Artificial Intelligence (AI) Working Group of the Engineering Council

Close-out Report and Recommendations

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Contents

Summary and recommendations

1. The Artificial Intelligence (AI) Working Group (hereafter referred to as the AI WG) considered the implications of Artificial Intelligence (AI) for registration and programme recognition.

2. Representatives of the Science Council and the Society for the Environment were involved, alongside Engineering Council staff and volunteers. A collaborative approach aimed to share expertise and minimise inconsistency as there is some overlap in the professional bodies and individuals represented by the three organisations.

3. The AI WG decided that it would be best to have three sub-groups - Task and Finish Groups (TaFGs) - to enable conversation to be more focused between working group members with the right expertise. Each TaFG provided updates and recommendations to the main AI WG.

4. In total twelve meetings were held of the AI WG and TaFGs, with work in between meetings including consultations and Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis.

5. The AI WG made the following recommendations:

   i.   General recommendations:

   a. That AI be embraced as a positive opportunity while risks must be considered, with due consideration given to ethics and implications for Equality, Diversity and Inclusion (EDI).

   b. The three regulatory bodies, jointly and individually, should continue to monitor the space closely, to avoid either missing opportunities to leverage generative AI, or opening the door for fraudulent AI applications.

   c. Appropriate use of AI by education providers and students to support engineering education should be welcomed.

   d. Appropriate use of AI by applicants and professional engineering institutions (PEIs) to support registration processes should be welcomed. This might include use of Large Language Models (LLMs) to 'triage' applications to drive efficiencies and make effective use of volunteer assessor time.

   e. While AI presents new opportunities for academic misconduct and misconduct by applicants for registration, existing guidance and policy related to misconduct should already cover this.

   f. Online proctoring and digital identity verification technologies may keep pace with the threat of misuse of AI tools, including deepfakes, but this 'arms race' will need to be monitored to safeguard Professional Review Interviews (PRIs) if not held in person.

   g. Consider opportunities to collect and share best practice related to use of AI in education and within PEI registration and programme recognition processes. These could include best practice-sharing workshops so that those Higher Education Institutions (HEIs) and PEIs who are further along the journey of AI implementation can share lessons with peers.

   h. Consider conducting further surveys related to use of AI in education and by PEIs, to see if there are significant changes at a later date given the rapid pace of technological development.

i. Consider requesting consent to share beyond the Engineering Council some or all of the examples of regulations and guidance for which links were provided in survey responses.

ii. Recommendations for guidance:

a. That regulatory guidance encourages a diversity of assessment methodologies and authentic assessment, while remaining clear that the Engineering Council does not mandate use of any specific assessment methodologies and welcomes innovative assessment and delivery approaches.

b. That the Engineering Professors' Council (EPC) be invited to develop and publish guidance and case studies related to the use of AI within engineering education, with some input from the Engineering Council. This might include guidance on identifying potential misuse of AI.

c. The Engineering Council should consider adopting or adapting the Science Council guidance for assessors (Attachment A), noting that this is a live document and if adopted the Engineering Council should check with the Science Council on an annual basis for any updates.

d. That the Engineering Council considers developing guidance on AI or technology for professional engineers (in industry and academia). Topics this might usefully address include introductory information for engineers who lack background knowledge related to AI/technology, ethical use and implications of AI/technology (taking account of some of the more detailed recommendations from the Ethics TaFG), consideration of EDI in AI/technology design and use.

e. Reviewing existing Engineering Council guidance for professional engineers and technicians in the context of AI.

f. Wider feedback as noted in this report and the AI Survey Summary (Appendix A) may inform development of guidance.

iii. Recommendations for the forthcoming Standards review:

a. The Standards shouldn't explicitly refer to AI in competences or learning outcomes (LOs), as the pace of change is so fast that coverage would quickly be out of date, and this would be too specific and warrant equivalent reference to other technologies. Rather, Accreditation of Higher Education Programmes (AHEP) and Approval and Accreditation of Qualifications and Apprenticeships (AAQA) learning outcomes should make reference to technological and societal change.

b. Commentary within the Standards or associated guidance could signpost where learning outcomes could consider AI/ emerging technologies, for example:

  i. Security related to use of AI
  ii. Appropriate use of AI as part of professional conduct
  iii. AI within the context of analytical tools and techniques
  iv. Ethical use of AI and data (in industry and education)
  v. Engineer and society (sustainability, including environmental impacts of servers; ethics; risk; security and EDI)
  vi. Communications
  vii. Lifelong learning

c. Consideration should be given to addressing technological and societal change in a later set of The UK Standard for Professional Engineering Competence and Commitment (UK-SPEC) competences as it may be unrealistic to expect competence in this area before it has been embedded in engineering programmes.

d. AI could be addressed via the commitment element of UK-SPEC by emphasising proficiency in emerging technologies and responsiveness to societal and technological change, as part of the engineers' commitment to maintain up-to-date knowledge.

e. Wider feedback as noted in this report and the AI Survey Summary report (Appendix A) may be considered to potentially inform the Standards review.

Terms of Reference

6. The AI WG was established in late 2023 with the following Terms of Reference (ToR):

    a. To consider implications of Artificial Intelligence (AI) for registration and programme recognition.

    b. To explore opportunities and challenges associated with the growth in AI and use of generative AI in education and skills development, including:

        i.   use of AI by students
        ii. inclusion of AI in curriculum
        iii. use of AI in programme development, delivery and assessment
        iv. contextualising AAQA and AHEP learning outcomes
        v.   use of AI in administration and management of programme recognition.

    c. To explore opportunities and challenges for registration processes associated with the growth of AI, including:

        i.   use of AI by applicants for registration
        ii. use of AI in assessment of competence and commitment
        iii. use of AI in contextualising generic UK-SPEC competences and commitments for PEI disciplines and practice areas
        iv. use of AI by licensees in the administration and management of applications for registration
        v.   use of AI to support initial and continuing professional development (CPD).

    d. Where appropriate, make recommendations for additions or changes to the Engineering Council Regulations for Registration (RfR), Standards and guidance[1].

Proposals from the AI WG may include ideas for possible AI solutions[2], that could be explored as part of future work.

Task and Finish Groups

7. The AI WG was supported by three sub-groups, known as Task and Finish Groups (TaFG) both to differentiate form the AI WG and as this was the terminology favoured by the Science Council and the Society for the Environment.

8. The Task and Finish Groups considered AI in the following contexts:

    a. Registration (this was a joint activity with the Science Council and the Society for the Environment).

    b. Ethics (led by the Engineering Council with inputs from the Science Council and the Society for the Environment).

    c. Engineering Council Standards (considering how UK-SPEC, AAQA and AHEP might address AI with a view to making recommendations to inform the forthcoming Standards review). This group would be continuing to make recommendations for the next Standards review.

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1   Regulatory guidance for PEIs; professional guidance for engineers and technicians.
2   AI solutions may be identified to potentially make PEI and Engineering Council processes more efficient.

AI and Registration Task and Finish Group

9. The AI and Registration Task and Finish Group (Registration TaFG) met three times during 2024.

10. The terms of reference invited the group to:

    a. Consider implications of the use of AI in the context of:
       i. registration processes, and
       ii. the potential for applicants to make use of AI in their applications and associated evidence, and
       iii. whether adjustments or additions may be needed to Engineering Council, Society for the Environment or Science Council documentation to take account of this.
    b. If appropriate, make recommendations for additions or changes to regulations, Standards or guidance.

    c. If appropriate, make other recommendations to the Engineering Council, the Society for the Environment and the Science Council.

11. The group agreed that, in general, AI should not be considered in a negative light. Science, and applied science professions, should anticipate being at the vanguard of uptake of new technologies, and there is huge opportunity in generative AI.

12. At its first and second meetings, the Registration TaFG tackled its topics from two angles: use of AI by an applicant; and use of AI by the membership body in support of the assessment process.

13. There were early examples of both: the Science Council reported having received two application portfolios that were clearly the product of an LLM, and when questioned the members had confirmed as much.

14. The Science Council reported having recently published a set of 'AI Tips for Assessors' which had been useful in identifying such applications which were initially judged to be 'fails' rather than fraudulent.

15. The Institution of Engineering and Technology (IET) had recently updated its regulations around the Professional Review to cover use of generative AI. In summary, use of AI to support an application would be allowed, as long as the member declared as much at the point of application.

16. Most Registration TaFG members considered the use of an interview to be a crucial 'safety net' in detecting malpractice or fraud of many sorts, not just illicit use of AI. While a written submission can mislead or obfuscate, properly-trained interview assessors can very quickly detect gaps in an applicant's knowledge or competence.

17. While there was no evidence of fraudulent use of AI 'deepfake' technology in online interviews, Registration TaFG members recognised the potential for this in future, given the state of the art, and the pace of progress.

18. When it came to use of AI by institutions, The two subsets of institutions' uses of AI were described as:

    1. Detecting fraud or malpractice
    2. Realising efficiencies in the assessment processes.

19. Automated proctoring is a growing industry, and may be useful for detecting fraud or malpractice in an interview. Modern systems can detect when applicants are using a second screen or otherwise 'cheating', and can be tuned to support 'open book' and 'closed book' assessments. Off-the-shelf plagiarism detection systems (eg TurnItIn) were on the market, and already widely used in Further Education (FE) and HE.

