



IET End Point Assessment Briefing - 2022

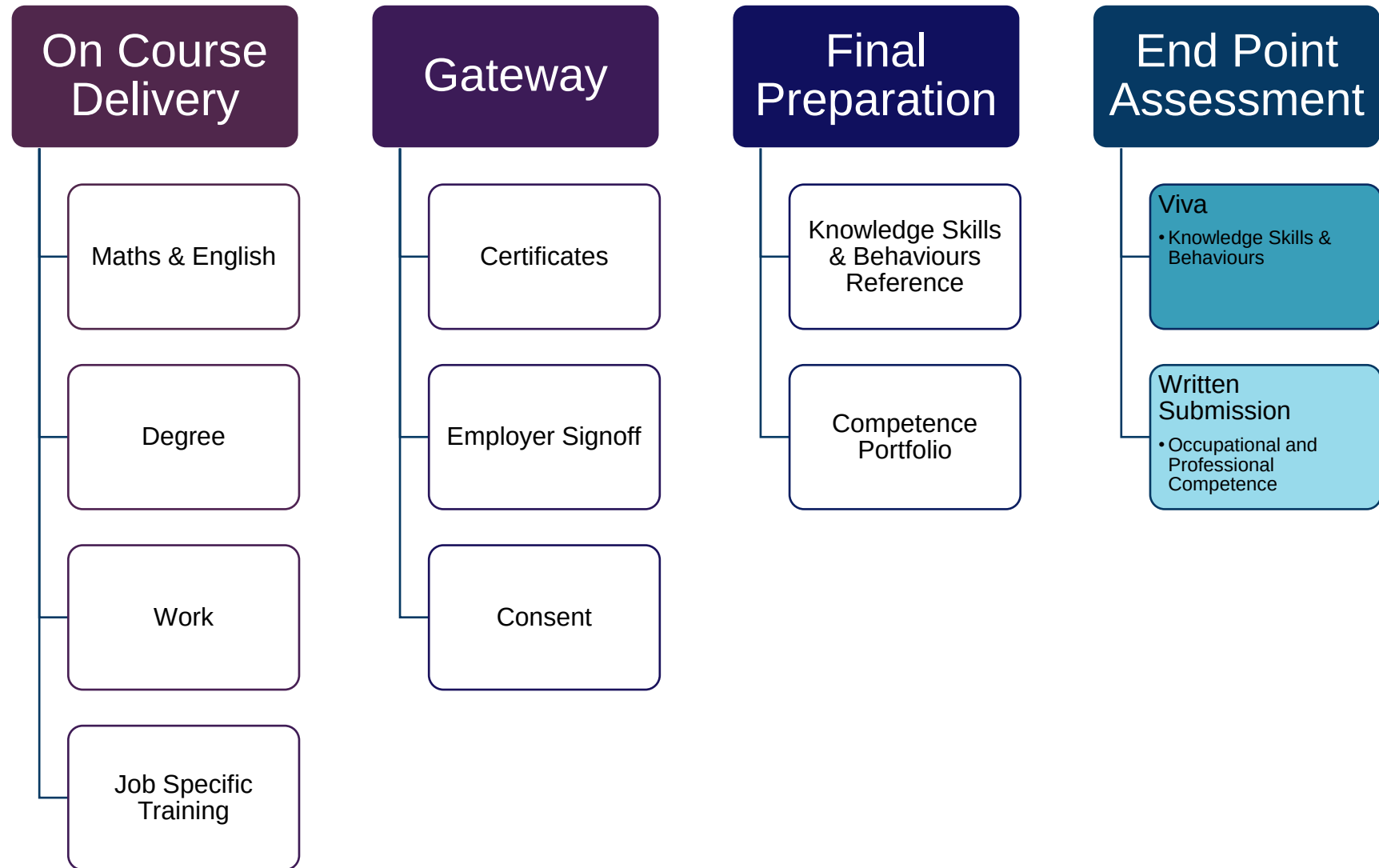
Embedded Electronic Systems Design and
Development Engineer Degree Apprenticeship

All apprentices must take an independent assessment at the end of their training to confirm that they have achieved occupational competence. Rigorous, robust and independent end-point assessment (EPA) is essential to give employers confidence that apprentices completing an apprenticeship standard can actually perform in the occupation they have been trained in and can demonstrate the duties, and knowledge, skills and behaviours (KSBs) set out in the occupational standard.

