questioning

This assessment method will assess the apprentice's ability to produce a proposal of a new or revised service offering. This assessment will focus on new business model creation, which may offer new customers or business opportunities. The assessment will have a strategic focus on brand new service initiatives rather than making improvements on existing service projects (as in assessment method 1). It will assess the apprentice's breadth of understanding and capability, and their ability to integrate the full spectrum of business, engineering and operational considerations into a viable proposal. It

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

will assess the apprentice's ability to work at a holistic or strategic level. The service for assessment method 2 must be different to that used in assessment method 1.

Assessment method 3: discussion underpinned by a portfolio of evidence

This assessment method will assess the apprentice's ability to apply knowledge, skills and behaviours within the workplace, which may not occur naturally in a project.

The individual assessment methods will have the following grades:

Assessment method 1: Project report

- fail
- pass
- distinction

Assessment method 2: Proposal executive summary, presentation and questioning

- fail
- pass
- distinction

Assessment method 3: Discussion underpinned by portfolio of evidence

- fail
- pass
- distinction

Performance in the EPA will determine the apprenticeship standard grade of:

- fail
- pass
- distinction

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

A typical overview of the apprenticeship standard elements and timeline (typically 24 months), is shown in Figure 1.

The timeline may vary between apprenticeship providers, or for individual apprentices. Typically, the on-programme learning element of the apprenticeship will comprise of several learning modules (with individual assessed assignments) and a group project.
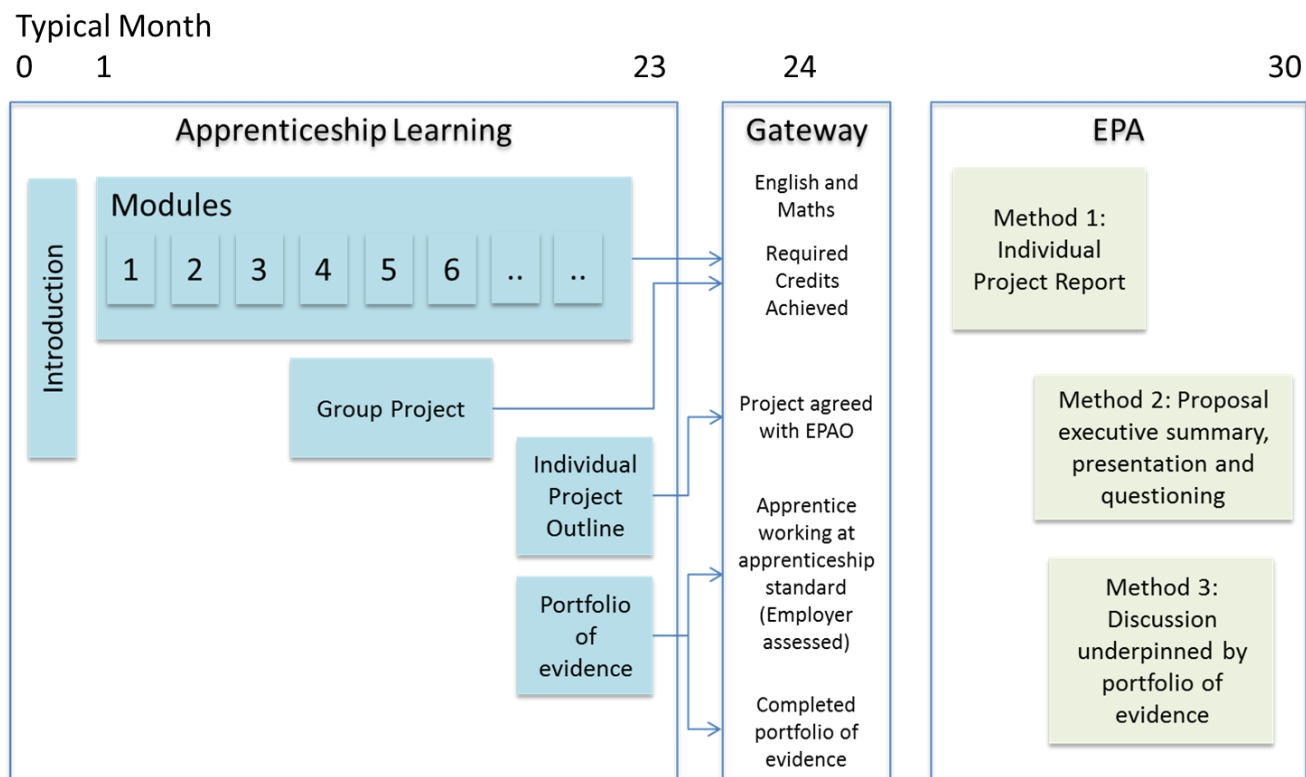
Typical Month

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0    1                              23      24                      30
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Apprenticeship Learning | Gateway | EPA