Some Registration TaFG members use such systems to detect plagiarism in submitted material eg journal articles.

20. When it came to supporting assessment, it was recognised that there was huge potential to drive up efficiency, though Registration TaFG members agreed that 'peer review' necessitated final and binding decisions remaining in human hands. At least in the early stages, it was more likely that AI could be used to 'triage' portfolios, to give members or institutions a quick overview of the degree of 'completeness' of an application, and what the member may need to work or expand upon.

21. Registration TaFG members initially recommended a pilot study to 'fine tune' an LLM to undertake this 'triage' function. It was suggested that given 50-60 anonymised portfolios, it should be possible to produce a bespoke AI system that would return comments that compared the member's submitted data with a competence standard, and returned commentary. Rather than a fully-functional product, this pilot would aim simply to establish the feasibility of such a plan. This was abandoned when Registration TaFG learnt that such a project was already underway at an Engineering Council licensed PEI (see the next section of this report).

22. Data protection issues were noted by Registration TaFG members. In most cases, LLMs are based on US cloud servers, and while Application Programming Interface (API) calls are in general private and secure, data security concerns would be salient to any next steps. It was suggested that in due course, models will be able to run on-premises, removing some of the data protection and privacy concerns that might arise from using AI to support assessment.

23. At the third and final meeting, a delegate from the Institution of Mechanical Engineers (IMechE) presented their progress on an automated 'registration application commentary' system. Based on an OpenAI Generative Pre-training Transformer (GPT) model, this used a thorough and well-refined prompt, in concert with a member's application and the competence standard, to deliver feedback on commentary on likely weak spots and improvement actions. While early feedback was patchy, a process of iterative improvement had delivered a product that was starting to show genuine insight into assessment and standards.

24. The IMechE was still piloting the system, and investigating how it might be used alongside – and in support of – existing assessment methods. Nonetheless, for the purposes of the Registration TaFG, it unequivocally demonstrated that such systems are possible using current technologies.

Recommendations from the AI and Registration Task and Finish Group

25. While use of AI in support of registration – by institutions and individuals – is in the early stages, the potential is clear. The three regulatory bodies, jointly and individually, must continue to monitor the space closely, to avoid either missing opportunities to leverage generative AI, or opening the door for fraudulent AI applications.

26. There was broad agreement with the IET's approach of welcoming AI used in support of an application, as long as it did not distort or exaggerate an applicant's history and competence, and that the member declares such usage.

All three regulatory bodies already have regulations along the lines of 'submissions must be the applicant's own work', and these would apply to the use of AI. Thus the Registration TaFG made no recommendations for urgent changes to current published documentation on registration.

27. There was little appetite for amending existing anti-fraud regulations to specifically mention AI – in part because the term 'artificial intelligence' could be defined very broadly, and could even include such established and widespread technologies as spell-checkers. As such, the broad principle of requiring that an application be 'the applicant's own work' should remain sufficient. It was nonetheless recognised that applications making fraudulent use of generative AI would likely become harder and harder to spot. Guidelines for helping assessors to spot signs that AI has been used were valuable here, and their use should be encouraged.

28. While an interview remained a 'backstop' against fraudulent applications, the pace of development of deepfake technology is such that online interview integrity will eventually be at risk. Online proctoring and digital identity verification technologies are working to keep pace with this threat, and the regulatory bodies must continue to monitor this 'arms race'.

29. Use of LLMs to 'triage' applications has the potential to deliver enormous efficiencies, and to enable precious volunteer assessor time to be spent where it is most needed. This technology is already in hand. While the ethos of 'peer review' remains sacrosanct across the sectors, the regulators should explore – and encourage their licensed institutions to explore – this opportunity, and monitor its risks.

30. The Engineering Council should consider adopting or adapting the Science Council guidance for assessors.

AI and Ethics Task and Finish Group

31. The AI and Ethics Task and Finish Group (Ethics TaFG) met twice during 2024.

32. The terms of reference invited the group to:

    a. Consider ethical implications of AI in the context of:
       i. registration and programme recognition processes, and
       ii. the competences and commitments that should be demonstrated by registrants, and
       iii. whether adjustments or additions may be needed to Engineering Council, Society for the Environment or Science Council documentation to take account of this.

    b. Review existing documentation related to ethics in the context of engineering, science and the environment alongside regulations, standards and guidance and identify if there are any gaps in coverage.

    c. If appropriate, make recommendations for additions or changes to regulations, standards or guidance.

    d. If appropriate, make other recommendations to the Engineering Council, the Society for the Environment, the Science Council, and to the Registration TaFG.

33. The Ethics TaFG Chair requested that members of the TaFG conduct SWOT analysis between the first and second meeting.

34. The second meeting focused on SWOT analysis that had been completed both by TaFG members and Engineering Council staff. A member of the TaFG annotated a record of the SWOT during the meeting which was the basis of recommendations from the Ethics TaFG.

Recommendations from the AI and Ethics Task and Finish Group

35. The Ethics TaFG recommended that, in future discussions of the AI WG, the Registration TaFG and the AI and Standards TaFG, consideration be given to ethical matters including:

    a. Accessibility and EDI, giving due consideration to the ethical implications of AI which pose both risks and opportunities for equality, equity, diversity and inclusion. *Members note that use of AI presents opportunities to potentially benefit some groups while disadvantaging others[3] in relation to registration processes, and teaching and assessment methodologies on recognised education programmes. It is also a topic that the AI and Standards TaFG should consider in terms of what knowledge, understanding and competences engineers should have to minimise harms and maximise benefits afforded by AI related to EDI.*

    b. Ethical data management and management of bias. *Members note that data driven decision making may provide useful opportunities to save resource that could be ethically diverted elsewhere, but also risks harms to individuals, professions and organisations if mismanaged. Both intentional and unintentional biases risk being built into data that powers AI and into AI decision making, including if AI is used to support registration and/or programme recognition processes. Consideration needs to be given to risks associated with data breaches, misuse and intentional unethical activity.*

    c. Digital inequality. *Members note that digital access or lack thereof, which may be impacted by socio-economic factors as well as variable broadband speeds and differences in individual confidence using technology, including but not limited to access to AI technology, should not disadvantage potential registrants or students. This may also be something that the AI and Standards TaFG should consider in relation to knowledge, understanding and competences, to encourage engineers to give due ethical consideration to digital inequality.*

    d. Integrity, quality and use of AI. *Members note that the regulations and codes of conduct of the three organisations are likely to already address matters related to professional and academic integrity. The three organisations and the AI WG and TaFGs may wish to consider whether any changes or enhancements might be appropriate given the opportunities associated with AI for individuals to cheat or otherwise behave unethically.*

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3   For example, AI applications can assist people with neuro-differences, such as dyslexia, to create well-sequenced documents with correct spelling; or assist people working in a second or subsequent language to create documents that feel more natural to people reading in their first language. However, AI applications may disadvantage people through faults or biases in the training of the AI model; or due to variability in the access that different people and different organisations have to AI applications (see also paragraphs b and c)

e. Ethical responsibility and AI. *Members note that AI may be used for societal good but may also bring harms (intended or otherwise). The three organisations, the AI WG, the AI and Registration TaFG and the AI and Standards TaFG should give due consideration to the risks and opportunities presented by AI both in how they and the organisations they regulate conduct their business, but also in what is taught to students and in Continuing Professional Development (CPD) for the sectors that they represent.*

f. Opportunities using responsible AI - Risk Analysis: *Members note that AI may be used by applicants, interviewees, staff and the organisations to maximise quality of their respective outputs. However, while AI offers opportunities it also hides ethical issues such as: contribution to carbon emissions through data storage, analysis and the hardware used; reduction in workforce through cynical application of AI; increase in plagiarism through use of AI to create information and lifelike avatars. Due consideration should be given by the three organisations to the potential opportunities and their respective potential ethical issues. In this regard an ethical risk analysis is recommended and should be developed, adopted and followed by the three organisations.*

g. AI is a rapidly evolving discipline: *Members note that the recommendations described are not fixed but must be seen as markers on a rapidly moving conveyor belt. As AI develops and evolves, the recommendations need to evolve with it. It is recommended, strongly, that a standing AI ethics working group is established that contains AI developers, ethicists, members from the three organisations and the general public.*

This group should meet in a timely manner so as to inform the organisations of any further ethical issues they need to consider.

36. The Ethics TaFG also recommended that, given the rapid pace of change and development in AI it may be best to avoid any overly specific messaging related to AI as this may become quickly out of date.

AI and Standards Task and Finish Group

37. The AI and Standards Task and Finish Group (Standards TaFG) met three times during 2024.

38. The terms of reference invited the group to:

a. Consider risks and opportunities presented by AI systems to the approval and accreditation of programmes, the acquisition of knowledge and competence, and the professional review processes.

b. Consider whether any of the following may be appropriate, in response to AI:

   i. Changes or additions to minimum competence standards for registered engineers

   ii. Changes or additions to threshold learning outcomes for recognised programmes (approved or accredited qualifications, apprenticeships or degrees).

   iii. Guidance on use of AI in development, delivery and/or assessment of recognised programmes.

   iv. Guidance on how approval and accreditation processes might respond to AI.

v. Suggestions for use of AI in administration and management of programme recognition.

c. To consider whether, in response to discussion of the above (a and b), and any recommendations from the AI and associated TaFGs, any changes of additions are needed to:

  i. UK-SPEC (including the competences specified)

  ii. AHEP and associated guidance

  iii. AAQA and associated guidance

  iv. Learning outcomes for AHEP and AAQA

  v. Engineering Council regulations related to programme recognition (approval and accreditation).

d. If appropriate, make recommendations for additions or changes to the Engineering Council RfR, Standards and/or guidance.

e. If appropriate, make other recommendations to the AI WG.