Institute for Apprenticeships

- **This ‘end point’ assessment is now a compulsory part of all apprenticeships in England.**
- **This is an independent assessment of your capability to carry out the job role effectively and safely.**
- **Your employer will not have put you forward for the End Point Assessment stage unless they consider you ready.**

Overview



Employer Sign Of



Employer Occupational Competence sign off – Embedded Electronics Systems Design and Development Engineer Standard

(EESDDE)

Apprentice (name): _____

Apprentice Unique
Learner Number (ULN) _____

Employer (company): _____

Person completing Form: _____

I, the above named, declare that I am satisfied that the Apprentice named above, has demonstrated Occupational Competence in their occupation as an:

Embedded Electronics Systems Design and Development Engineer

Furthermore, I can confirm that the apprentice has achieved the following qualifications, as required by the Standard:

Level 2 Mathematics ☐ (tick)

Level 2 English ☐ (tick)

Honours Degree in Electronics or Electrical & Electronic Engineering which has been accredited by one of the Professional Engineering Institutions licensed by the UK Engineering Council

Details _____

Based on the above I am pleased to confirm that the Apprentice is ready to enter the End Point Assessment process.

Signed _____

Date _____



Consent



END POINT ASSESSMENT APPRENTICE CONSENT FORM

The signing of this consent form by an Apprentice provides the required evidence of their acknowledgement and declaration that they have undertaken and completed an Apprenticeship and that they authorise the Institution of Engineering & Technology to claim their Apprenticeship Completion Certificate

Apprentice Name:

Employer:

Training Provider:

APPRENTICE DECLARATION & AUTHORISATION

I declare that:

- I authorise the IET to apply for my Apprenticeship Completion Certificate, on my behalf, and that they will provide the Certifying Authority with the necessary evidence of my achievements and pay the appropriate certification fee
- I consent to the use of my personal data by the IET for the purpose of claiming my Apprenticeship Completion Certificate
- I agree to my Occupational Competence Validation Interview being recorded for the following purposes; As part of an audit trail for Quality Assurance within the IET and with the relevant External Quality Assurance body, for the training of IET Assessors and as evidence, should the outcome of the Interview be challenged by my Employer, the Apprenticeship Provider or myself. If you do not permit your interview to be recorded, please tick this box ☐

Apprentice Signature:

Date of Signature:



Standard

Extract from the Apprenticeship Standard:

'The role of the Embedded Electronic Systems Design and Development Engineer is to apply their knowledge of electronics and of embedded software to the design of circuits or devices that provide a useful function, that are capable of being manufactured at a competitive cost,

and that are reliable and safe in use. This involves the use of the engineer's knowledge of electronics and electronic principles, married to an expertise in the end use of the final product. In electronics this end use can cover a wide spectrum.'

[https://www.instituteforapprenticeships.org/apprenticeship-standards/embedded-electronic-systems-design-and-development-engineer-\(degree\)-v1-0](https://www.instituteforapprenticeships.org/apprenticeship-standards/embedded-electronic-systems-design-and-development-engineer-(degree)-v1-0)

EMBEDDED ELECTRONIC SYSTEMS DESIGN AND DEVELOPMENT ENGINEER (DEGREE)

Overview of the role

Designing and developing electronic circuits, devices and systems for a range of industries

Details of standard

Occupation

The role of the Embedded Electronic Systems Design and Development Engineer is to apply their knowledge of electronics and of embedded software to the design of circuits or devices that provide a useful function, that are capable of being manufactured at a competitive cost, and that are reliable and safe in use. This involves the use of the engineer's knowledge of electronics and electronic principles, married to an expertise in the end use of the final product. In electronics this end use can cover a wide spectrum. Examples of industrial sectors that rely heavily on Embedded Systems Design and Development Engineers include Aerospace, Automotive, Automation and Instrumentation, Robotics, Telecommunications, Information and Computer Technology, Defence, Energy (including renewables), Transport and Consumer Electronics. The role provides the basis of learning with potential to specialise as a Hardware Engineer, Software engineer or Systems Engineer in these sectors and can extend from design of integrated circuits through to complete systems.

Embedded Electronic Systems Design and Development Engineers will spend their careers in these industries developing the next generations of products such as smartphones, electric vehicles, communications satellites, smart grids and bringing concepts such as smart cities into reality. For others, an initial grounding in design and development will prove an excellent launch pad for a career in applications engineering, product management, marketing or general management.

The Embedded Electronic Systems Design and Development Engineer must be proficient in a wide range of skills, underpinned by academic understanding, to enable them to work across these sub-sectors and specialisms.

Apprentices will complete a Degree that will support the fundamental scientific and mathematical principles that equip them with the understanding required to operate effectively and efficiently at a high level within any of these sectors. This will be supported by vocational training to develop the required competencies specific to particular roles within the chosen sectors.