Introduction

Modules

| 1 | 2 | 3 | 4 | 5 | 6 | .. | .. |

Group Project

Individual Project Outline

Portfolio of evidence

Gateway

English and Maths

Required Credits Achieved

Project agreed with EPAO

Apprentice working at apprenticeship standard (Employer assessed)

Completed portfolio of evidence

EPA

Method 1: Individual Project Report

Method 2: Proposal executive summary, presentation and questioning

Method 3: Discussion underpinned by portfolio of evidence

Figure 1. Typical TES-S apprenticeship standard overview

EPA summary table

On-programme (typically 24-months)	Training to develop the occupation standard's knowledge, skills and behaviours.
	Working towards on-programme credits of MSc in Through Life Engineering.
	Working towards English and mathematics level 2, if required.
	Compilation of a portfolio of evidence.
End-point assessment gateway	Employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard.
	Apprentices must have completed and passed all credit carrying modules and Group Project of MSc in Through Life Engineering - other than the final module (which will form the EPA assessment).
	Achieved English and mathematics level 2, as a minimum.
	Had a project subject, title and scope agreed by their EPAO.
	Compiled a portfolio of evidence.
End-point assessment (which will typically take six-months)	Assessment method 1: project report, with the following grades: • fail • pass • distinction Assessment method 2: proposal executive summary, presentation and questioning, with the following grades: • fail • pass • distinction Assessment method 3: discussion underpinned by portfolio of evidence, with the following grades: • fail • pass • distinction EPA graded: • fail • pass • distinction
Professional recognition	Aligns with Charted Engineer (CEng) recognition by: • The Institution of Mechanical Engineers • The Institution of Engineering and Technology

Table 1. EPA Summary

Length of end-point assessment period

The EPA will typically be completed within an EPA period lasting 6 months, after the apprentice has passed the gateway.

Order of assessment methods

The assessment methods can be delivered in any order. However, it is anticipated that state assessment method 2: component 2 and assessment method 3 should take place, where possible on the same day to aide efficiency, after assessment method 1. The result of one assessment method does not need to be known before taking another.

Gateway

The EPA period should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, that is to say they are deemed to have achieved occupational competence. In making this decision, the employer may take advice from the apprentice's training provider(s), but the decision must ultimately be made solely by the employer.

In addition, the apprentice must have completed the following gateway requirements prior to beginning EPA:

- completed and passed all MSc in Through-life Engineering credit carrying modules and Group Project - other than those elements which will form part of the EPA assessment
- achieved English and mathematics level 2, as a minimum. For those with an education, health and care plan or a legacy statement the apprenticeships English and mathematics minimum requirement is Entry Level 3 and British Sign Language qualification are an alternative to English qualifications for whom this is their primary language.
- completed the requirements below related to the assessment methods

Project report requirements (assessment method 1)

An apprentice must have their project subject, title and scope agreed by their EPAO.

The aim of the project must be to provide a significant improvement in a through-life engineering service. It may include improvement at one or more stages of the service life-cycle, for example service design, implementation, operation or retirement.

The project scope must present the approach for the research, data analysis and stakeholder communications, key performance indicators and how it will cover the full lifecycle at a high level.

Proposal executive summary, presentation and questioning requirements (assessment method 2)

No specific requirements

Discussion underpinned by portfolio of evidence requirements (assessment method 3)

Compiled a portfolio of evidence.

Portfolio of evidence requirements:

- it must be submitted to the apprentice's EPAO at the gateway
- it may be electronic or paper-based
- it must include evidence relating to the knowledge, skills and behaviours (KSBs) assessed by the discussion underpinned by portfolio of evidence
- it must include a mapping of the evidence to the KSBs); evidence can be mapped against more than one KSB
- it will typically contain five-six pieces of evidence
- it can include evidence sources such as work product artefacts, for example risk assessments, reports, meeting records, plans and costings. Any contributions from others, for example witness statements and reviews, should

focus on direct observation of evidence of competence rather than opinion. Records of learning activities targeting their own performance, can support demonstration of behaviour B4. This list is not definitive and other evidence sources are allowable.

- it must include a statement from the apprentice's employer confirming that the work is attributable to the apprentice.

Assessment methods

Assessment method 1: Project report

Overview

This assessment method has one component – project report. It will assess the apprentice's ability to work at a task level of detail within one to three elements of a total service offering.

The KSBs assessed by this assessment method are shown in the KSB mapping.

The project should be designed to ensure that the apprentice's work meets the needs of the business and is relevant to their role.

The aim of the project must be to propose and plan a significant service element improvement, offering engineering advantage, engineering benefits, or deliver step engineering change(s). The report must include research, data analysis, stakeholder communications, findings, and recommendations. The report must illustrate how the apprentice has selected, designed, planned and evaluated the service improvement proposal.