39. At the first meeting members discussed:

a. Concerns about use of data, including whether users have appropriate permissions, security of data and the need for an ethical framework.

b. That AI presented huge opportunities in relation to teaching and learning, including for LLMs to give quick feedback to students to aid their learning.

c. Risks of academic malpractice and assessment approaches, and whether guidance on assessment should be developed, noting:

  i. Students commissioning work was not new but AI provided a new way to quickly and freely commission work.

  ii. Even if academics suspect that AI was used to complete a piece of work, there is no way they could prove it, making it difficult to have consequences.

  iii. PEIs need to consider how education providers' quality assurance (QA) procedures deal with malpractice and ensure learning.

  iv. Proctoring is not considered acceptable in the UK.

  v. Face to face assessments such as examinations, computer assessment in exam conditions, discussions, and student presentations make it easy to be sure work has been completed by the student. However scalability is a challenge.

  vi. Varied assessments are important for inclusivity.

  vii. At the time, in late 2023, ChatGPT was capable of producing work that demonstrated the requirements of AHEP for BEng but not CEng due to the level of analysis required. That difference won't last long as LLMs improve so AHEP 5 needs to distinguish between levels differently.

  viii. Any updates to Engineering Council Standards or guidance need to be implicit rather than explicit as IT changes rapidly.

  ix. Choice of assessment is important and something where advice or sharing of good practice may be useful, but not something the Engineering Council or PEIs should dictate.

  x. Guidance on assessment or examples of good approaches published by either the Engineering Council or PEIs was likely to be interpreted by accreditors and academics as requirements or a 'tick list'.

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Therefore it might be useful if guidance could be developed with a non-regulatory partner such as Advance HE or the Engineering Professors' Council. It was also suggested that the Engineering Council might consider not issuing guidance. This was due to concern that different PEIs might produce inconsistent guidance, and also that there was a risk that guidance might be treated by some accreditors as a tick list when they should look at whether assessment is appropriate in specific circumstances.

40. Members of the Standards TaFG and the wider AI WG were invited to complete a survey in between the first and second meetings of the Standards TaFG. The questions and responses are presented in Appendix A.

41. At their second meeting members of the Standards TaFG questioned whether Engineering Council Standards should explicitly cover AI, noting:

    a. There was a risk if AI were explicitly addressed, the Standards would quickly go out of date.

    b. If AI was specified, consideration would need to be given to specifying other technologies.

    c. UK-SPEC needs to be broad enough to cover a wide range of applicants for registration, whose involvement with AI will vary.

    d. All the UK-SPEC competences and AHEP 4 learning outcomes could potentially pick up AI, but some clarification and signposting may be useful. Identified examples of where current Standards and learning outcomes could relate to AI include:

       i. Security related to use of AI (although the intended coverage of security was wide and could for example include IT and data but also physical security including in the built environment). It was suggested that there might be a need for further clarification related to security learning outcomes.

       ii. Appropriate use of AI as part of professional conduct.

       iii. AI within the context of analytical tools and techniques.

       iv. Ethical use of AI and data (in industry and education).

       v. Engineer and society (sustainability, including environmental impacts of servers; ethics; risk; security and EDI).

       vi. Communications.

       vii. Lifelong learning.

    e. consideration should be given to adding an AHEP learning outcome under the section 'The Engineer and Society' related to societal and technological change. This could potentially address AI and other wider changes, including potentially some that might not yet be known. This might help to future-proof the learning outcomes in a world where the pace of change is increasing and may help HEIs to update programmes in between cycles of Standards review.

42. At their July meeting the Standards TaFG members suggested that the following questions could usefully be considered by the AI WG, these questions were revisited by the TaFG at their third meeting in September (when the additional comments presented in italics were made):

a. Do the competences and learning outcomes cover AI sufficiently or would we want to suggest additions, perhaps to include learning outcomes related to societal and technological change? *Yes, members would like that included. However, terminology and wording would need to be developed*

b. Should guidance be issued, if so by whom, in what format and to say what? *Members believed that some guidance or a toolkit would be helpful, particularly for HEIs, as a means of sharing good practice. AI WG members could potentially help to produce guidance to be shared by the EPC.*

c. Would it be useful to produce guidance to 'nudge' behaviour, for example to encourage use of authentic assessment, before a change might be more explicitly picked up in a later iteration of the Standards? *It was agreed that this needed further discussion.*

d. Would it be useful for some new things, for example societal and technological change, to be added to learning outcomes but not expected as competences until a later Standards review? *Members agreed that they would like them added to the learning outcomes within AHEP in the next Standards review with the view that it would filter into the competences at a later date.*

43. At their September meeting Standards TaFG members agreed that it would be beneficial to include reference to digital technologies and their impact on society within the standards. Members suggested using the broader term "digital technologies" rather than "AI" specifically, to attempt to keep standards future proof.

It was also agreed that embedding the principles of professionalism and competence into the Engineering Council Standards, for students/ early engineers to understand in the context of societal change, should be a recommendation of the AI WG.

44. It was also noted at the September meeting that one member had raised a number points which others felt were beyond the scope of not just the TaFG but also the Engineering Council's remit as a non-statutory regulator. These points had been shared with the Head of Data and Communications for his potential consideration.

Recommendations from the AI and Standards Task and Finish Group

45. The Standards TaFG Chair concluded the September meeting by suggesting the following recommendations

a. Guidance may be helpful but it should be hosted outside the Engineering Council so seen as a resource rather than prescriptive.

b. Guidance on authentic assessment would be useful.

c. Awareness of technological changes and associated societal impact should be addressed in learning outcomes in the next Standards review and competences probably in a later Standards review.

AI WG meetings

46. The AI WG met twice in 2023 and four times in 2024.

47. Outcomes from the first three (held in October 2023, November 2023 and January 2023) AI WG meetings included:

    a. Confirmation that AI had not been discussed with the Engineering Council's international partners.

    b. Agreement to set up sub-groups (referred to as Task and Finish Groups) to allow more focused discussion to feed into the AI WG and support collaborative discussions with the Science Council and the Society for the Environment.

    c. Agreement that the WG would not try to define AI.

    d. Agreement that the priorities of the WG would include to consider opportunities and challenges for professional registration processes associated with the growth of AI, including:

       i. Use of AI by applicants for registration.
       ii. Use of AI in assessment of competence and commitment.

    e. Setting up of a MS Teams channel to allow WG members to share relevant documents.

48. The fourth AI WG meeting, held in April 2024, focused upon updates from the TaFGs and wider updates from members. Member updates highlighted:

    a. The IET was investigating new anti-plagiarism software to detect AI use.

    b. Emerging AI technology for face swapping may pose opportunities and risks for Professional Review Interviews.

Potentially these could be a positive opportunity for EDI.

49. The fifth AI WG meeting, held in September 2024, focused upon updates from the TaFGs and feedback from two consultation surveys (presented as Appendix B to this report).

50. AI WG members were invited to discuss both the consultation report and recommendations from the TaFGs but did not reach clear conclusions in terms of agreeing recommendations for inclusion in the consultation report and/or to the Engineering Council and other organisations. A suggestion was made that an infographic be produced, but it was unclear what purpose this might serve or what information it might usefully contain.

51. A sixth and final meeting was held on 11 November 2024. During this meeting members agreed the following:

    a. To sign off this closing report, including the recommendations within it.

    b. That the AI WG be stood down, but members' details would be retained for a year (unless any individuals requested them to be removed) in case the Engineering Council, Science Council and/or the Society for the Environment wished to further consult members or invite volunteers to contribute to any future related work.

    c. The Engineering Council, Science Council and Society for the Environment should keep each other informed of their developments in this area.

Appendix A - AI and Standards survey of AI WG members

1. How does AI currently fit within <u>UK-SPEC</u>?
- Is technology suitably addressed?
- If not, where could technology sit within the standards?
- AI is not explicitly covered under the current UK-SPEC, which broadly focuses on engineering principles and problem-solving, lacking specific reference to AI technologies.

No, it is not specifically addressed. AI could be integrated into the competence and commitment standards by emphasising proficiency in emerging technologies, including AI, as part of the engineers' commitment to maintain up-to-date knowledge.

UK-SPEC refers to technology which seemed to be the term favoured in the meeting. As the Standards are reviewed approximately every 5 years but competences and learning outcomes (LOs) should last a career (with supplements through CPD) it might be sensible for any specific mention of AI as a fast moving tech and current trend topic to be in guidance or the Standards text rather than the competences and LOs.

Each of the Standards refer to some of the topics raised by the AI and Ethics TaFG eg diversity and inclusion (although not equity or equality or digital divide) TaFG may want to consider if the link between these and technology needs to be explicit (this could be in competences, LOs, Standards text or guidance) as well as whether anything raised by the Ethics TaFG is missing or needs better presenting.