Status: Approved for delivery 

Level: **6**

Degree: non-integrated degree

Reference: ST0151

Version: 1.0

Approved for delivery: 10 June 2016

Route: Engineering and manufacturing

Typical duration to gateway: 36 months (this does not include EPA period)

Maximum funding: £27000

Trailblazer contact(s):

 stewart.edmondson@ukesf.org

Employers involved in creating the standard:
Renishaw, Imagination Technologies, Siemens, ABB, Emerson Process Management, Automated Technology Group (Autotech), MTL Instruments, Schneider Electric, Selex, GE Aviation, Alstom, Gambica, NMI, Arun Technology, Specac, MSE, TechUK, Electronics Yorkshire

EQA Provider: [Institute for Apprenticeships and Technical Education](#)

 **Print the occupational standard (including PDF)**

 **Embedded electronic systems**

KSBs - Knowledge

Ref	Knowledge	What is Required	Assessment Methods
K1	Electrical circuit theory	Understanding of basic electrical theory	Degree / PEI
K2	Electronic components	Knowledge of the method of operation of basic semiconductors and passive components including their most common uses	Degree / PEI
K3		Also the basic formulas used in their application	Degree / PEI
K4	Analogue and digital design techniques	Understanding of design of both analogue and digital circuits and the basic design rules for mixed analogue and digital circuit boards	Degree / PEI
K5	Structured software	~~Comprehension of the fundamentals of structured software design~~	Degree / PEI
K6	Company Specifics	Understanding key aspects of the employer's business and product applications – against a template to be generated by the employer	Log Book

KSBs - Skills

Ref	Skills	What is Required	Assessment Methods
S1	Circuit design	Design functional electronic systems and circuits from component level	Degree / PEI
S2	Circuit layout	Utilise modern CAD technology to implement circuit design with understanding of considerations for heat dissipation, electrical interference and other industry specific considerations affecting layout	Degree / PEI
S3	Structured programming for embedded software	Write and document structured code to comply with industry norms and to allow others to understand and subsequently maintain/modify the code	Degree / PEI
S4	Mathematical modelling	Utilise modelling techniques for circuit design, embedded software development and thermal management	Degree / PEI
S5	Design for purpose	Ability to demonstrate an understanding of the principles and practice of design for market, design for manufacturability, design for testability and design for maintainability	Degree / Log Book
S6	Testing methodology	Ability to develop a test plan for a product that they have developed	Degree / Log Book
S7	Product transition into production	Ability to explain the process by which a product is introduced into production, including what aspects are discussed at what stage and with whom and how development gateways work	Degree / Log Book
S8	Project Management	Ability to develop a basic project plan including resource planning, time planning, use of contingencies etc.	Degree / Log Book
S9		Also techniques for predicting pinch points and strategies for timescale recovery	Degree / Log Book
S10	Compliance	Awareness of international standards and compliance requirements for the products designed by the employer	Log Book
S11		Ability to discuss the differences between legislative and non-legislative requirements	Log Book
S12	Commercial awareness	Ability to demonstrate knowledge of basic business fundamentals including costs, overheads, gross margin, net margin, profit, and cash	Log Book
S13	Health and Safety	Ability to demonstrate awareness and understanding of basic health and safety principles both in the general workplace and specific to electronic circuit design	Log Book