The improvement may be an incremental or major change to an existing service. In the event that the apprentice's organisation does not offer a service suitable for use as a baseline for improvement, the apprentice shall define an assumed baseline service to be used as the basis for the proposed improvement. The assumed baseline may be based upon a service offered by another company with the assumption that the apprentice will have access to the data and stakeholders in these situations to the same extent as if it were their own organisation.

The project's subject, title and scope must be agreed by the EPAO as a gateway requirement.

The rationale for this assessment method is: this is a typical activity completed by TES-Specialists and should have business benefit. The written based nature of the assessment method complements the other assessment methods which are presentation and discussion based.

Delivery

Apprentices will conduct a project and produce a report.

The project and report must be completed after the apprentice has gone through the gateway (this excludes any preliminary research to support the gateway requirement for an EPAO agreed project subject, title and scope).

The project and report write up should take approximately four months to complete. The apprentice must conduct their project and submit their report to their EPAO by week 20 of their EPA period.

The employer must ensure the apprentice, over a four-month duration, has reasonable and sufficient time and ensure the necessary resources (including access to information) are provided, within this period, to plan and undertake the project and write up.

Whilst completing the project, the apprentice should be subject to their normal workplace supervision arrangements.

As a minimum all project reports must include:
- an introduction
- an overview of the scope of the project (including key performance indicators and covers the full lifecycle at a high level)

- how the outcomes were achieved including stakeholder engagement
- a project plan
- research and findings
- project target outcomes
- recommendations and conclusions

The project report must have a word limit of 8,000. The report must include a one-page summary outlining recommendations (included in the word count). A tolerance of plus or minus 10% is allowed. Appendices, references, diagrams etc. will not be included in this total.

The project report must be submitted in paper form or electronically as directed by the EPAO.

The project report must map, in an appendix, how it evidences the relevant KSBs for this assessment method. Although the report can focus on improvement at one or more stages of the service life-cycle for an existing project, it must address at a high level the full lifecycle of a service improvement opportunity, such as:
- stakeholders & business context
- value propositions
- requirements
- design
- implementation
- operation
- retirement

The report should include evidence of communication of the proposal to relevant stakeholders within the apprentice's employer organisation, including their feedback on the value, validity, practicality and, where possible, realised outcomes of the project.

As a minimum the report will cover detailed working on:
- the opportunity description and value assessment
- improvement design (concept and detail)
- implementation planning

Actual implementation of the improvement is not a requirement; however, discussion of the implementation, operation and retirement phases of the improvement lifecycle are required within the report.

The improvement must address one or more significant challenges in TES. These challenges may be found in the TES framework model published in BSI PAS 280[2].

When the project report is submitted, the employer and the apprentice should verify the submitted work is that of the apprentice.

Marking

An independent assessor must review and assess the project in a timely manner, as determined by the EPAO.

Typically, the project report will be submitted by week 20 of the EPA period and the review and marking will be completed by week 24 of the EPA period. Similarly, all quality control processes must also be conducted in a timely manner, as determined by the EPAO.

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[2] PAS 280:2018 BSI, PAS 280. Through-life engineering services: Adding business value through a common framework. Guide Status: Current   Published: July 2018

Supporting material

EPAOs will produce the following material to support this assessment method:
- outline of the assessment method's requirements
- marking materials
- examples of project titles, including: 'Enhanced gas turbine life cycle management, optimising the efficiency in spares consumption.'

Assessment method 2 – Proposal executive summary report, presentation and questioning

Overview

This assessment method has two components: component 1. proposal executive summary report; component 2. presentation and questioning.

The evidence from the two components will holistically assess the KSBs assigned to this assessment method, as shown in the KSB mapping.

Apprentices will prepare and deliver a proposal executive summary report and presentation based on a strategic evaluation and proposal of a potential new or revised service offering. The presentation will be followed by questioning to check understanding and further assess against the KSBs.

The rationale for this assessment method is this is a typical activity completed by TES-Specialists and should have business benefit. The presentation-based nature of the assessment method complements the other assessment methods which are written, and discussion based.

Delivery

Apprentices must submit their proposal executive summary to their independent assessor at least one-week prior to the presentation date.

The proposal executive summary must be a pre-reading board paper, of no more than two-pages of A4. The two-pager should be well structured to enable a board level participant to get a quick overview of the topic and purpose of the presentation. An example structure may be: title, background, questions to be answered, conclusions and decisions/direction required. There should be sufficient visual presentation to enable enhanced understanding of complex concepts.

The independent assessor is expected to review the documents and prepare questions pertinent to it. The proposal executive summary must cover the scope, methodology, and key results allowing the presentation audience to understand the context and outline of the material to be presented in advance of the presentation. Appendices can be provided for further evidence and must include a mapping of the evidence against the KSBs.