AI has been around for many years with Expert Systems first created in the 1970s. However, recent developments in Deep Learning and large language models have raised awareness in the general public of the capabilities of the latest advances in AI with the through the release of systems like ChatGPT.

For all the registration categories covered by UK Spec, each of them has a section covering "Knowledge and Understanding" which is quite generic in terms of subject disciplines. As such there would be no need to mention AI specifically in this section.

My overall comment is that, as AI is basically a knowledge based system, the technology is suitably addressed in the standards. For example, AI is a more powerful technology form of the expert systems and neural networks which are knowledge based engineering tools encapsulating technical knowledge and/or expertise. In UK-Spec, AI would be addressed under the competence requirement for IEng and CEng. AI could be referenced under Example of Evidence in Section A, Knowledge and Understanding. For IEng this would be an example of 'Taking steps to develop and extend personal knowledge of appropriate technology, both current and emerging'. For CEng this would be an example of 'Understanding the current and emerging technology and technical best practice in your area of expertise'.

The use of AI and Chatbot programmes such as ChatGPT would also be addressed under ethical issues but there are measures in place to prevent the abuse of AI technology.

Broadly, AI could fit within the UK-SPEC for all 5 areas, being mindful that aspects of AI should not be over-assessed when it comes to recognised qualifications. However, if asked to be more specific, then the category of "Knowledge and understanding" in the context of AI could be most appropriate.

Here is what AI (ChatGTP) makes of this question....

To explicitly incorporate AI technology within UK-SPEC, the following updates could be considered:

1. Knowledge and Understanding (Section A): Include specific references to understanding AI principles, machine learning algorithms, and data science techniques as part of the required technical knowledge for engineers.

2. Design and Problem-Solving (Section B): Highlight AI as a tool for innovative design and complex problem-solving, encouraging engineers to integrate AI solutions in their projects.

3. Professional Commitment (Section E): Emphasize the ethical implications of AI, including considerations for bias, transparency, and accountability in AI systems.

These additions would ensure that the standards remain relevant in the context of rapid technological advancements and prepare engineers for the challenges and opportunities presented by AI.

I think AI has made a pretty good summation here, but because this is such a new technology the current engineering pool of trained assessors are currently not equipped to assess people who may be developing AI into engineering products. I am aware of at least one real case where this has happened.

I have always found software one of those difficult technologies where it can have a strong engineering content, when used to solve real engineering problems, conversely many people working with software are working with code / prewritten modules with little to no engineering content. Assessors we never really look at the detail of their coding work, so for me it's always been a grey area on the edges of true problem-solving engineering.

My own views would be to look for the AI methods and collation of good source data to train the machine learning algorithms, and then to verify the outputs from the programme, against parallel run traditional methods. All AI programmes must also be risk assessed, especially if the programmes are being run in safety critical environments, with consideration of multiplex systems.

It also calls into play ethics, by timely recalling a programme that fails to meet its design aims. In the longer term, we (humans) are going to need AI programmes (police-bots) to perform independent real time monitoring of machine learning output. That can 'whistle blow', when a programme starts to operate outside of a set of well-defined baseline limits. How we manage the rehab training is anybody's guess at this time.

While GenAI could be seen to fit under a few different areas, an explicit acknowledgement inherent to understanding its use and limitations, and ethics associated with it, would be valuable

Technology not currently addressed. AI can fit in A2, B1-B3 and possibly E5. Active engineers will be using AI – how are any ethical issues identified and managed (can be part of risk constraints in B2, etc.

As has been discussed at AI WG meeting AI is 'just' another source. To the extent that no technology is explicitly addressed in UK-SPEC then there is no need to AI to be treated differently in this regard. The Professional and Ethical Behaviour coverage in the spec addresses the potential misuse of AI in common with any other technology that might be misused for similar purposes.

2. **How does AI currently fit within AHEP 4?**
   ◦ Is technology suitably addressed?
   ◦ If not, where could technology sit within the standards?

AHEP 4 generally addresses integrating new technologies in curriculums, possibly including AI as individual institutions decide. AI lacks specific guidelines within AHEP 4, indicating a general but not explicit inclusion. AI could be specifically included by defining standards for AI education in engineering programs, ensuring graduates are well-prepared to work with AI technologies.

UK-SPEC refers to technology in the competences, the LOs don't and this probably needs addressing

Universities should be teaching at least an awareness of AI in all their Engineering related programmes. For some programmes this could just be covering the capabilities and limitations of AI, whilst other programmes will be probing an in depth understanding how AI systems operate and how they are developed.

The relevant AHEP4 Area of Learning for AI would be Science, Mathematics and Engineering Principles and Engineering Analysis. In AHEP4, graduates from an accredited programme must achieve the prescribed Learning Outcomes with emphasis on the ability to apply knowledge. AI is an important source of engineering knowledge and analytical tool for problem solving.

Given the rapidly changing nature of the field of AI it would not be appropriate to specify particular technologies. However, as all registration categories covered by AHEP4 have a section "The engineer and society" it might be appropriate for this to include a new area of learning "Artificial Intelligence" with a requirement along the lines of "An appreciation of the capabilities and limitations of Artificial Intelligence". This would ensure that accredited programmes at least introduce the topic of AI to their students.

There is no doubt that AI is a powerful tool for students. However, there is the potential for plagiarism where a student submits work for quality assessment which has been generated using an AI tool. The misuse of AI in the example of plagiarism would be covered under Ethics and HE establishments have well established policies and procedures for dealing with such malpractice.

In terms of AHEP4, this technology could be introduced at foundation degrees in EQF Level 5, and thereafter integrated in Level 6 and 7. This could fit within the scope of "Engineering practice", and/or "Engineering analysis"

I lead an IET accreditation working group working at producing guidance in relation to the teaching of risk and security LOs and we discussed AI in this context - AI tools fits as an example of disruptive technology, and therefore could be an example for a case study when considering risk. (AHEP LO 9). We don't think the standard should necessarily mention specific technologies as these change over time and with fashion (quantum computing would be another current example of a potential disruptive technology). The AHEP 4 standard already includes mention of contract cheating as an issue in relation to assessment and the use by students of AI is therefore already covered. Potentially this could be more explicit but I think the current standard is sufficiently broad to cover this issue already.

Likewise, while certain learning outcomes could be related to GenAI, given its increasing importance and concerns raised about it in higher education, ensuring students are educated to use GenAI for engineering soundly, ethically, and effectively would be future-proofing the next AHEOP.

Technology not suitably addressed. Beneficial/ethical use of AI as a component of a learning outcome. Clarity of sanction for non-ethical/non-declared use of AI

Essentially the same response as to that above for the UK-SPEC. The rate of technological change is such that tying any spec into a technology will only create a maintenance nightmare. Pointing out to guidance on the use of AI, which can be maintained in a more agile manner, is probably the best (lightweight but effective) approach.

3. How does AI currently fit within AAQA?
  - ◦ Is technology suitably addressed?
  - ◦ If not, where could technology sit within the standards?

AAQA focuses on the quality and rigour of academic programs more than on specific technologies, potentially including AI under broader technological competencies. Like other standards, AAQA does not explicitly address AI. AAQA could develop specific guidelines or criteria to evaluate how institutions incorporate AI and other rapidly developing technologies into their curriculum.

UK-SPEC refers to technology in the competences, the LOs don't and this probably needs addressing.

Like UK-Spec this is a generic document and there is no specific need to include AI in the document. Similar comments on the risk of plagiarism as made in the answer to Question 2.

This would be a similar approach to that of AHEP4, and appliable within the category of "Knowledge and understanding" an/or "Design, development and solving engineering problems" in terms of AAQA table of competences

Technology not suitably addressed. Beneficial/ethical use of AI as a component of a learning outcome. Clarity of sanction for non-ethical/non-declared use of AI

4. Mindful of the need to avoid unduly tying ourselves to current technology, what is the suitable terminology to use when referring to AI in the context of standards?
Terms such as "emerging technologies," "digital competencies," or "technological literacy" are recommended to provide a flexible framework adaptable to future technological advancements.
UK-SPEC refers to technology which seemed to be the term favoured in the meeting.
AI is a knowledge based engineering system / tool encapsulating technical knowledge and/or expertise. It is now accepted as a technical term for the technology in the same way that expert systems and neural networks are accepted terms for specific knowledge based technologies. *The respondent included an image, but as this appeared to have copied from the internet this is not included to include copyright infringement.*
Alternative suitable terminologies could include "digital technology", "cognitive computing methods", "digital computational methods" or "knowledge engineering". This could include use of natural language processors (ChatGPT), generative design in CAD, machine learning, etc.
AI again…   1. Advanced Computational Techniques: This term covers a range of technologies, including AI, machine learning, data analytics, and other evolving computational methods.   2. Emerging Technologies: This term allows for the inclusion of current and future technological developments beyond AI, ensuring the standards remain relevant as new innovations arise.   3. Intelligent Systems: This encompasses AI as well as other systems that exhibit intelligent behavior, such as robotics and advanced automation.   4. Digital Innovation: This term broadly covers technological advancements in digital technologies, including AI, cloud computing, and the Internet of Things (IoT).   5. Data-Driven Technologies: This term highlights technologies that rely on data processing and analysis, which includes AI and big data analytics.   Lots to consider here, or a mix of words. My take would be 'Emerging Data-Driven Intelligent software System'.
Generative AI (GenAI) is the correct way to refer to what the public sees as the recent rise of AI. Ai has been around for decades, it is GenAI that has triggered a massive step-up in the public knowledge and interest, and the capabilities of GenAI.
Any artificial intelligence/machine learning/data mining tool – suggest *"Artificial intelligence (AI) refers to computer systems capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems."*
Don't try to define anything. Stick with "AI/ML" as an umbrella term for the time being until either an alternative set of more useful terms wins out, or sufficient of a consensus on what AI/ML actually means emerges to make it the winner by default.

