Engineering Professors' Council

Promoting excellence in engineering in higher education

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Ofqual A level reform consultation 2012

ENGINEERING PROFESSORS' COUNCIL

The Engineering Professors' Council

The Engineering Professors' Council (EPC) exists to promote excellence in engineering in higher education. Our primary purpose is to provide a forum at which academic engineers can exchange ideas about engineering education, research and other matters of common interest and come together to provide the authoritative voice of engineering in UK Higher Education (HE). All branches of engineering are represented within the membership: Aeronautical, Civil, Chemical, Electrical, Electronic, Manufacturing and Mechanical Engineering, as well as Minerals, Metallurgy and Marine Engineering, the broad areas of General engineering studies and those in which engineering is combined with a range of other topics. There are currently 77 institutional members encompassing around 10,500 academic staff.

Key points of response

- We welcome the involvement of universities in determining the content and standards of A Levels but believe strongly that the whole HE sector should be able to contribute, not just those represented by the Russell Group. This is a particularly inappropriate assumption for engineering as many universities outside of the Russell Group deliver high quality engineering programmes, as attested by the 'kitemark' of accreditation by the Engineering Council for Chartered Engineer or Incorporated Engineer registration and often in collaboration with major employers. Given that universities liaise extensively with, and academic staff are represented on, the learned societies, it may be that the latter are the appropriate primary set of bodies with which to work. In addition, we believe it is impractical and unrealistic to expect universities to be engaged with each of the five examination boards in all the major subjects – universities simply do not have the resources for this. We suggest National Subject Committees (NSCs) as a viable option with the powers to regulate implementation by the awarding bodies.

- While we agree that universities should be involved in determining content and standards (and there is more than one route to enable this to happen, for example through NSCs and/or through the learned societies on which universities are extensively represented), there is a significant risk in having universities endorse the qualifications offered by individual awarding bodies leading to these qualifications potentially becoming entrance examinations for those universities. There is then a risk of exclusion based on choice of awarding body rather than ability.

- We do not believe that paragraphs 41-44 cover the purposes of A Levels adequately. Firstly, the focus is almost exclusively on accessing Higher Education when A Levels perform an equally important indicator of ability for employers in recruiting school leavers. Secondly, it should be noted that A Levels are not the only route into Higher Education. The development and availability of alternative routes (to A Levels) into engineering at degree level remains a strong contributor to widening participation from non-traditional university entrants. Thirdly, many subjects studied at A Level lead to higher education (HE) study in a different subject and this is common in engineering. We believe that this needs to be recognised in the statement of primary purpose.

- We are sceptical about statements on content: style and approach are the points at issue. Analytical skills are vital and content-driven specifications tend not to describe these adequately. We believe that there should be a single regulated specification for a subject. Awarding bodies may interpret this in different ways but achievement must be measured against a common standard.

- We have specific concerns regarding modularisation which, we believe, has encouraged compartmentalisation and lack of depth of learning. Success in engineering requires a strong contextual understanding which we do not believe is tested adequately in STEM A Levels.

- We would emphasise that the current inadequate coverage of mathematics in science A Levels needs to be remedied: there needs to be an integration of learning and teaching across related subjects.

- The experience of our membership is that the mathematical ability of entrants to engineering degrees is insufficient. Our own research and that published in a recent report by SCORE, together with the prevalence of "remedial" and additional courses in mathematics for first year undergraduates across the HE sector shows that the coverage and assessment of mathematics is inadequate. Essay questions are not appropriate in testing mathematical ability: rather, the need is for testing the ability to analyse a substantial multi-step problem and to set out an extended answer with indications of reasoning. This does not mean, however, that we believe the standards of literacy amongst candidates are adequate: these too need to be addressed.

- We do not believe that setting out the balance and purpose of assessment is sufficient. All GCE exams must have a sufficient weighting for analysis, understanding and, in general, higher-level skills. Knowledge should not be too heavily weighted and synthesis and reflection seem to be absent from the list of assessment objects.

- We believe that any changes to the grading structure should be undertaken only if necessary and then, carefully and sensitively introduced. An alternative to changing the grading structure might be to add percentile information to the grade.

- We believe that STEM subjects should be considered for reform as a whole in order that our recommendations regarding appropriate integration between subjects is able to be addressed. This would mean considering Science subjects as a set alongside Mathematics, Further Mathematics, Computer Science and Design and Technology.

- We also believe that there should be a common implementation date for all subjects to avoid the very real risks of confusion. In addition, 2014 is far too early an implementation date and carries a very high risk of failure.

Questions on Section 1: Background and purpose

The following questions refer to Section 1: Background and purpose.