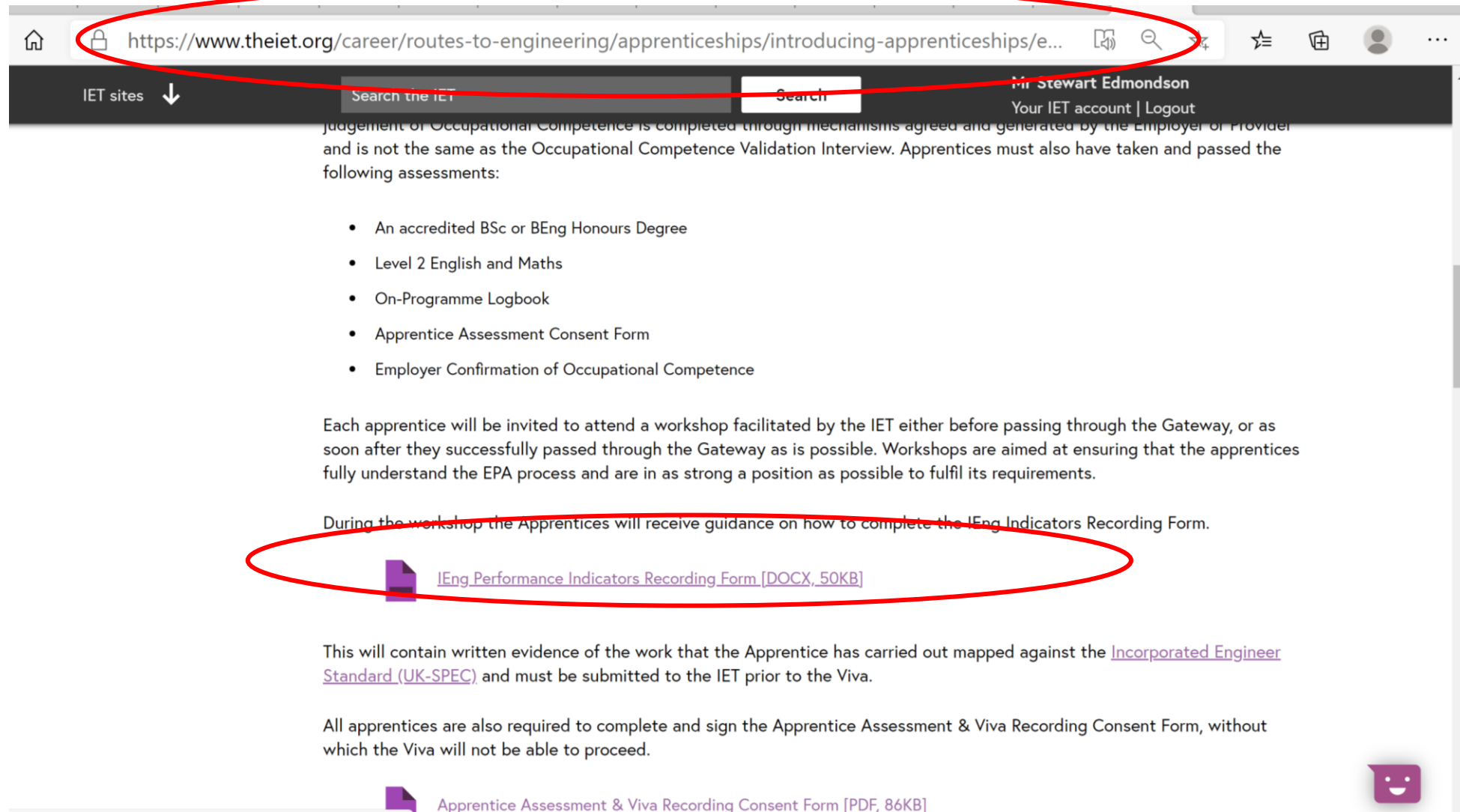


KSBs - Behaviours

Ref	Behaviours	What is Required	Assessment Methods
B1	Motivation	Self-starter, organised thinker	Log Book
B2		Works safely and effectively without close supervision	Log Book
B3	Communication	Confident in oral, written and electronic methods	Log Book
B4		Ability to communicate effectively with all levels of stakeholder	Log Book
B5	Team ethos and leadership	Exhibits leadership behaviour and qualities	Log Book
B6		Demonstrable ability to work as a member of a team	Log Book
B7	Continuous development	Committed to personal learning and development	Log Book
B8	Problem solving/practicality	Enjoys problem solving	Log Book
B9		Able to demonstrate practical capabilities in their professional role	Log Book
B10	Responsibility	Accepts responsibility for own work and that of others	Log Book
B11	Ethics and professional standards	Exercises responsibilities in an ethical manner and respects and complies with company rules and guidelines	Log Book
B12		Able to commit to beliefs, goals, and standards of their employer and the wider industry and its professional standards	Log Book



KSBs - Recording Your Evidence



https://www.theiet.org/career/routes-to-engineering/apprenticeships/introducing-apprenticeships/e...

IET sites ↓ Search the IET Search

Mr Stewart Edmondson
Your IET account | Logout

judgement of Occupational Competence is completed through mechanisms agreed and generated by the Employer or Provider and is not the same as the Occupational Competence Validation Interview. Apprentices must also have taken and passed the following assessments:

- An accredited BSc or BEng Honours Degree
- Level 2 English and Maths
- On-Programme Logbook
- Apprentice Assessment Consent Form
- Employer Confirmation of Occupational Competence

Each apprentice will be invited to attend a workshop facilitated by the IET either before passing through the Gateway, or as soon after they successfully passed through the Gateway as is possible. Workshops are aimed at ensuring that the apprentices fully understand the EPA process and are in as strong a position as possible to fulfil its requirements.

During the workshop the Apprentices will receive guidance on how to complete the IEng Indicators Recording Form.

 [IEng Performance Indicators Recording Form \[DOCX, 50KB\]](#)

This will contain written evidence of the work that the Apprentice has carried out mapped against the [Incorporated Engineer Standard \(UK-SPEC\)](#) and must be submitted to the IET prior to the Viva.

All apprentices are also required to complete and sign the Apprentice Assessment & Viva Recording Consent Form, without which the Viva will not be able to proceed.