5. Taking into consideration the above answers, do you think there should be guidance created regarding the use of AI, as well as the inclusion in the standards?

If yes, how should this guidance be shared?

Yes, guidance should be created. This guidance should be disseminated through updates to existing standards, official documentation, and professional development programs and workshops for educators and practitioners.

I think this need further discussion and research. Do education providers address this sufficiently or do they need guidance? If EngC doesn't provide guidance there is a risk of inconsistency including potential for PEIs to publish their own inconsistent guidance/address inconsistently in training but if EngC issues guidance there are risks of it being treated as regulatory and/or a tick list.

AI represents a new knowledge based technology with tremendous potential benefits in many engineering fields. There are obvious risks of malpractice from the use of AI tools such as Chatbot programmes. As the benefits of AI greatly outweigh the threats from the use of AI tools, Higher Education (HE) establishments are best placed to provide guidance on their use.

We do not consider that general or specific guidance on AI should be included in these standards.

Yes – this guidance should be shared are part of AHEP4.5; or aspects of ethical use of AI and good practice in the Engineering Council Standards and Guidance pages.

AI Again…

Yes, guidance regarding the use of AI should be created and included in the standards to ensure that engineers are well-equipped to handle AI technologies responsibly and effectively. Here's how this guidance can be structured and shared:

1. Development of AI Guidance

Content of the Guidance:
- Ethical Considerations: Address issues like bias, transparency, accountability, and the ethical implications of AI.
- Best Practices: Include industry best practices for designing, developing, and deploying AI systems.
- Regulatory Compliance: Ensure engineers are aware of relevant regulations and standards pertaining to AI.
- Risk Management: Provide strategies for identifying and mitigating risks associated with AI implementation.
- Continual Learning: Encourage ongoing education and professional development in AI and related fields.

2. Integration into Existing Standards

Amend UK-SPEC:
- ◦ Include Sections on AI: Incorporate sections that specifically address the use of advanced computational techniques and intelligent systems.
- ◦ Case Studies and Examples: Provide examples of AI applications within the existing framework of engineering competencies to illustrate how AI can be integrated into professional practice.

3. Dissemination of Guidance

Online Resources:
- ◦ Dedicated Webpage: Create a section on the Engineering Council's website with detailed guidance documents, FAQs, and resources related to AI.
- ◦ Webinars and Online Courses: Offer webinars, workshops, and online courses to educate engineers about AI technologies and their applications.
- ◦ Professional Development:
- ◦ Continuing Professional Development (CPD) Programs: Include AI-focused modules in CPD programs to ensure ongoing learning and adaptation to new technologies.
- ◦ Collaboration with Professional Institutions: Work with professional engineering institutions to disseminate guidance through their networks and member communications.

Publications:
- ◦ Guidance Documents: Publish comprehensive guidance documents that can be downloaded or accessed online.
- ◦ Newsletters and Journals: Regularly feature articles and updates on AI in professional newsletters and journals.

Events and Conferences:
- ◦ Workshops and Seminars: Organize workshops and seminars at engineering conferences to discuss AI technologies and their implications.
- ◦ Panel Discussions: Facilitate panel discussions with experts in AI and engineering to share insights and experiences.

Benefits of Providing AI Guidance
- ◦ Ensures Ethical Use: Helps engineers understand and mitigate ethical concerns related to AI.
- ◦ Promotes Best Practices: Encourages the adoption of best practices in AI development and deployment.
- ◦ Enhances Competence: Improves the overall competence of engineers in handling advanced technologies.
- ◦ Keeps Standards Relevant: Ensures that professional standards remain up-to-date with technological advancements.

By developing and disseminating comprehensive AI guidance, the Engineering Council can ensure that engineers are well-prepared to integrate AI into their professional practice responsibly and effectively.

Better than my answer would have been!

Yes, first in the form of an appendix/supplementary to UKSPEC, AHEP, AAQA, to provide guidelines and clarifications, and ultimately integrated in the respective documents.

Yes, both guidance and inclusion in standards. Guidance to be shared in same ways as UK-SPEC/AHEP/AAQA

Create guidance – maintained by EC (?) and have standards point to the guidance, with regular (e.g. annual) review of the guidance material. Do not replicate material in standards – that maintenance nightmare again. Also there is bags of policy/guidance material already out there which could be adopted/adapted, rather than starting from a green field site, however, tempting that might be.

Appendix B - Consultations summary report

AI Consultations Feedback Summary Report

Introduction and Background

Generative AI is a broad label that's used to describe any type of Artificial Intelligence (AI) that can be used to create new text, images, video, audio, code or synthetic[1]. The launch of ChatGPT in late 2022 popularised the use of generative AI, which is rapidly altering the landscape of higher education (HE). The ability of generative AI tools to produce human-like language and images has sparked an international debate about AI's influence on education, and particularly learning and the assessment of learning.[2]

Consequently, the AI Working Group (AI WG) was formed in late 2023 to consider implications of AI for registration and programme recognition.

Representatives of the Science Council and the Society for the Environment have been involved, alongside Engineering Council staff and volunteers. A collaborative approach aimed to share expertise and minimise inconsistency as there is some overlap in the professional bodies and individuals represented by the three organisations.

The AI Working Group decided that it would be best to have three sub-groups to enable conversation to be more focused between working group members with the right expertise.

These sub-groups would feedback updates and recommendations to the main AI WG.

The three sub-groups have considered AI in the following contexts:
- ◦ Registration (this is joint activity with the Science Council and the Society for the Environment)
- ◦ Ethics (led by the Engineering Council with inputs from the Science Council and the Society for the Environment)
- ◦ Engineering Council Standards (considering how UK-SPEC, AAQA and AHEP might address AI with a view to making recommendations to inform the forthcoming Standards review).

There has been a lot of fast-paced development in the technology surrounding AI and an increase in its use, during the past two years (2022 – 2024). With this increased use, concerns had been raised in the engineering world regarding the misuse of AI by engineering students and applicants for registration. This survey report aims to provide insight into the amount of use of AI by students via Higher Education Institutions (HEIs) and applicants via Professional Engineering Institutions (PEIs), and HEI and PEI responses to the growth of this technology.

This report presents feedback from two separate surveys. Both HEIs and PEIs were surveyed individually on their use of AI at the request of the AI WG. Feedback from PEIs was collected through the Licensed PEI Heads of Membership Survey and the feedback from HEIs was collected through the Engineering Council AI Survey of Engineering Educators that was included on the Engineering Professors' Council (EPC) website.

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1   Rouse, 2023
2   Canterbury Christ Church University website (https://www.canterbury.ac.uk/learning-and-teaching-enhancement/resources-for-academics/ai-staff-guidance.aspx)

The HEIs who have responded are members of the EPC and have shared their experiences in relation to AI.

This data will help to inform further discussions of the AI WG. Use of AI by applicants and institutions is a topic of interest for Registration Standards Committee (RSC) and is being investigated by the AI WG and its subgroups.

Questions and Responses from Engineering Council AI Survey of Engineering Educators

Note that responses have been anonymised. Many responses included links to an HEI's policy or guidance documents related to AI and such information may be publicly available on HEI websites.

1. **Does your Department or HEI have any regulations or guidance in relation to the use of AI by students?**

There were twenty-one responses to this question. Five HEIs responded to say that they did not know if their department or HEI had any regulations or guidance in relation to the use of AI by students. Two HEIs said that there were no regulations in place. The remaining 16 HEIs responded to confirm that they did have regulations or guidance in place. Most responses were in the form of links to HEI documents (seven responses including links), other responses were:

   ◦ We have guidance at HEI level, but unfortunately, they are internal access only.
   ◦ Currently being updated for approval at university level.
   ◦ On website.
   ◦ It is in the process of being prepared but I am unaware of it being put into the regulations yet.
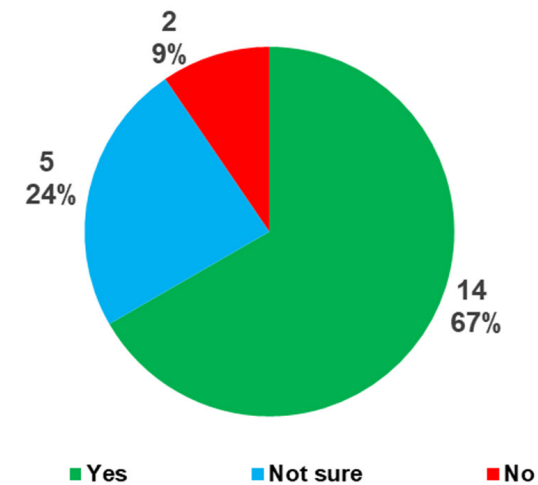
All the links provided demonstrated a similar perspective on the use of GenAI by students for their studies and assessments. All HEIs commented to agree that AI could be a very useful tool to aid learning, and its effective, responsible use is likely to be a desired trait for employers. However, its use must be guided by principles of academic integrity and with awareness of the risks it poses, when not used with care. Each HEI has outlined how to responsibly use AI for certain aspects of assessments such as grammar, spelling, helping to create ideas and critically analysing written materials to assess validity. All HEIs warn against the potential accuracy of GenAI results. All HEIs request that the use of AI be referenced, cited and in some cases described throughout written work and lack of referencing could be seen as being dishonest and treated as academic misconduct following existing rules for plagiarism.