Apprentices will present to an independent assessor and representative from their employer face-to-face; this provides an audience for the presentation, which is reflective of conditions an engineer would face when presenting a project in the workplace. The employer representative's role is to provide technical engineering information, at the independent assessor's request, in relation to the apprentice's workplace and the apprentice's work, such as confirming company policies, procedures, processes, providing context on technical information or on emerging technologies. The employer representative must not have any role in the decision-making process. They must not provide information on behalf of the apprentice or influence 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 proposal executive summary report, presentation and questioning. The employer representative is expected to provide their services free of charge.

The presentation will last for 30 minutes. The independent assessor has the discretion to increase the time of the presentation by up to 10% to allow the apprentice to complete a point.

The presentation must be prepared as if they were being delivered to the apprentice's employer's board of directors (or similar). They should be succinct, addressing the main points of the proposal rather than the fine detail.

There are no restrictions on how apprentices deliver the presentation or support resources/materials used. It is anticipated that the presentation will typically consist of five-to-ten PowerPoint slides.

To deliver the presentation, the apprentice can have access to:

- PowerPoint
- flip chart
- work products
- notes
- computer
- executive summary report

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.

The presentation must cover:
- the current situation (current offering or competitive landscape)
- the value proposition for a new or enhanced service (from the perspective of both customer and supplier)
- the proposed service
- the risks associated with the new service
- a practical implementation proposal

The independent assessor will ask a minimum of five questions at the end of the presentation; follow up open questions may be asked to probe further or seek clarification. Independent assessors will devise questions based on the evidence presented. Questioning must last for 30 minutes. The independent assessor has the discretion to increase the time of the questioning by up to 10% to allow the apprentice to complete an answer. Questions and responses must be recorded by the independent assessor.

Venue

EPAOs must ensure that the presentation and questioning components are conducted in a suitable controlled environment in any of the following:

- employer's premises
- other suitable venue selected by the EPAO (for example, a training provider)

The venue should be a quiet room, free from distraction and external influence.

Supporting material

EPAOs will produce the following material to support this assessment method:

- outline of the assessment method's requirements
- marking materials

Assessment method 3 - Discussion underpinned by portfolio

Overview

This assessment method has one component – discussion.

The discussion is underpinned by a portfolio of evidence. The portfolio of evidence will be used by the independent assessor to tailor questions and apprentices must refer to their evidence when answering questions. The evidence itself is not directly assessed.

The knowledge, skills and behaviours assessed by this assessment method are shown in the KSB mapping.

The rationale for this assessment method is it allows for knowledge and behaviours that may not naturally occur as part of other assessment methods to be assessed. It makes use of naturally occurring evidence and complements the other assessment methods that are written, and presentation based.

Delivery

An independent assessor will conduct and assess the discussion underpinned by a portfolio of evidence.

The discussion must be appropriately structured to draw out the best of the apprentice's competence. It will involve questions that will focus on coverage of prior learning or activity, as documented in the portfolio of evidence.

The discussion must last 45 minutes. The independent assessor has the discretion to increase the time of the discussion by up to 10% to allow the apprentice to complete a point.

The independent assessor must ask a minimum of eight open questions covering the themes below; minimum one question per theme):

- Through life Engineering Service (TES) framework (K1)
- Recommendation and Decision making (S5)
- Technical and commercial communication (S6)
- Entrepreneurial mind-set (B1)
- Value focused (B2)
- Pragmatic (B3)
- Ethical (B4)
- Integrator (B6)

Independent assessors may ask follow up open questions to probe further or seek clarification and to assess the KSBs aligned to this assessment method.

Independent assessors must use questions from the EPAO's question bank. They may tailor the questions based on the evidence presented. Questions must be open, holistic and competency-based in design.

The portfolio of evidence must be present during the discussion. The apprentice can refer to and draw on its contents when answering questions.

Independent assessors must use the assessment tools and procedures that are set by the EPAO to record the discussion.

EPAOs must ensure that apprentices have a different set of questions in the case of re-sits/re-takes.

Independent assessors must be developed and trained by the EPAO in the conduct of discussions and reaching consistent judgement.

The independent assessor will make all grading decisions.

Venue

EPAOs must ensure that the discussion underpinned by portfolio of evidence is conducted in a suitable controlled environment in any of the following:

- employer's premises
- other suitable venue selected by the EPAO (for example, a training provider)

The venue should be a quiet room, free from distraction and external influence.

Supporting material

EPAOs will produce the following material to support this assessment method:

- outline of the assessment method's requirements
- marking materials
- a question bank must be developed by EPAOs. The 'question bank' must be of sufficient size to prevent predictability and the EPAO must review it regularly (and at least once a year) to ensure that it, and its content, are fit for purpose. The questions relating to the underpinning knowledge and behaviours, must be varied yet allow assessment of the relevant knowledge, skills and behaviours.

Weighting of assessment methods

All assessment methods are weighted equally in their contribution to the overall EPA grade.