1. I believe that all equality issues have been considered in the accompanying equality analysis.

( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

2. Do you have any comments or suggestions?

While we welcome the opportunity to reform areas which are demonstrably weak in international comparisons, such as in mathematics attainment, there appears to be inadequate discussion about whether different types of assessment benefit different genders. This does seem to be a good opportunity to ensure that female students are encouraged to study the physical sciences and pursue careers that require such an educational background.

Questions on Section 2: What we hope to achieve

The following questions refer to Section 2: What we hope to achieve.

3. I support the general principles as set out in this section.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

4. I support the need for comparability of demand and content in different specifications in a subject.

(■) Yes
( ) No
Do you have any comments or suggestions?

In respect of the general principle, we are sceptical about statements on content: style and approach are the points at issue. Analytical skills are vital and content-driven specifications tend to miss the point. We believe that there should be a single regulated specification for a subject. Awarding bodies may interpret this in different ways but achievement must be measured against a common standard.

Questions on Section 3: Design rules - The purpose of A levels.

The following questions refer to Section 3: Design rules - The purpose of A levels.

5. I believe that Condition 1 adequately defines an appropriate primary purpose of A levels for regulation.

( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

We do not believe that paragraphs 41-44 cover the purpose of A Levels adequately. While the focus is almost exclusively on accessing Higher Education which is the primary interest of this body, it should be noted that A Levels are not the only route into Higher Education. The development and availability of alternative routes (to A Levels) into engineering at degree level remains a strong contributor to widening participation from non-traditional university entrants.

In addition, we believe that the wording of the first bullet point on page 16 is too loose ("*particularly (although not only) to study the subject concerned*"). Many subjects studied at A Level lead to HE study in a different subject and this is common in engineering. We believe that this needs to be recognised in the statement of primary purpose.

The following questions refer to Section 3: Design rules
Condition 2 - Size and grading.

6. A new grading structure should be introduced for new A levels.

( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

We believe that changes to the grading structure should be undertaken only if necessary and then, carefully and sensitively introduced.

That said, we do have some specific concerns regarding:

- the introduction of modularisation which, we believe, has encouraged compartmentalisation of learning ("*pass module/forget material*"). Success in engineering requires a strong contextual understanding of learning.
- The usefulness of A*/A grades. While this may be appropriate for the majority of candidates, for the most able candidates, these grades could helpfully be supplemented with percentile information.
- Use of pre-determined mark boundaries. We believe that this has been problematic. That said, the previous system of percentiles was also problematic with clustering of marks in the middle grades but at least allowed candidates to be ranked.

7. The current number of grades, as specified in Condition 2, is appropriate for discrimination.

( ) Strongly agree
(■) Agree

( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
While we broadly agree, we believe there needs to be stricter criteria than at present to achieve grades A* to C to allow greater discrimination between abilities.

8. Even considering the other changes being made to A levels, the A* grade (or similar) should be retained as it will continue to facilitate differentiation of achievement.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

9. The expectations for the performance of learners should be set out for the upper and lower levels of the grading scale (currently grades A and E).

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

We agree that performance expectations are very helpful and that contextual understanding and analytical skill should be emphasised strongly. The problem with simple mark-based grading is that candidates with some weaknesses can sometimes attain high grades. Criterion referencing can help eliminate this.

The following questions relate to the options regarding the future structure of A levels:

Condition 3 - Qualification structure and availability of assessments

10. The opportunity for assessment in January should be removed.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

11. I believe that Option 1 is the right option – Removing the AS qualification – which would mean a return to a linear two year course of study.

( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
() Disagree
(■) Strongly disagree

12. I believe that Option 2 is the right option – Making the AS a standalone qualification but where the results do not contribute to the A level.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

13. I believe that Option 3 is the right option – Retaining the AS qualification in its present form – but making changes as outlined in paragraphs 48-53.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions on these three options?

We believe that A Levels should be a holistic assessment of a 2 year course but that the "taster" qualification of AS should be retained as:

- It provides an indicator of VIth form performance at UCAS application time
- It provides a broader curriculum in year 12
- It allows students unsure of their future choices more flexibility and room to make up their minds.

While we have supported the option to remove the January assessment for academic reasons, the implications for equality impact and the effect on those with genuine mitigating circumstances, often the most vulnerable, need to be considered.

The following questions relate to Option 3 – Retaining the AS qualification – but making changes as outlined in paragraphs 48-53.

14. The opportunity for AS/A2 assessment and therefore resits in January should be removed.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

15. I believe that where a student resits an assessment the highest mark should count towards the student's qualification.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

16. AS and A2 should contribute equally to the overall outcome of A levels.

( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

I think that the weighting should be split as follows:
AS: 40%, A2: 60%

_____
_____
_____

Do you have any further comments or suggestions?