2. Does your Department or HEI have any regulations or guidance in relation to the use of AI by teaching staff?

There were 21 responses to this question. Five HEIs responded to confirm that they did not have regulations or guidance in place in relation to the use of AI by teaching staff. Six HEIs responded to say that they did not know if guidance or regulation were in place. The remaining ten HEIs confirmed that they had regulations or guidance in place. Seven responses included links, another stated:
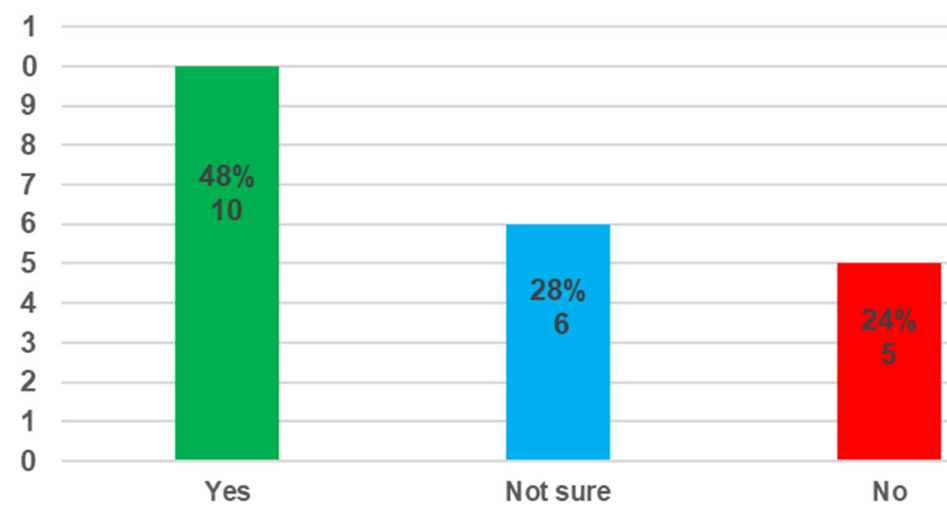
- ◦ We have guidance at HEI level, but unfortunately, they are internal access only.

All HEIs that provided the below links and answered "Yes" to this question have taken a similar approach and have opted to promote ethical and transparent engagement with GenAI tools rather than seek to ban them. Discussing GenAI with HEI students is essential to help develop a shared understanding of its appropriate use and to support students in building critical AI literacy. The below links take you to detailed toolkits and guidance for HEI staff to review course assessment, develop course curriculums and mitigate the immediate risk of AI use for academic malpractice.

3. What if any changes have been made to engineering curriculum in your department in response to growth in AI?

There were 19 responses to this question. To summarise, eight HEIs confirmed that they had made changes to their engineering curriculum. Four HEIs have introduced regulations for the use of AI by students for assessments. Seven HEIs responded to say that no changes had been made to their curriculum.

From the responses to this questions seen below, you can see that HEIs are going through a period of change with how and when to integrate AI into their curriculums. Some HEIs have added new modules or AI content to existing modules. Others have not changed the curriculum but have introduced AI in practice as part of student's learning experience. Other HEIs are having departmental wide discussions on the topic and some have not made any changes at all. The majority of HEIs answered "Yes" to this question.

Training on ethics associated to AI.	Additions to module content (and in some cases new modules), which cover AI techniques for decision-making, inclusion of Python programme and application of various AI techniques to problem solving.
We are making changes not so much in curriculum as in teaching and learning experience and practice: for example introducing more expectation on continuous reflective activity from students, to enable students to demonstrate their own learning and progress, to move away from the sense of a 'final outcome' (such as an assessment) being the only thing that really matters; since it is the ongoing practice, including reflection and learning, of engineering that engineers do and that AI is (at the moment anyway) not capable of. We have also been focussing a number of student projects on the role of AI in teaching and learning, as a method of basing future development directly on the evidenced student-level experience of how AI tools can help, and what they are not good for. It is clear to us that a 'frozen in time policy' is no use in such as rapidly developing scenario, and anyway would only miss the opportunities that AI tools represent to enhance learning and practice: instead we need to understand (and help students understand) the difference between AI use that is detrimental to learning, and AI use that helps learning. If we can help students focus on the latter, then we realise the opportunities and minimize the damage,	Changes to the training re academic misconduct and plagiarism for students
	To adapt to the growth of AI, engineering departments often update their curriculum by integrating AI content into existing courses or introducing new ones. This includes teaching concepts like machine learning and robotics and emphasizing skills like programming and data analysis. They may also encourage interdisciplinary collaboration with computer science departments, address ethical considerations, and offer practical industry experience. Regular reviews ensure curriculum alignment with AI advancements and industry needs.
	The focus of conversations at a department level has been around assessment, however more informally at a teaching level changes are being made to how we help students engage with and navigate the use of AI within their work.
A form needs to be completed for coursework to indicate they are AI proof, however this does not happen much in practice and is not well designed either, so it does not cover what it is supposed to.	AI heavily relies on data, and engineering curricula have started to emphasize the importance of data collection, management, and analysis. This includes courses in statistics, data engineering, and data visualization, which help students develop skills required for AI-related projects. The ethical implications of AI have gained significant attention as well. Engineering programs have begun including courses on AI ethics, responsible AI development, and societal impacts of AI. This ensures that future engineers understand the ethical dimensions of their work and can navigate the complex challenges associated with AI technologies.
AI in terms of machine learning for control and signal analysis has been integrated as new modules into the curriculum.	
We have a new introductory ML module at Master level, but otherwise we have made little change to the curriculum.	
We are continuing to assess the impact of AI for our assessments, and changing these in line with in depth discussions within the School.	Nothing

No changes to curriculum yet, other than access to options in AI delivered by Computer Science department.
Working to embed AI/Data Science throughout the engineering curriculum.
None
none as yet but we are discussing it positively
Nothing of any note
The assessment of what has been in the curriculum has been looked at so that More Face-to-Face examinations and in person class tests take place to ensure that standards are upheld.
None
No official changes as lot of the work students do is practical and this AI cannot easily consider.

4. **What if any changes have been made to assessment of engineering students in your department in response to growth in AI?**

There were 19 responses to this question. To summarise, five HEIs confirmed that no changes had been made to the assessment of engineering students. Fourteen HEIs confirmed that changes had been made to the assessment of engineering students. These included changes in the methods of assessment and declaration forms for student's work.

From the responses to this question seen below, it is common that the majority of HEIs have firstly focused on their modes of assessment to mitigate the risk of academic malpractice and plagiarism through the use of AI. These HEIs have made it clear what responsible use of AI looks like. You will see from the comments below, the variety of ways HEIs have changed their assessments.

Review of Assessment. Specifying where AI can be used.
A stronger shift towards results generation and analysis and less on presentation on style.
As in above response, we have been introducing more continuous reflection from students to improve the evidence of their ongoing learning, moving away from a single final 'assessed artefact' such as an exam or report. These reflections, judged carefully against criteria that students are given from the start, provide a way to assess students' learning that cannot be 'faked' by AI very easily, unlike eg parts of a report. We are finding that they are also helping to motivate and engage students, if used and presented int he right way. This is an ongoing task to roll out such changes across the cohorts, and will raise challenges of scale-up, but there are potentially strong gains for 'authentic' assessment.
A form needs to be completed for courseworks to indicate they are AI proof, however this does not happen much in practice and is not well designed either, so it does not cover what it is supposed to.

Assessments, especially online exams, have been reworded and checked to ensure robustness against use of generative AI to gain an academic advantage. That said, use of AI as a productivity tool, i.e. for language checks in coursework, have been promoted for those that it will benefit.

We have seen a move away from the recently introduced open book assessment back to traditional closed book 'memory test' exams.

We are changing a number of assessments, particularly for Project work or where the production of documents is required. We are looking to reduce the page count for these types of assessments and move towards other forms of assessment such as oral examination.

Modifications to coursework briefs which require analysis of data, and discussion of the engineering decision that results with justification for applying engineering judgement.

All coursework is submitted in soft form and run through Turnitin. I am not sure if we have the AI detection part of Turnitin, or how reliable that is.

Changes in engineering student assessment due to AI growth might involve integrating AI concepts into assessments, including coding tasks, data analysis using AI techniques, and evaluating critical thinking regarding AI solutions. Assessments could also cover ethical considerations and industry-relevant skills, with feedback loops to improve learning.

Clarification of where use of AI is allowable and where it is not. Some changes to wording and requirements of report and essay-based assignments.

Assignments can be structured in a way that incorporates individual assessment components, such as written explanations, analysis, or reflections. These components cannot be easily automated by AI, encouraging students to provide their unique insights and demonstrate their understanding beyond the technical aspects. Coursework assessments may involve in-person components, such as presentations, demonstrations, or practical exams, where students are required to showcase their abilities and knowledge directly to instructors or evaluators.