Overall grading

Details on how each assessment method will be graded is provided in Appendix B.

All assessment methods must be passed for the EPA to be passed overall.

Apprenticeship must gain a distinction in all three-assessment methods to gain a distinction overall.

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

Grades from individual assessment methods should be combined in the following way to determine the grade of the EPA as a whole:

Assessment method 1 - Project report	Assessment method 2 – Proposal executive summary, presentation and questioning	Assessment method 3 - Discussion underpinned by portfolio	Overall grading
Fail	Any grade	Any grade	**Fail**
Any grade	Fail	Any grade	**Fail**
Any grade	Any grade	Fail	**Fail**
Pass	Pass	Pass	**Pass**
Distinction	Pass	Pass	**Pass**
Pass	Distinction	Pass	**Pass**
Pass	Pass	Distinction	**Pass**
Distinction	Distinction	Pass	**Pass**
Distinction	Pass	Distinction	**Pass**
Pass	Distinction	Distinction	**Pass**
Distinction	Distinction	Distinction	**Distinction**

Table 2. Grading Summary

Re-sits and re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a re-sit or a re-take. A re-sit does not require further learning, whereas a re-take does.

Re-sits will typically be completed within 6 months of a fail notification, re-takes will typically be completed within 12 months of a fail notification.

Apprentices should have a supportive action plan to prepare for the re-sit or a re-take. The apprentice's employer will need to agree that either a re-sit or re-take is an appropriate course of action.

An apprentice who fails an assessment method, and therefore the EPA in the first instance, will be required to re-sit the failed assessment methods only.

Re-sits and re-takes are not offered to apprentices wishing to move from pass to distinction.

Where any assessment method has to be re-sat or re-taken, the apprentice will be awarded a maximum EPA grade of pass, unless the EPAO determines there are exceptional circumstances requiring a re-sit or re-take.

The University – in its role as EPAO – must ensure that different questions are used in the case of a re-sit/re-take of any assessment method.

Roles and responsibilities

Role	Responsibility
Apprentice	• complete the on-programme element of the apprenticeship • prepare for and complete the EPA
Employer	• identify when the apprentice is ready to pass the gateway and undertake EPA • notify the EPAO that the apprentice has passed the gateway • provide an appropriate representative to attend the presentation component
Employer representative	• attend the presentation • provide technical engineering information, at the independent assessor's request, in relation to the apprentice's workplace and the apprentice's work • must not provide information on behalf of the apprentice or influence the apprentice in any way • plays no part in the assessment decision
University in their role as EPAO	As a minimum, EPAOs should: • appoint independent assessors to conduct and assess the assessment methods. It is anticipated that the same independent assessor will assess assessment methods 1, 2 and 3, however this is not a requirement and EPAOs may schedule different independent assessors to ensure cost effective allocation of resources. • coordinate different independent assessors and where ever possible enable assessment method 2 and 3 to take place on the same day and at the same location. • provide training and CPD to the independent assessors they employ • have processes in place to conduct internal quality assurance and do this on a regular basis • organise standardisation events and activities in accordance with this plan • organise and conduct moderation of independent assessors' marking in accordance with this plan • have, and operate, an appeals process
Independent assessor	As a minimum an independent assessor should: • be independent of the apprentice, their employer and on-programme delivery i.e. there must be no conflict of interest. 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. • hold or be working towards an independent assessor qualification for example TAQA (Training Assessment and Quality Assurance) and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading • have the capability to assess the apprentice at this level • undertake a minimum of one-day EPAO standardisation training per year
University in their role as on-programme training provider	As a minimum the training provider should: • work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period • advise the employer, upon request, on the apprentice's readiness for EPA prior to the gateway

Internal Quality Assurance (IQA)

Internal quality assurance refers to the requirements that EPA organisations must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must:

- appoint independent assessors who have:
  - an engineering, science or business degree
  - strong working knowledge, particularly demonstrating how to implement an efficient and effective TES approach of the TES framework (BSI PAS 280)
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time
- operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this apprenticeship standard and before they deliver an updated assessment method for the first time

Affordability

Affordability of the EPA will be aided by using at least some of the following practice:

- using an employer's or university's premises
- the project and presentation subject should have a business benefit and using naturally occurring evidence for the portfolio of evidence
- where scheduling allows, there is the possibility to undertake assessment method 2 and 3 on the same day

Professional body recognition

This apprenticeship is designed to prepare successful apprentices to meet the requirements for registration as Charted Engineer with the Institution of Mechanical Engineers and The Institution of Engineering and Technology.

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this apprenticeship standard. This should include how an apprentice qualifies for reasonable adjustment and what reasonable adjustments will be made. The adjustments must maintain the validity, reliability and integrity of the assessment methods outlined in this EPA plan.