The resit, not higher, mark should be counted unless the student is absent from the resit exam (in which case another attempt should be permitted). That way a student with a genuine personal reason for impaired performance in the resit can choose at the last minute not to "use up" the attempt (at the penalty of having to wait another year).

We believe that the style of assessment should change at A2 to allow more substantial, synthesising questions requiring a strategic/analytical approach.

Questions on Section 3: Design rules – A level design

The following questions refer to Section 3: Design rules – A level design.

17. To enable Ofqual to secure standards in A levels (GCEs), the rules outlined in Condition 4 are:

Needed?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Sufficient?
( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

The experience of our membership is that the mathematical ability of entrants to engineering degrees is insufficient. Our own research and that published in a recent report by SCORE, together with the prevalence of “remedial” and additional courses in mathematics for first year undergraduates across the HE sector shows that the coverage and assessment of mathematics is inadequate. Essay questions are not appropriate in testing mathematical ability. Rather, a way of testing the ability to analyse a substantial multi-step problem and to set out an extended answer with indications of reasoning. This does not mean, however, that we believe the standards of literacy amongst candidates are adequate: these too need to be addressed. Condition 4 needs to include ways to promote full and appropriate coverage of mathematics in science A Levels.

18. To enable Ofqual to secure standards in A levels (GCEs), the rules outlined in Condition 5 are:

Needed?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Sufficient?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
While we agree broadly, we would re-iterate that the current inadequate coverage of mathematics in science A Levels needs to be remedied: there needs to be an integration of learning and teaching across related subjects.

19. To enable Ofqual to secure standards in A levels (GCEs), the rules outlined in Condition 6 are:

Needed?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Sufficient?
( ) Strongly agree
( ) Agree
( ) Neither agree nor disagree
(■) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
We do not believe that setting out the balance and purpose of assessment is sufficient. All GCE exams must have a sufficient weighting for analysis, understanding and, in general, higher-level skills. Knowledge should not be too heavily weighted and synthesis and reflection seem to be absent from the list of assessment objects.

The rules should be set at national level for all providers of a subject and not be at the discretion of individual awarding bodies.

20. To enable Ofqual to secure standards in A levels (GCEs), the rules outlined in Condition 7 are:

Needed?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Sufficient?
( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
While we agree broadly, it should be remembered that A Levels are not simply for university entry and the needs of employers need to be borne in mind.

21. I believe that a minimum of 60 per cent external assessment is the correct proportion for most subjects.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
We do not believe that "one size fits all" and that this will be different for different subjects.

22. I believe that the weighting of synoptic assessment should be flexible.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?
We are not clear on the definition of "flexible".

Questions on Section 3: Design rules – Qualification support
The following questions refer to Section 3: Design rules – Qualification support.

23. I believe that universities should be able to provide this level of engagement.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

24. I believe that the level of support required is sufficient to demonstrate that the qualification will allow progression to study at higher education.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

We welcome the involvement of universities in determining the content and standards of A Levels but believe strongly that the whole HE sector should be involved, not just those represented by the Russell Group. This is a

particularly inappropriate assumption for engineering as many universities outside of the Russell Group deliver high quality engineering programmes, often with the strong support of major employers. Given that universities liaise extensively with the learned societies, it may be that the latter are the appropriate primary set of bodies with which to deal. In addition, we believe it is impractical and unrealistic to expect universities to be engaged with each of the 5 awarding bodies in all the major subjects – HE simply does not have the resources for this. We suggest National Subject Committees (NSCs) as a viable option, with appropriate representation from all disciplines, including engineering on the science and mathematics awarding bodies, with the powers to regulate implementation by the awarding bodies.

25. Do you have any suggestions about how we might categorise universities as defined in Condition 8?

We believe this is ill-defined and requires extensive further discussion. However, proper engagement with the learned societies as suggested above may be one way forward, as would National Subject Committees with a balance of representation from universities, learned societies, employers, schools etc.

26. Would you propose a different number or proportion of universities providing support?

( ) Yes
(■) No

Do you have any comments or suggestions?
See our response above regarding universities' involvement.

27. I believe that the level of support required is sufficient to demonstrate that most universities will accept a qualification for entry.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

While we agree that universities should be involved in determining content and standards (and as we have indicated earlier, there is more than one route to enable this to happen), there is a significant risk in having universities endorse the qualifications offered by individual awarding bodies leading to these qualifications potentially becoming entrance examinations for those universities. There is then a risk of exclusion based on choice of awarding body rather than ability.

28. I believe that the support required should also provide additional assurances to those set out in paragraphs 73 and 74.