 [Apprentice Assessment & Viva Recording Consent Form \[PDF, 86KB\]](#)



Incorporated Engineer Performance Indicators Recording Form

Incorporated Engineer

Performance Indicators Recording Form - PIRF

Apprentice Name:	Apprentice Signature:
Employer:	
Apprentice Employee Number:	Date:
(if applicable)	I confirm that the information I present in this document and any attachments is a record of my own work. If it is found that work of others has been included without proper reference, I understand that the submission may be rejected and if the final certificate has been issued, it may be withdrawn.
Print name:	
Supporter Signature:	
Print name:	
Supporter Job Title:	
Relationship to Apprentice:	
Date:	
I confirm that the information and evidence contained in this assessment document is the work of the apprentice, named above:	

This document should be used to record your evidence for the **Professional Competence End Point Assessment**. This is an independent assessment of your knowledge, skills and commitment to the engineering competencies for the Incorporated Engineer (IEng) requirements as defined by the UK-SPEC, regulated by the Engineering Council. You should consult these to find more information about Incorporated Engineer Competencies here:

- <https://www.engc.org.uk/ukspec4th>

Categories of Professional Registration

4 Categories of Professional Registration
(assessed in accordance with the Engineering Council Registration Code)

CEng

IEng

EngTech

ICTTech



The UK
Standard for
Professional
Engineering
Competence
(UK-SPEC)

ICTTech: The
Standard



UK-SPEC - Incorporated Engineer

*Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation.

Incorporated Engineers are able to demonstrate:

- A. The theoretical knowledge to solve problems in developed technologies using well proven analytical techniques
- B. Successful application of their knowledge to deliver engineering projects or services using established technologies and methods
- C. Responsibility for project and financial planning and management together with some responsibility for leading and developing other professional staff
- D. Effective interpersonal skills in communicating technical matters
- E. Commitment to professional engineering values.



* Ref Engineering Council UK-SPEC

How to Present Evidence of Competency

Your **KSBs** are explored through *competency-based* questions evidenced through examples of when you have used them.

Competency questions ask you to tell a story ...

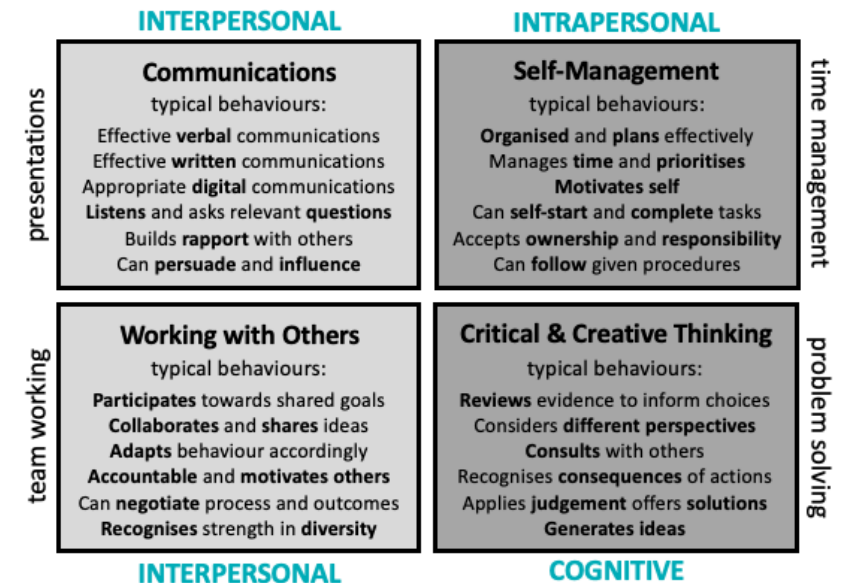
Tell us about a time when.....? What was the outcome and what did you learn?

Responses to *competency* questions ask you to choose and share past examples drawn from your work experience structured using the STAR (or CAR) model:

STAR - situation, task, action, result/reflection

CAR - context, action, result/reflection

[Careers advice: How to answer competency questions during an interview - YouTube](#)



Logbook Examples.....

The applicant shall demonstrate that they:

A1. Have maintained and extended a sound theoretical approach to the application of technology in engineering practice

- Identifying the limits of your knowledge and skills
- Taking steps to develop and extend personal knowledge of appropriate technology, both current and emerging
- Applying newly gained knowledge successfully in a task or project
- Reviewing current procedures and processes and recommended improvements or changes to reflect best practice
- Developing knowledge needed to work in a new industry area or discipline

As part of my apprenticeship I have completed a degree at Portsmouth University in Electronic Engineering with First Class Honors. I studied many topics including Advanced Electronics Systems, Digital Signal Processing, and Field Programmable Gate Arrays. My time at Portsmouth gave me an extensive theoretical understanding of these subjects, as well as giving me the opportunity to apply theory in project based learning. I am already applying the theory learned at university in the workplace as I am now responsible for an FPGA based project which used DSP.