Annex A: Mapping of knowledge, skills and behaviours (KSBs)

Assessment method 1: Project report (Service improvement project)

Knowledge
K5 The fundamentals of deterioration and obsolescence: the physical initiators, drivers and consequences of deterioration. Deterioration prediction and detection methods. Deterioration recovery (repair) methods. The significance of product deterioration as the driver for the core through life services.
K6 Service value streams: their component service elements (avoid, contain, recover, convert) and how to configure them to meet differing needs depending upon the sector, product and business context.
K8 Supply chain design: the dynamics, interactions, mind-sets, motivations and incentivisation methods of complex networks of organisation's involved in overall service delivery and consumption.
K11 Value analysis: the alternative methods for value analysis, including value opportunity identification, value ranking, value realisation potential and competitive advantage analysis.
K12 Accounting and business cases: service accounting methods (e.g. International Financial Reporting Standard IFRS15) and their impact on service business valuation and financing options.
K13 Requirements management: service requirements of outcome, quality, quantity, timeliness, responsiveness, cost, data flows and how they can be translated into product requirements.
K14 Logistics management: techniques in product support services, including forecasting, provisioning, warehousing, transportation etc.
K15 Data capture: methods for acquisition of equipment utilisation & health data including Equipment Health Monitoring (EHM), inspection, maintenance and Internet of Things (IoT) technologies.
K16 Data Management: data management techniques for product service data flows ('as designed', 'as made', 'as configured', 'as operated', 'as maintained'), including the impact of big data (cloud) computing capability; cyber security considerations; data storage options.
K17 Data Analysis: service data mining, visualisation and analytics capabilities, e.g. reliability, sentiment, cost, correlation, causal factor, anomaly detection, statistical characterisation, trend analysis etc.
K18 Modelling and simulation: service modelling and simulation methods e.g. variability & sensitivity analysis, scenario modelling, simulation and artificial intelligence etc.
K19 Decision support: optimisation techniques and their applicability to supporting the human decision making process at the key decision points in the engineered product/service life cycle. For example intervention timing, logistics optimisation, life-cycle cost optimisation.
Skills

S7 Service Design: design an engineered product/service offering from requirements capture through to verification/validation.
S8 Service Delivery: manage and optimise delivery of the service to a defined process and monitor the service delivery metrics to identify both risks and opportunities.
S9 Service Data management: use specialist skills to define data requirements, acquire data and manage data flows within and between organisations within a complex service ecosystem.
S10 Service analysis and prediction: derive insight from available data, apply appropriate methodologies and approaches within the engineering and commercial domains to understand, model and predict causes and effects.
S11 Technical Issue management & engineering problem solving: use specialist knowledge, methodologies and approaches in the process of issue investigation, failure mode & root cause analysis, issue mitigation and solution implementation.
S12 Service change Management: plan and execute a programme of change within a complex service delivery system.
Behaviours
B5 Leader, champion & influencer: an enthusiast for services in the right context; willing to educate and support others on their journey to service value delivery.

Assessment method 2: Proposal executive summary report, presentation and questioning (New service proposal)

Knowledge
K2 TES value and risks: from the viewpoint of all parties in the supply chain, including increased value in use, decreased cost of use and risk transfer.
K3 Service models and business constructs: the wide variety of service models from basic spares services through to advanced pay for outcome services, including when and where they are applicable.
K4 Servitisation as a journey: the process steps, methods, risks and success factors involved in the journey from a product focus to a service focus.
K7 Product and Service life cycle: the life cycle of a product and service combination and the activities involved in the processes of planning, developing, preparing, utilising and retiring them.
K9 Constraints: legal, commercial and other constraints that impact service design and delivery, including export control, intellectual property, health & safety and environmental.
K10 Contracting methods: alternative contracting arrangements [e.g. customer/supplier, risk and revenue sharing) and how they may be reformulated for different service and engineering product contexts.
Skills

S1 Critical evaluation of Service solutions: research options and select optimal solutions within complex business contexts.
S2 Systems thinking: understand and integrate service system elements to achieve an optimised overall solution.
S3 Opportunity recognition: identify and prioritise opportunities to increase value or reduce risks and costs in the context of current or future products and services.
S4 Business model design: design business models and commercial constructs that enable effective, profitable and sustainable service delivery networks within complex business contexts.
Behaviours
B1 Entrepreneurial mind-set: for example, a big picture and strategic thinker, willing to critically analyse the current state, identify opportunities and propose beneficial change.
B2 Value focused: clearly seeking value for the total service system, yet responsive of the needs for all parties to achieve a local value return.

