

## **ROYAL ACADEMY OF ENGINEERING RESPONSE TO THE DRAFT AGGREGATION HIERARCHY ON BEHALF OF THE BIOENGINEERING COMMUNITY**

*Comments on the current draft aggregation hierarchy as part of the subject coding reform ([https://www.hediip.ac.uk/subject\\_coding/](https://www.hediip.ac.uk/subject_coding/)) being undertaken by HEDIIP and the effects on the discipline of bioengineering.*

### *Key points*

1. Activity in the field of Bioengineering has been increasing in the UK for a number of years. In 2007 there were 15 institutions which offered undergraduate bioengineering, medical and biomedical engineering courses and in 2017 there will be 28 institutions. However, the lack of a unique high level JACS (HECoS) code means that bioengineering cannot be easily separated from other data for NSS, league tables, REF, TEF, and others. The spread of data is currently across general engineering, medical technology, electrical engineering and subjects allied to medicine.
2. The HECoS coding systems is an opportunity for bioengineering to ensure recognition on a par with other engineering disciplines. The response below outlines recommended changes which are supported and co-signed by the named institutions offering undergraduate courses in bioengineering, medical and biomedical engineering.

### *Response*

3. Bioengineering has been increasing in the UK for a number of years. In 2007 there were 15 institutions which offered undergraduate *bioengineering, medical and biomedical engineering* courses and in 2017 there will be 28 institutions offering undergraduate *bioengineering, medical and biomedical engineering* courses.<sup>1</sup> The World Health Organisation (WHO) has reported that by 2050, there will be 393 million people aged 80 years or over, 68% of whom will be in the developing world.<sup>2</sup> These figures reflect the importance of bioengineering as a discipline globally, and that it is an expanding field with estimates of growth ranging up to 27% per annum.<sup>3</sup>
4. The bioengineering discipline has been campaigning for recognition on par with other engineering disciplines through JACS codes reform for a number of years. The issue around recognition of the discipline was highlighted in the House of Commons Science and Technology Select Committee Seventh Report of Session 2009-10 on Bioengineering.<sup>4</sup>

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<sup>1</sup> UCAS search for Biomedical Engineering programmes in 2017

<http://search.ucas.com/search/providers?CountryCode=&RegionCode=&Lat=&Lng=&Feather=&Vac=1&AvailableIn=2017&Query=biomedical+engineering&ProviderQuery=&AcId=&Location=&IsFeatherProcessed=True&SubjectCode=>

<sup>2</sup> World Population Ageing 2013, United Nations

<http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2013.pdf>

<sup>3</sup> Growth of biomedical engineering <http://www.engineering.com/career-advice/6-engineering-fields-with-high-growth/>

<sup>4</sup> House of Commons Science and Technology Select Committee Seventh Report of Session 2009-10 on Bioengineering (ref 1.5, 1.6, 1.7, 1.8, 1.9 and 1.10)

[https://books.google.co.uk/books?id=OjzdwaPDDOoC&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.co.uk/books?id=OjzdwaPDDOoC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false)

5. A campaign led by Imperial College London, supported by a number of senior academics and backed by Professor David Delpy (past-CEO, EPSRC) and Philip Greenish (Chief Executive, Royal Academy of Engineering) led to bioengineering being ascribed the code H160, a subcode of general engineering (H100).<sup>5</sup> This was a step in the right direction but fell short of the high level code required to ensure bioengineering is considered as important as other engineering disciplines such as electrical, mechanical or chemical engineering.
6. The HEDIIP subject coding reform provides an opportunity to represent bioengineering as a relevant branch of engineering that is equally important as more traditional disciplines such as electrical, mechanical or chemical engineering. This would help to increase student awareness and recruitment to ensure the discipline can fulfil the growing need for bioengineers.
7. Mapping *bioengineering, medical and biomedical engineering* to 'Others in Engineering' will raise a number of issues experienced in the H160 mapping, where an institution may have multiple programmes under this code. For example, H160 mapped to 'Electrical Engineering', given that a number of the institutions run both electrical engineering and *bioengineering, medical and biomedical engineering* programmes HESA returns were made under H100 (general engineering) to ensure the data for the two courses were separate. The lack of high level code means that the number of *bioengineering, medical and biomedical engineering* programmes cannot easily be captured. With returns in medical technology, subjects allied to medicine, general engineering and other engineering disciplines.
8. From 2015/16 an open source list of undergraduate *bioengineering, medical and biomedical engineering* programmes in the UK was made available for course leads to contribute and share data on numbers and diversity of bioengineering intake.<sup>6</sup> For example over the last three years at Imperial College London the undergraduate student intake has increased from 85 in 2013/14 to 108 in 2015/16 and 110 expected in 2016/17. The increase in number of students has been accompanied with increasing quality with 97% of the 2015/16 intake achieving A\*A\*A in A-levels or equivalent. Positioning bioengineering as the third highest quality of student intake in Imperial overall and second in the Faculty of Engineering. Imperial's MEng in Biomedical Engineering was ranked first in the General Engineering category of the Guardian University League Table 2017.<sup>7</sup>
9. The recent review of STEM degree provision and graduate employability undertaken by Professor Sir William Wakeham FEng for the Department of Business Innovation and Skills highlighted concerns around graduate employment of biomedical engineering graduates based on the available data and subsequent correspondence with relevant professional bodies. The review recommended a more in-depth investigation of the subject to develop a clearer understanding of the nature of graduate employment outcomes. Without a high level JACS code for the subject it will be difficult for the community to undertake this detailed investigation and examine trends in outcomes over time.

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<sup>5</sup> 2012/13 Review of Bioengineering codes (JACS 3)  
<https://www.hesa.ac.uk/dox/datacoll/jacs3/Bioengineering.pdf>

<sup>6</sup> Table of undergraduate bioengineering, medical and biomedical engineering programmes in the UK.  
<https://docs.google.com/spreadsheets/d/1QtoluaMUa-py4OqiIk2aKqACeG6h2PtQMzx03s6n0v4/edit?usp=sharing>

<sup>7</sup> Guardian University League Table 2017, general engineering  
<http://www.theguardian.com/education/ng-interactive/2016/may/23/university-league-tables-2017#S160>

## **RECOMMENDATION**

It is for these reasons we propose the following changes are made to the draft aggregation hierarchy to ensure *bioengineering, medical and biomedical engineering* is recognised appropriately.

1. That bioengineering is recognised at the same level as other engineering disciplines and that the name of its label should be bioengineering, medical and biomedical engineering:
  - Level 1: engineering and technology
  - Level 2: bioengineering, medical and biomedical engineering
  - Level 3: bioengineering, medical and biomedical engineering
  
2. That the following subjects fall under the above classification system
  - bioengineering
  - biomedical engineering
  - biomechanics
  - dental technology
  - medical biotechnology
  - prosthetics and orthotics
  - tissue engineering and regenerative medicine
  - biomaterials
  - bioelectronics
  
3. That medical biotechnology should be changed to medical technology
  
4. That medical devices should be included as an additional sub discipline.

The recommendation above is supported and co-signed by:

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