I am currently working on a Programmable Logic Controller project but before this have no experience with PLCs. Because of this I have used this opportunity to attend a training course on Siemens PLC software TIA Portal earlier this year.

Logbook Examples.....

B2 Contribute to the design and development of engineering solutions.

- Contributing to the identification and specification of design and development requirements for engineering products, processes, systems and services
- Identifying operational risks and evaluating possible engineering solutions, taking account of cost, quality, safety, reliability, accessibility, appearance, fitness for purpose, security (including cyber security), intellectual property constraints and opportunities, and environmental impact
- Collecting and analysing results
- Carrying out necessary tests

Evidence

For the PIC134 project I was involved in drafting the full requirements specification. This came from railway and British standards which are mandatory. There were customer specific requirements to gain approval, installation, reliability, availability, maintainability and safety targets. I set functional requirements to achieve the required functionality for use as describe by the customer. I also considered Unipart Rail (UR) requirements for quality, cost, delivery, design for manufacture and design for testing. Once I had all the requirements I created a matrix to show how I planned to achieve and show full compliance to the requirements, this was testing, design, research, external testing, trial, etc.

Through the design i had to meet BS EN 50126 which meant creating a FMECA, risk analysis, hazard logs, safety plans and RAMS results. This was done via simulation, testing, review of the standards, assumptions and calculations. Environmental testing was done to BS EN 50125-3:2003 but this was to just show the unit would function properly in its intended environment. We then had to show compliance with ROHS, REACH, battery directive and WEEE. These were mainly directions of use and disposal of the item which were all include in the operation and maintenance manual I drafted.

To prove full compliance to the requirements I drafted a clause by clause which included lab testing to show correct functionality. Lab testing to show removal of any major hazards from the hazard log. External EMC compliance to reduce effects of Electromagnetic Interference (EMI) on the device and to other devices. Transients and static for protection. The trial also gave good data showing zero failures and the units were in tolerance throughout the entire trial.

Logbook Examples.....

The applicant shall demonstrate that they:

C1. Plan the work and resources needed to enable effective implementation of engineering tasks and projects

- Identifying factors affecting the project implementation
- Carrying out holistic and systematic risk identification, assessment and management
- Preparing and agreeing implementation plans and method statements
- Securing the necessary resources and confirming roles in a project team
- Applying the necessary contractual arrangements with other stakeholders (clients, subcontractors, suppliers, etc)

My university project required me to plan out the research, design and implementation process to ensure I would have access the facilities and equipment I needed and have sufficient time to complete the necessary work. To help with this I made a Gannt chart to break down the project into week long sections allowing me to easily check the progress of my project and whether or not I was on track.

Because my project was based around an optical component I worked closely with an optical engineer to ensure I would have the necessary equipment, and that I was on the right track with the theory and design work of the project.

I have monitored costs and managed risks throughout the projects I have run. The risks have been rated both on impact and likelihood to give an overall risk value. An example of this is the risk that the new sensor technology on the prototype PCB wouldn't work. To minimize this risk the PCB had 3 review lifecycles prior to manufacture. Additional contingency circuitry was added onto the PCB to further minimize risk. These precautions were taken because of the expensive cost of the new sensor technology and assembled PCB costs.

Basic continuity tests were carried out on the PCBs to check they were manufactured correctly. The test circuitry was then isolated and tested.

During the project justification stage of the project where funding is granted to a project, I have identified critical resources (staff and physical assets). I have then secured these resources by submitting stock requests or by checking team member's availability.

When testing an optical modem product, I created a custom jig to prevent other people in production from being exposed to the distracting light source.

During the manufacture of the prototype PCB I noticed that a component footprint was incorrectly orientated. This was critical as it was a Ball Grid Array (BGA) part that was being assembled externally. To resolve this issue I contacted the manufacturer and sent updated documentation.

I have provided feedback on the performance of apprentices and prospective employees for the company. I identified where the individual would need further training and skills for the proposed job role. I also discussed their performance with other people they have worked with to get a more accurate review.

When I have managed work experience students I have asked them for feedback about how their time at the company could have been improved.

Tips For Writing Evidence

Tip	Example
First Person Singular	I identified an alternative approach to solving the problem. My role on the team was to calculate the expected loads and thus specify the rating of the cable harness.
Don't use acronyms (or define at least once)	Whilst designing the AHB (Automatic Half Barrier) crossing, I
Reflection on your performance (Even if things went wrong)	My design was easily installed apart from an unforeseen issue with access. This was overcome and a check was documented to avoid future occurrences.* I was pleased with the outcome of the project and welcomed the opportunity to learn about BIM (Building Information Modelling). * Don't forget to provide more details about the issue.
Be concise and not too 'wordy'.	
Remember that the Assessors do not work for your company so do not assume they know about internal procedures.	After completing the design I submitted it to the Chief Engineer for checking and final sign-off.