Assessment method 3: Discussion, underpinned by portfolio

Knowledge
K1 Through life Engineering Service (TES) framework: the capabilities and activities that comprise a full TES delivery system as described in British Standards Institute PAS 280.
Skills
S5 Recommendation and Decision making: optimise recommendations & decisions at significant points in the product/service lifecycle.
S6 Technical and commercial communication: use appropriate methods and means to facilitate communications between and within engineering and commercial stakeholder groups, ensuring effective integration of activity across the technical / commercial interfaces.
Behaviours
B1 Entrepreneurial mind-set: for example, a big picture and strategic thinker, willing to critically analyse the current state, identify opportunities and propose beneficial change.
B2 Value focused: clearly seeking value for the total service system, yet responsive of the needs for all parties to achieve a local value return.
B3 Pragmatic: a practical thinker, aware of and responsive to facts and evidence but willing to take managed risk where appropriate.
B4 Ethical: always operates in an ethical manner, respecting the rights and opinions of others and always seeking the zero harm outcome and approach. Personal commitment to professional standards recognizing obligations to society, the profession and the environment.
B6 Integrator: encourages integrated activity to develop and deliver services.

Annex B: Grading criteria for KSBs

The table below details the grading criteria. It is provided as indicative of evidence of performance at distinction, pass and fail levels. It is based on the following principles:

PASS:

- pass criteria shows the apprentice is demonstrating competence against the KSB statement; distinction criteria build on the pass criteria
- to receive a pass – all the pass criteria for an assessment method must be demonstrated

DISTINCTION:

- to receive a distinction - the stipulated number of KSBs in the grading descriptors table for the assessment method must be demonstrated at distinction, with all other KSBs demonstrated at pass.
- the distinction criteria are based upon the following:

Knowledge = the demonstrated ability to increase the value of knowledge through extension of its scope, frequency or effectiveness of use. Distinction level will demonstrate a deeper level of understanding of the knowledge element than the pass criteria, allowing the apprentice to demonstrate where they are working at a level above that outlined in the occupational standard:

  o Describe the key elements of the Concepts, Facts, Tools and Methods in new ways, to separate the important aspects from the less important and focus effort appropriately.
  o Adapt the Concepts, Facts, Tools and Methods for application beyond their taught context.
  o Share their knowledge with others, effectively increasing its potential for use.

Skill = the value of a skill can be increased by improving the effectiveness/efficiency ratio, achieving more outcome for less input. Distinction level will demonstrate the ability to get more value out of a skill by actively improving either efficiency or effectiveness.

Behaviour = the value of a behaviour is increased when it is applied more effectively or more broadly. Distinction level will demonstrate the ability to get more value out of a behaviour through effective application or by encouraging its adoption by others.

Assessment method 1: Project report (Service improvement project)

End-point assessment method and KSB reference as shown in annex A	Pass, apprentice demonstrates all of the following	Distinction, apprentice demonstrates eight or more of the following distinction statement boxes
K5 The fundamentals of deterioration and obsolescence	Evaluates the positioning of the improvement project against the lifecycle of deterioration and recovery	Explains and justifies why the improvement project does or does not address each stage of the deterioration life cycle
K6 Service value streams	Configures the 4 value streams (Avoid, Contain, Recover, Convert) to meet business needs	Evaluates and critiques at least 2 alternative improvement scenarios against the 4 value streams and justifies the selected option
K8 Supply chain design	Applies at least 1 supply chain design tool or method's applicability to the project	Assesses and critiques the comparative value of more than one tool or method against the one applied
K11 Value analysis	Applies at least 1 value analysis tool or method's applicability to the project	Assesses and critiques the comparative value of more than one value analysis tool or method against the one applied
K12 Accounting and business cases	Applies at least 1 business case construction method's applicability to the project	Assesses and critiques the comparative value of more than one business case construction method against the one applied
K13 Requirements management	Translates service requirements into product requirements	Assesses the impact of numerous potentially conflicting service requirements
K14 Logistics management	Assesses the impact of the proposed service improvement on logistics management	Assesses the impact of the proposed service improvement on logistics management from multiple stakeholder perspectives, identifying conflicts of interest and potential areas of implementation risk
K15 K16 S9 Data capture and Management	Assesses appropriate data capture methods and data management techniques and identifies the risks related to their practical implementation	Assesses more than one level of data capture and management and justifies a proposed optimum based upon a balance of value, cost and risk
K17 Data Analysis	Applies at least 1 data analysis method that benefits the improvement project	Applies a range of different data analysis methods that benefits the improvement project
K18 Modelling and simulation	Applies at least 1 service modelling or simulation method that benefits the improvement project	Applies a range of different service modelling or simulation methods that benefits the improvement project