We have had to move all our online assessments to paper based due to the ease of passing due to AI. This will add extra stress to students who now have to carry out these tests in more strict exam conditions.

No major changes as yet, other than students to explicitly state if used in coursework.

Ongoing review.

None

none yet but we are discussing it positively

More Face-to-Face examinations and in person class tests

None

Not much

Licensee Heads of Membership Survey 2024 - Part 3: Use of and responses to Artificial Intelligence and other digital technologies

This survey was circulated to staff members of PEIs who look after membership for their institution. The below questions were included in a larger survey made up of three sections. The third section of this survey asked questions about the use and responses to AI and other digital technologies within the institutions to discover the developments of how they are dealing with the emerging risks and opportunities.

25. **Does your organisation have any policies on the use of AI by applicants when preparing their application/evidence for registration?**

There were two responses for "yes", one response for "not sure" and 23 responses for "no".

- Yes
- Not Sure
- No
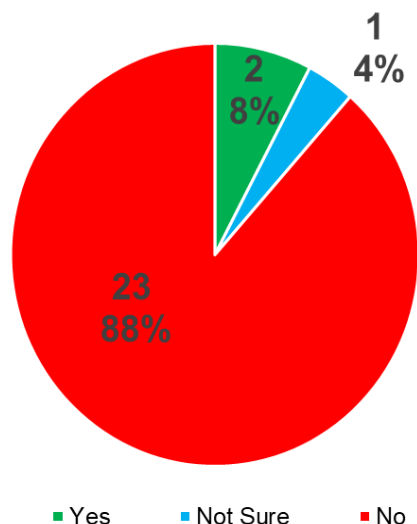
The below comment was submitted by one of the respondent's that answered "yes".

> Do not currently prohibit the use of AI for registration applicants, however, applicants must declare if AI has been used in the preparation of their submission and that it has only been used for purposes of presentation.

The below comment was presented by the respondent that answered "not sure".

> Committees have had informal discussions, but I don't believe there are any firm policies in place. It would be exceptionally difficult to identify with any significant rigour whether an applicant is "inappropriately" using AI: but what would be the definition of inappropriate? It is well accepted that the rigour of the PRI becomes increasingly important and must therefore also be rigorously monitored. Guidance from EngC for all PEIs to refer to would be helpful as learnings emerge

The remaining comments were left by respondents who answered "no". You will see that many PEIs are having discussions and that policies may be developed in the future. Some institutions have commented to say that applicants have to declare that their applications are authentic and not plagiarised.

> Not yet, we are experimenting with AI applications inhouse, to better understand the quality of response available.

> They are being developed.

No policies currently in place but have been considered and will be reviewed following the work of the AI Task and Finish groups. Applicants are required to confirm the work submitted is their own.

This is currently a discussion topic at our various committees

Not currently, but it will be included in applicant guidance on an upcoming iteration.

Currently under review.

Not yet, however this will form part of our IT strategy development from 2025-6.

It's something we will be looking to develop going forward but nothing is in place yet.

Not yet, but we are looking at this and plagiarism generally across the organisation

Discussions are starting to take place at Council and Committee level. We also nominated a volunteer to participate in the AI working group.

We do not believe it currently poses a problem; it is simply another tool. The application process, including the PRI, ensures that people understand the work they have prepared in their application. If they have added all their evidence to ChatGPT and had it produce the evidence, then they have still demonstrated their competence.

only that applications should be their own work

No but our guidance states that if the reviewers think that outside sources have been used to generate applications then they may question the submission

Our professional review guidance simply says that "The use of the internet, artificial intelligent (AI) software tools, search engines, contacting another person or accessing other devices, is not permitted during the Professional Review and Communication Task, except to access the MS Teams meetings, the login email from ICE, and the Communication Task page required to carry out the Communication Task."

26. **Has your organisation seen instances where applicants may have misused AI or other technologies when generating evidence to support their application for registration?**

There were two responses for "yes", five responses for "not sure" and nineteen responses for "no".
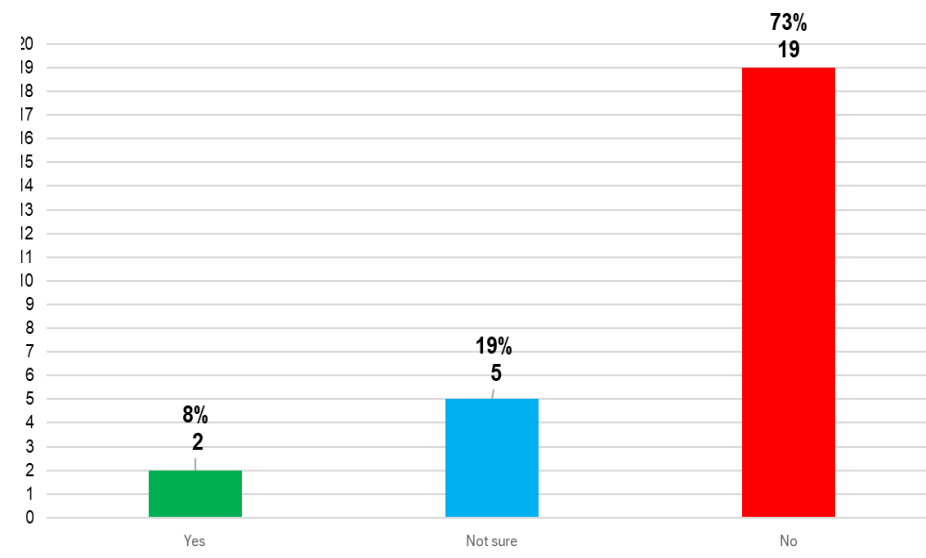
Two institutions answered "yes" and their comments can be seen below.

> Although we have indicated yes to this question, we have only seen applications submitted for professional membership that have been generated by AI.

> We had an instance of an applicant looking up answers online during an interview.   This was spotted by the interviewers and we generated procedure for interviewers to follow if this occurs.

Five respondents answered "not sure" and their comments can be seen below.

> ICP have picked up some sentences which haven't made sense, but these are picked up as part of the review.

> We have one instance which caused us to ask the applicant to confirm if AI had been used or not and from that developed our guidance.

> If we have, then we have not spotted it.

> We have instances of reviewers querying whether a candidate has used AI tools but no confirmed cases.

The remaining nineteen institutions answered "no" and their comments can be seen below. This shows that most PEIs have not seen or noticed GenAI being used for applications for registration. As some comments have suggested, this may be because registration is made up of multiple stages and untruthfulness would be noticed at the interview stage.

> Not specifically looking for it but applications have not changed overnight

> We are not aware of instances involving our registrants yet but have heard of them occurring elsewhere through our involvement with academic partners and other registration bodies
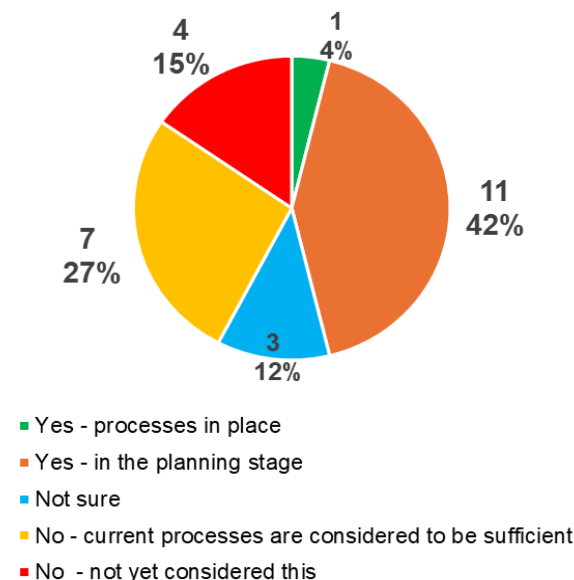
> Any evidence presented at PRI that is not the own work of the applicant will soon be found out during the interview process, but we have not had any instances of this being an issue.

> Science Council provided some examples recently which were discussed during a training session.

> We've seen no evidence of this.

27. **Does your organisation have any processes or plans to introduce processes to address risk of applicants misusing AI or other technologies when generating evidence?**

There were 26 responses to this question and the proportion of answers can be seen in the below pie chart.

- Yes - processes in place
- Yes - in the planning stage
- Not sure
- No - current processes are considered to be sufficient
- No - not yet considered this

One institution answered "Yes – processes in place" and commented that **"Applicants who misuse AI will be addressed under the [PEI]'s rules of conduct."**

Eleven institutions answered "Yes – in the planning stage" and their comments on how they will do this can be seen below.

We currently use software to determine whether AI has been used in another area of our business and are at the very early stages of considering if this software could be used in the registration process
Looking at the phraseology of questions in our application forms primarily for our own professional membership standard to ensure that it allows for personalisation of responses to ensure that AI is not used.
We are currently looking at this
We are considering what free or low cost plagarism software such as Turnitin may assist in scanning members Professional Review Reports
We are writing a policy document and will provide guidance to applicants - out of interest, how does EngC define 'misuse'
We are setting up a working group to look at the use of AI across all assessment methods.

Three institutions answered "Not sure"

Engineering Council guidance would be useful
Very early stages of considering this at present.