( ) Yes
(■) No

If your answer is Yes, please give further details:

See response to Question 27 regarding the risks.

29. I believe that exam boards (awarding bodies) should be expected to consult schools, colleges and employers specifically for each qualification.

( ) Strongly agree
(■) Agree

( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Obtaining employer engagement that is truly representative of all types of employer can be notoriously difficult. We suggest that engagement through the learned societies who already engage extensively may be the appropriate route.

Questions on Section 4: Exceptions

The following questions refer to Section 4: Exceptions.

30. Exceptions to Condition 1 should be allowed in relation to the purpose of A levels.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

31. Exceptions to Conditions 4–7 should be allowed in relation to the design of A levels.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

32. Exceptions to Condition 8 should be allowed in relation to the support secured for an A level.

( ) Strongly agree
( ) Agree
(■) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

33. If you anticipate that there will be particular challenges for specific subjects which may require exceptions, please outline them below.

Mathematics is a subject requiring exceptions. The lack of “extended writing” should not simply be accepted but rather substituted with a requirement for a strategic/analytical approach and the setting out of a reasoned, extended answer to multi-step problems of suitable complexity.

Questions on Section 5: Making sure standards are right year on year

The following questions refer to Section 5: Making sure standards are right year on year.

34. These review arrangements are sufficient and appropriate to secure standards.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

Do you have any comments or suggestions?

_____
_____
_____
_____

Questions on Section 6: Implementation

The following questions refer to Section 6: Implementation.

35. I support the proposed staged approach to the reform of A levels.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

36. I agree that all current A levels should have been reviewed by 2018.

( ) Strongly agree
(■) Agree
( ) Neither agree nor disagree
( ) Disagree
( ) Strongly disagree

37. I agree that the priority subjects for implementation in September 2014 should be:

Please rank in order of preference, 1 being your first choice.
2___physics, chemistry, biology
4___French, German and Spanish
1___mathematics
5___English literature
3___geography and history
6___a combination

Do you have any suggestions for other subjects/combinations of subjects?

While we have ranked the above as requested, we believe that STEM subjects should be considered as a whole in order that our recommendations regarding the relationship between subjects and appropriate integration is able to be implemented. This would mean considering Science subjects as a set alongside Mathematics, Further Mathematics, Computer Science and Design and Technology.

We also believe that there should be a common implementation date to avoid the very real risks of confusion. In addition, 2014 is far too early an implementation date and carries a very high risk of failure.

General questions
38. Do you have any additional comments in relation to all proposals as set out in Sections 1- 6.

_____
_____
_____
_____

Your details
Name* Professor Helen Atkinson, FREng CEng FIMMM FIMechE, President of the Engineering Professors' Council

Organisation*
( ) School/College
( ) Training Provider
( ) Higher Education Institute
( ) Awarding Organisation
( ) Student/Learner
( ) Parent/Carer
( ) Employer
(■) Representative group/Interest Group
( ) Government Body/Organisation (national and local)
( ) Other (including General Public)

School / College type
( ) Academy and/or Free School
( ) Comprehensive
( ) State Selective
( ) Independent
( ) Special School
( ) FE/Sixth Form
( ) None of the above

Is your institution a member of any of the following groups?
[ ] Russell Group
[ ] Million+
[ ] 1994 Group
[ ] University Alliance
[ ] GuildHE
[ ] UUK
[■] None of the above

Your role
Director of representative group

How many staff does your business employ (full or part time)?
(■) Fewer than 50
( ) 50 to 249
( ) 250 or more

However, the organisation represents the engineering departments of 77 UK higher education institutions, 2,000 professors of engineering and over 8,000 other academic staff.

Representative group / interest group type
(■) Learned Body / Subject expert group
( ) Equalities group
( ) Unions
( ) Sector Skills Council (SSC)
( ) QAA
( ) UCAS
( ) Other voluntary or community group
( ) None of the above

Organisation name*

Engineering Professors' Council

Nation*
(■) England
(■) Wales
(■) Scotland
(■) Northern Ireland
( ) International

Email address* Via Susan Kay, Director of the Engineering Professors' Council: s.kay@epc.ac.uk

May we contact you for more information?
[■] Yes

Senior staff from amongst our membership are also prepared to sit on any groups or committees which are convened as a result of this consultation.

Would you like us to treat your response as confidential?
[ ] Yes

We are changing the way we communicate. We want to write clearly, directly and put the reader first. Overall, do you think we have got this right in this document?
( ) Yes
(■) No

Do you have any comments or suggestions?

This consultation document was lengthy, complex and unwieldy. It was also issued the busiest time of the year for those likely to provide the most expert input, risking inadequate consultation on a very important issue.