K19 Decision support	Applies at least 1 decision support method that benefits the improvement project	Applies a range of different decision making methods that benefits the improvement project
S7, S8 Service Design/Delivery	Applies the flow of activities that constitute the service, optimises the changes created by the improvement project and justifies how they create value	Explains the alternative changes that were evaluated but rejected and justify the selection of the projects final change package
S10 Service analysis and prediction	Applies the minimum analysis and prediction activity required for improvement project success	Assesses more than one level of analysis and prediction and justifies a proposed optimum
S11 Technical Issue management & engineering problem solving	Identifies, captures and manages issues experienced in the design and operation of the service improvement	Evaluates the required changes in issue management and problem solving as part of the improvement project and justifies each addition, deletion or amendment
S12 Service change Management	Proposes a practical method of change management following implementation of the improvement project	Compares and critiques more than one method of change management post implementation of the project, justifying the proposed option
B5 Leader, champion & influencer	Leads, champions or influences within the improvement project	

Assessment method 2: Proposal executive summary report, presentation and questioning (New service proposal)

End-point assessment method and KSB reference as shown in annex A	Pass, apprentice demonstrates all of the following	Distinction, apprentice demonstrates 10 or more of the following distinction statement boxes
K2 **TES value and risks**	Evaluates and explains the provider → customer service value proposition, identifying at least 1 opportunity area for a new service offering	Assesses multiple new service offerings and estimates the relative value of each
K3 **Service models and business constructs**	Evaluates at least 2 case studies of potential service offerings and selects the preferred proposal	Evaluates and describes the components of the service model and business construct and explains how a viable proposal can be synthesised from components drawn from separate case studies

K4 **Servitisation as a journey**	Assesses the current organisational position on the servitisation journey and the transition required to successfully implement this proposal	Estimates the risks and hurdles in the servitisation journey and explains how they can be mitigated
K7 **Product and Service life cycle**	Assesses the service value opportunity in the context of the product and service life cycle	Evaluates the implications of future changes in the product and service life cycle on the value opportunity
K9 **Constraints**	Evaluates and explains the constraints on the service solution proposal	Appraises and explains which constraints are important and which are open to change and how
K10 **Contracting methods**	Judges at least 2 alternative contracting methods that could be applied and justifies a preferred method	Assesses a new or modified contracting method that better addresses the service opportunity
S1 **Critical evaluation of Service solutions**	Assesses and explains the improvement opportunities and risks within the proposed service solution	Revises the proposal pro-actively to better address the value opportunity, risks or improvement opportunities
S2 **Systems thinking**	Appraises and explains the key components of the service, the key stakeholders and their required interactions to deliver the service value	Assesses the service system and concludes the likely areas for interaction failure, risk or bottle necks
S3 **Opportunity recognition**	Evaluates the <u>relative</u> size of customer pain and gain value opportunities	Analyses and <u>quantifies</u> the size of customer pain and gain value opportunities
S4 **Business model design**	Evaluates a business model that shares value between the service provider and customer	Evaluates the choice of business model based on equitable and sustainable value sharing
B1 **Entrepreneurial mind-set**	Revises at least one new service option based upon supporting the organisations existing or planned products	Appraises at least one new service option which is not related to support of existing or planned products
B2 **Value focused**	Assesses how each element of the service proposal contributes value to the total proposal	Evaluates the service proposal elements that add the most value and demonstrates a clear focus on them

Assessment method 3: Discussion, underpinned by portfolio

End-point assessment method and KSB reference as shown in annex A	Pass, apprentice demonstrates all of the following	Distinction, apprentice demonstrates 3 or more KSB's at the following level
K1 **Through life Engineering Service (TES) framework**	Assesses the roles(s) the apprentice has undertaken in the context of the TES framework	Evaluates the use of the framework to communicate, plan, align or optimise activity within the organisation
S5 **Recommendation and Decision making**	Evaluates at least 2 alternative contracting methods, select an optimum choice and justifies the selection	Appraises at least 1 tool to qualitatively evaluate the alternative options, identify weaknesses and recommend a better hybrid or modified contracting method
S6 **Technical and commercial communication**	Appraises a coherent technical and commercial argument to pursue or not purse the proposal	Assesses alternative communication methods to create a compelling argument to pursue or not pursue the proposal
B1 **Entrepreneurial mind-set**	Estimates at least one new service option based upon supporting the organisations existing or planned products	Estimates at least one new service option which is not related to support of existing or planned products
B2 **Value focused**	Estimates how each element of the service proposal contributes value to the total proposal	Appraises the service proposal elements that add the most value and demonstrates a clear focus on them
B3 **Pragmatic**	Appraises a coherent argument as a practical thinker, aware of and responsive to facts and evidence but willing to take managed risk where appropriate	Evaluates alternative arguments as a practical thinker, aware of and responsive to facts and evidence but willing to take managed risk where appropriate
B4 **Ethical**	Evaluates the value of ethics in the TES context and illustrates at least one ethical dilemma that might occur and how they would address it	Assesses at least one ethical dilemma faced and outlines how they effectively dealt with it or helped others deal with it.
B6 **Integrator**	Evaluates the TES integration challenges within their role and how they effectively tackle them	Evaluates at least one occasion where their TES learning was applied to help others work better together in delivering TES outcomes