Seven PEIs answered "No – current processes are considered to be sufficient". These PEIs believe that the interview or Professional Review process would mitigate the risk of applicants misusing AI for their applications.

The final test will be the interview where AI cannot substitute for the candidates knowledge.
Role of applicant's sponsors and PRI deemed to be sufficient. Has been identified as a potential risk and position undergoes ongoing review.
Although current processes are considered to be sufficient, this is still a topic that is considered by the Institution's Digital Workflows Panel.
Proceses are considered to be sufficient for the time being, especially every application is dicussed in detail at Committee level. So concerns are normally brought to light. However, as mentioned in the previous question, the Society is starting to discuss and consider AI and look forward to the output from the AI working group.
It is thought that the interview stage is sufficient to verify knowledge and skills of the applicant. Keeping our minds open though in case instances occur.

Four PEIs answered "No – not yet considered this" with two commenting that it is either currently being reviewed or will be reviewed in the future.

not yet planned
Currently under review.
No – not yet considering this; but will keep it on the radar for when we have any experience to work from.

28. Does your organisation use or plan to introduce use of AI or other technologies to assist registration processes?

There were three institutions that answered "yes – in the planning stage", ten institutions that answered "not sure" and twelve institutions that answered "no".
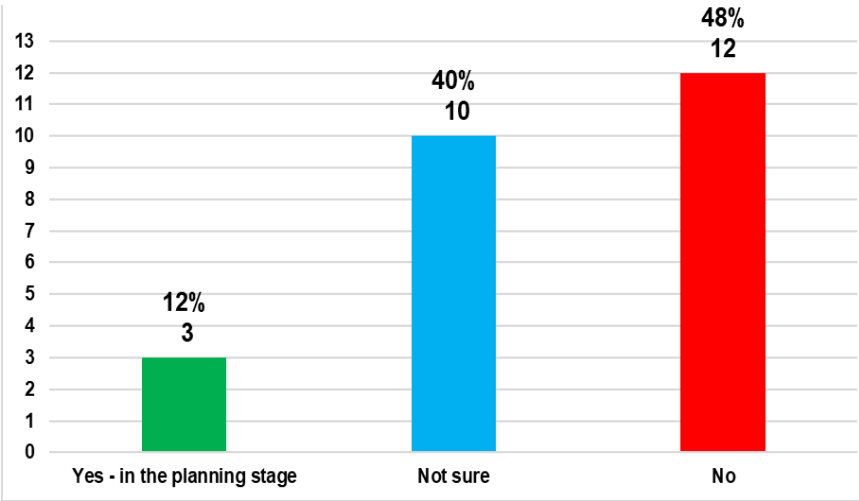
Three PEIs answered "Yes – in the planning stage" and their comments include examples of how this could be done.

Route Advice could be automated
Update team for the IET's Review Process System is actively investigating the use of AI and other assistive technologies for registration evidence and also for qualification verification.

Ten institutions answered "Not sure" but would consider reviewing in the future.

We presently need more understanding of what the technology can do
No current plans
Not at the moment. Possibly when we have some time to investigate.
Not at the moment. Possibly when we have some time to investigate.

Twelve PEIs answered "No" and their comments can be seen below.

No plans at present.
not yet planned
Not presently.

Summary of Responses and Conclusions

From the survey of HEIs, a maximum of 21 responses were received per question, with some questions receiving 19 responses. Each answer came from a different HEI and the feedback was collected through the Engineering Council AI Survey of Engineering Educators that was included on the EPC website. This consisted of four questions, and you will see that the majority of HEIs are providing regulations and guidance for their students and staff on the use of AI and making changes to their curriculum and assessments to reflect AI popularity.

The feedback reflects that some HEIs are at different stages in the period of change with the majority developing with the increase in the use of AI. There are also a smaller number of HEIs currently having department wide discussions around future changes that have not been made yet. Of the respondents to this survey, the smallest number of HEIs have not made any changes or provided any guidance for students and staff for the use of AI.

The survey of PEIs was circulated to staff members who look after membership for their institution. The questions were included in a larger survey made up of three sections. The third section of this survey asked questions about the use and responses to AI and other digital technologies within the institutions to discover the developments of how they are dealing with the emerging risks and opportunities. There were 26 responses to the survey from staff members of different PEIs.

You will see from the feedback collected and recorded above that contrary to the HEIs, the majority of PEIs have not yet put procedures or guidance in place for applicants or considered using AI to help assess applications. Some comments suggest that they are looking for guidance on the matter from the Engineering Council. From the respondents of this survey, there is a very low number of instances where PEIs have seen the misuse of AI for registration applications. The comments suggest that this could be because of the interview stage of the process mitigating the risk of fabricated applications. The majority of PEIs either have or are planning to have processes in place to deter applicants from misusing AI as part pf their applications.

Next Steps
Members of the AI WG recommend the following next steps, in response to this report:

d. Consider conducting follow-up surveys, to see if there are significant changes at a later date given the rapid pace of technological development.

e. Consider opportunities to collect and share best practice related to use of AI in education and within PEI registration and programme recognition processes.

f. Consider requesting consent to share beyond the Engineering Council some or all of the examples of regulations and guidance for which links were provided in survey responses.

g. Consider arranging best practice sharing workshops so that those HEIs and PEIs who are further along the journey of AI implementation can share lessons with peers.

Attachment A - Science Council guidance for assessors

The Use of Artificial Intelligence (AI) – Tips for Assessors

1. **Unusual Patterns**: Assessors should be vigilant in examining applications for any unusual patterns or indicators that could suggest the use of AI. These patterns may include exceptionally consistent formatting, language, or organisation throughout the application. If certain sections exhibit a high degree of precision or contain complex analyses or procedures that are beyond the expected capabilities of an individual applicant, it may be an indication of AI assistance.

2. **Language:** AI-powered natural language generation (NLG) models can assist in generating well-written and coherent content. Assessors should be attentive to language patterns that exhibit a consistently high level of fluency, grammar, and vocabulary which may appear sporadically throughout the application. Unusually sophisticated and error-free writing, particularly in areas where you would not expect the applicant's expertise to lie, might imply AI-generated content.

3. **Supporter Review**: All applications require a supporter to verify that the content of the application is true and accurate to the best of their knowledge. Science Council staff check supporter reviews as part of the pre-assessment checks. Assessors are also encouraged to flag anything that may strike them as unusual in the supporter review.

4. **CV:** All applications require a CV; this is primarily checked to ensure the applicant has the right length of work experience for the chosen register. This forms part of the application checks completed by SC staff. Assessors are encouraged to raise any discrepancies they find with the examples provided in the competence report and the information on the applicant's CV. Where the applicant's examples are not matching the applicant's listed experience, this could indicate use of AI.

5. **Requesting Clarification and Documentation:** Assessors have the right to seek clarification from applicants when assessing applications, this can include querying the use of AI in registration applications. As part of the review process, assessors can request additional documentation or evidence to support any suspicions of AI usage.

Attachment B - Useful AI related links from Teams Channel

Summary	Link
An introduction to AI for readers who are unfamiliar with the subject	What is AI? A simple guide to help you understand artificial intelligence - BBC News
Introduction to generative AI for readers who are unfamiliar with the subject	What is generative AI? Your biggest questions answered - FutureLearn
UNESCO guide to use of AI in HE	ChatGPT-and-Artificial-Intelligence-in-higher-education-Quick-Start-guide_EN_FINAL.pdf (unesco.org)
UNESCO guide to AI and education, including definitions of AI	AI and education: guidance for policy-makers - UNESCO Digital Library
Department for Education Statement on AI	DfE external document template (publishing.service.gov.uk)
Government paper on AI regulation	AI regulation: a pro-innovation approach - GOV.UK (www.gov.uk)
Russell Group principles on use of AI in education	https://russellgroup.ac.uk/news/new-principles-on-use-of-ai-in-education/
BCS report on AI and ethics	Living with AI and emerging technologies: Meeting ethical challenges through professional standards	BCS
Guidance and Standards for AI Practitioner Competence and Commitment:	https://istonline.org.uk/cms/wp-content/uploads/2023/10/ist-accreditation-ai-practitioners.pdf
EPC consultation response	EPC response to the DfE generative AI consultation
Ofsted's approach to AI	Ofsted's approach to artificial intelligence (AI) - GOV.UK (www.gov.uk)
ONR's recently published policy paper on regulating AI	ONR shares pro-innovation approach to regulating AI in the nuclear sector	Office for Nuclear Regulation

Queen's digital hub for AI	https://blogs.qub.ac.uk/digitallearning/ai/
Face-swapping in real time demonstration.	https://www.reddit.com/r/OpenAI/comments/1cchuwh/this_is_ai_its_so_over/
EPC response to DfE	EPC's response to the DfE call for evidence on Generative AI in education consultation
EU Artificial intelligence (AI) act: first worldwide rules on AI	https://euraxess.ec.europa.eu/worldwide/lac/news/eu-artificial-intelligence-ai-act-first-worldwide-rules-ai
BBC News Article	AI can beat real university students in exams, study suggests - BBC News
Evidence Base for the IEEE 7009 standard and supporting introductory guide.	Evidence Base
Office for Nuclear Regulation information	https://www.onr.org.uk/our-expertise/innovation/artificial-intelligence/