UK-SPEC - Incorporated Engineer

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Incorporated Engineers are able to demonstrate:

- A. The theoretical knowledge to solve problems in developed technologies using well proven analytical techniques
- B. Successful application of their knowledge to deliver engineering projects or services using established technologies and methods
- C. Responsibility for project and financial planning and management together with some responsibility for leading and developing other professional staff
- D. Effective interpersonal skills in communicating technical matters
- E. Commitment to professional engineering values.



* Ref Engineering Council UK-SPEC

- Maintaining public and employee safety
- Undertaking work in a way that protects the environment and contributes to sustainable development
- Complying with codes of conduct, codes of practice and the legal and regulatory framework
- Managing, applying and improving safe systems of work
- Carrying out the CPD necessary to maintain and enhance
- competence in relation to duties and responsibilities
- Exercising responsibilities in an ethical manner
- Recognising inclusivity and diversity
- Adopting a security-minded approach
- Actively participating within the profession

The Statement of Ethical Principles is available at:
www.engc.org.uk/ethics



Commitment to Professional Engineering Values

E1 Understand and comply with relevant codes of conduct	• Demonstrating compliance with your Licensee's Code of Professional Conduct • Identifying aspects of the Code particularly relevant to your role • Managing work within all relevant legislative and regulatory frameworks, including social and employment legislation
E2 Understand the safety implications of their role and manage, <u>apply</u> and improve safe systems of work	• Identifying and taking responsibility for your own obligations for health, <u>safety</u> and welfare issues • Managing systems that satisfy health, <u>safety</u> and welfare requirements • Developing and implementing appropriate hazard identification and risk management systems and culture • Managing, <u>evaluating</u> and improving these systems • Applying a sound knowledge of health and safety legislation, for example: HASAW 1974, CDM regulations, ISO <u>45001</u> and company safety policies
E3 Understand the principles of sustainable development and apply them in their work	• Operating and acting responsibly, taking account of the need to progress environmental, <u>social</u> and economic outcomes simultaneously • Recognising how sustainability principles, as described in the Guidance on Sustainability on page 48 can be applied in your day-to-day work • Providing products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understanding and encouraging stakeholder involvement in sustainable development • Using resources efficiently and effectively • Taking action to minimise environmental impact in your area of responsibility -
E4 Carry out and record the Continuing Professional Development (CPD) necessary to maintain and enhance competence in their own area of practice	• Undertaking reviews of your own development needs • Planning how to meet personal and organizational objectives • Carrying out and recording planned and unplanned CPD activities • Maintaining evidence of competence development • Evaluating CPD outcomes against any plans made • Assisting others with their own CPD
E5 Understand the ethical issues that may arise in their role and carry out their responsibilities in an ethical manner.	• Understanding the ethical issues that you may encounter in your role • Giving an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 47 • Giving an example of where you have applied or upheld ethical principles as defined by your organisation or company



Examples.....E1:

When I am performing my role, I try to keep my approach in line with the ethical principles outlined by the Engineering Council. The Council has four fundamental principles as follows:

1. Honestly and Integrity
2. Respect for life, law, the environment and public good
3. Accuracy and rigor
4. Leadership and communication.

In all cases, I approach my customers and members of the public with integrity and respect with a desire to communicate accurately – providing rigorous justification in the engineering decisions I make.

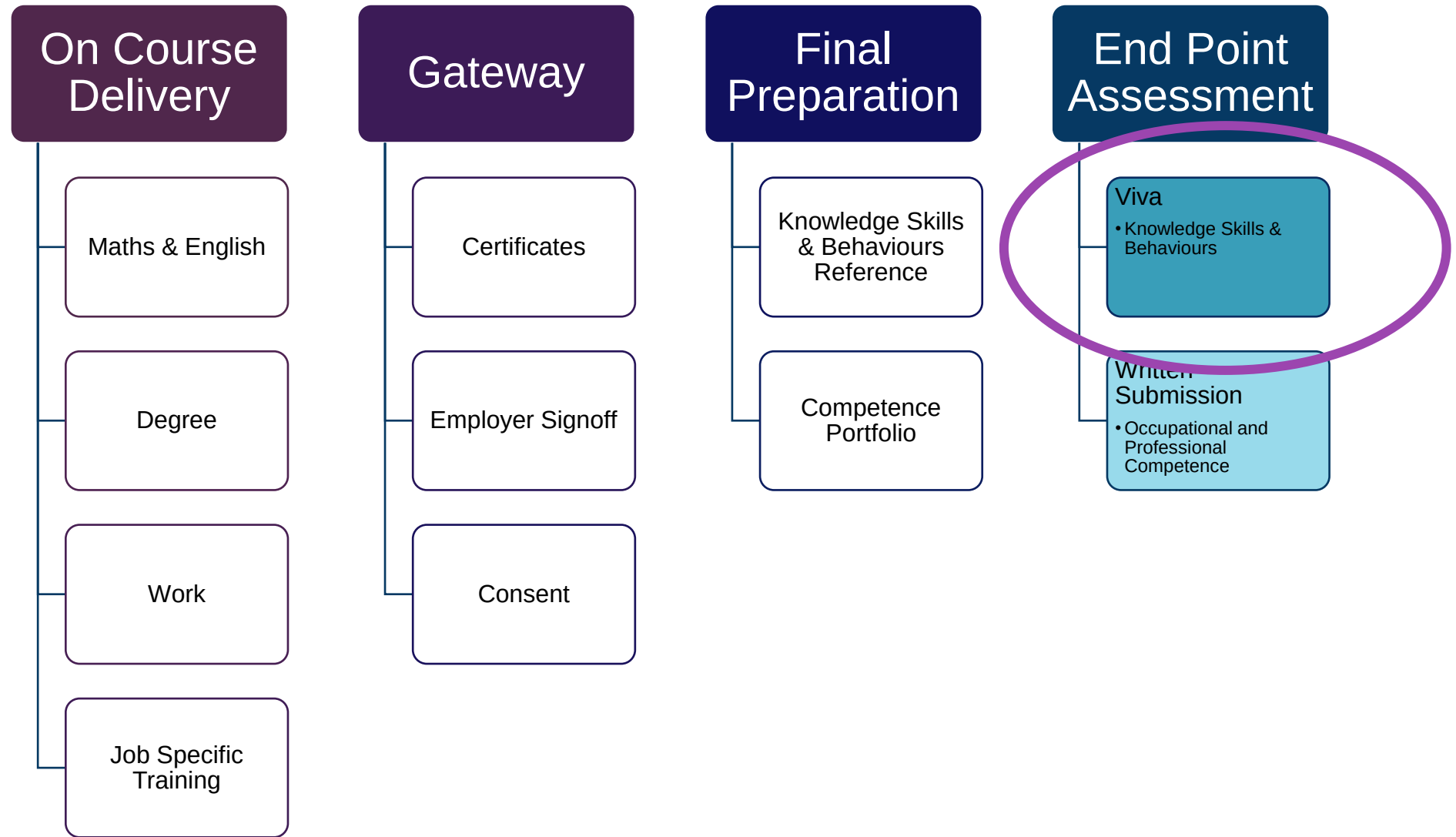
A recent example of points 1, 2 and 3 is in my recent communications with both my customer and a fellow engineer. With the customer, I contacted them to raise my concerns on a cable termination schedule that was produced by others. This schedule was completed from a contractual point of view and did not need to be assessed again; however, I noticed that the content of the termination schedule was not detailed enough to be used in the way it was intended. Therefore, I raised my concerns with the customer. In addition, when working alongside another engineer I noticed that he had missed a warning label from one of the project panels. I pointed this out to him and volunteered to get it added.

Examples....E5:

I am aware of the Engineering Councils statement of ethical principles.

1. Honesty & Integrity – I am a valued member of the hardware team and can be trusted by others. Capula enrol each employee and I have completed an ELF training course regarding Bribery and corruption. An example of this generally towards the Christmas break suppliers tend to send gifts, it is essential to make a log of what has been received to avoid taking this as any bribe.
2. Respect for Life, law and environment – I am very conscious of health and safety and report any hazards/near misses via “Tell Birt” Capula’s reporting method for any health and safety concerns. Another example which is only very small but ensure all drawings and documents that have been printed for review purposes are disposed of correctly for instance shredding of “official” marked items.
3. Accuracy & Rigour – I only complete tasks that I am suitably qualified and trained to undertake. I am aware of my own capabilities. I can access manage and mitigate risks in a professional manner for example by completion of a design risk assessment for the HPC contract.
4. Leadership and Communication – I have been truthful throughout my career most recently I had to make known a conflict of interest regarding receiving a quotation from a sub-supplier who was a family member. I made sure that I was excluded from these communications.

Overview



VIVA

- Viva = spoken examination
- Not a test and not an interview. Not trying to catch you out.
 - Refer to notes, don't rely on memory
- Professional discussion. To demonstrate occupationally competent and assess whether all the KSBs have been met.
- How long? Between 1-2 hours.
- Who? Two assessors. Independent. One appointed by the IET and an employer's representative. Starting point is written evidence (log book).
- Example questions: Tell me about when you.....? How did it go? What did you learn?
- Future plans (CPD) and career aspirations. Anything else?



Questions?

Timescales?

Resits?

For further information contact: epa@theiet.org