Development of a collaborative, distance learning based route to BEng/MEng qualifications for engineers in employment

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Abstract
This report presents the development of an integrated programme entitled MEng Engineering that will provide an opportunity for engineers already in the workforce to engage with upskilling that can lead to professional recognition. Progression will be provided directly from a range of qualification levels, namely HNC, HND or FdSc. This will enable engineers already in employment to gain BEng and MEng qualifications by part-time distance learning mode. The programme will be jointly delivered by Bournemouth University (BU) and Bournemouth & Poole College (BPC). The award will be a BU award. The programme will be delivered over two to six years, depending upon entry and exit points and amount of credits studied in an academic year. The programme has been developed through close discussion with various employer representatives. It is the intention that the programme will be submitted to the Institution of Engineering Designers (IED) and the Institution of Mechanical Engineers (IMechE) for Engineering Council accreditation for the academic requirements of Incorporated/Chartered Engineer (IEng/CEng), as appropriate to level.

Keywords: engineering, upskilling workforce, professional accreditation, distance learning

Background
A study on behalf of the Engineering Council UK undertaken in October 2009 (A Feasibility Study for the Development of Research-Focused Work-Based Masters Degrees in Engineering Leading to Professional Qualification) has revealed the need for a route for those in work to gain CEng status. The STEM subjects are seen to offer secure employment opportunities (see Smallpeice Trust’s 2011 report Securing Tomorrow’s Workforce which claims that 680,000 STEM related jobs will need to be filled in the UK by 2017). The House of Lords’ Science and Technology Sub-Committee launched an inquiry (November 2011) to investigate how the UK will build the educational foundations it needs to face the challenges of the future. It is based on an understanding of the central place of the STEM subjects in providing growth for the UK economy and the necessity of being able to address global challenges. At the heart of this is the provision of “a well educated, well motivated and inspirational cadre of graduates in the key areas of science, technology, engineering and mathematics”. The inquiry chairman acknowledges that there are “clear warning signals from industry and academia that the supply and quality of STEM graduates needs to be addressed urgently”.

There is very little alternative provision accessible to employers based on the south coast of the UK. Whilst BEng/MEng degrees in a variety of engineering disciplines are common, most do not enable the student to continue in employment while engaging with the academic programme of study. Exceptions are:
Buckinghamshire New University – BEng/MEng Mechanical Engineering Design – a part-time programme but requiring weekly attendance at the university so not accessible to engineers in the south.

Open University (OU) – BEng/MEng – a part-time, distance learning programme but feedback from many employers indicates that many students find it difficult to engage with OU programmes and would not consider this option.

Portsmouth University – BEng Mechanical and Manufacturing Engineering and BEng Electronic Systems Engineering – both are distance learning programmes but only offer a top-up with no optionality.

Staffordshire University – BEng/MEng Electrical Engineering – distance learning programme.

There is also the possibility of undertaking a Further Learning Programme through the IMechE, an example of which has recently been approved at Bournemouth University (BU), or the Technical Report route through the IED. However, neither option offers any of the academic qualifications which many potential students are seeking.

**Rationale**

**Aim:**
The aim of this project was to provide an accessible and flexible opportunity for upskilling the workforce in the engineering sector. This would be through the provision of a programme which allows engineers qualified to HNC/D/FdSc level to obtain BEng and MEng qualifications (accredited to IEng and CEng respectively) while remaining in work.

**Objectives:**
- Obtain formal agreement for collaboration arrangements.
- Obtain approval to develop programme.
- Develop programme to meet the needs of stakeholders.
- Obtain formal validation to deliver programme.
- Market programme and recruit students to commence September 2012.

**The approach**
This initiative started with an observation by one industry partner (BAE Surface Fleet who are now know as BAE Systems Maritime – Naval Ships), for whom staff within the School of Design, Engineering and Computing (DEC) at BU were conducting research, that many of their engineers lacked higher level qualifications and this was becoming a business issue for them. Further investigation (as discussed in the 'Background' section) indicated that this was a widespread problem. Initial discussions with the two industry partners, BAE and Paragon Skills Ltd, indicated that two aspects would be critical to the success of the development: first, the provision should be available at a distance and second, the focus should be on solving engineering problems by simulation and visualisation rather than physical experiment. Further, it was suggested that a breadth of technical specialisms would be required, which led to linking with a partner academic institution. Consultation with the industry partners indicated that a local provider was considered essential and that they would be very comfortable with an FE college as they already had links (through apprenticeship training) with the FE sector. Bournemouth & Poole College (BPC) thus became the education partner. In hindsight, this has worked better than anticipated, proving beneficial in terms of providing further and greater opportunities for employer engagement than
were likely if the relationship had continued with the HEI. Key to the success of employer engagement was openness to their needs and a pre-existing relationship. This has led to further employer engagements through word of mouth communications and pre-existing relationships with the FE partner.

The structure of the programme can be seen in Figure 1. The core and option units allow for a breadth of technical specialisms to be incorporated. Figure 1 indicates the nature of the subject areas to be covered which currently tend towards either a mechanical or manufacturing engineering pathway. This emphasis concurs with current feedback on demand from local engineering employers. An emphasis on simulation as a tool for designing engineering solutions can also be seen. This also reflects the outcomes of discussions with employers who strongly indicated their desire for a move away from engineering being taught through practical experimentation to engineers being taught how to develop their solutions using simulation tools.

As part of this consultation it became evident that, while distance learning was required as a delivery mode due to the difficulty in releasing reasonably senior members of staff during working hours, ‘local’ delivery which could facilitate some face-to-face was considered essential. This led to the development of an online learning model of delivery for the programme, using the BU VLE as a platform to deliver each unit (20 credits or 200 hours of learning) over a ten week period. However, this online learning is supported by an initial one-day introduction to each unit, followed by an afternoon mid-point tutorial, both delivered face-to-face at either BU or BPC. The programme has been designed so that students take the units sequentially, as feedback from other academics running part-time programmes indicates that students find it difficult to focus on more than one unit at a time alongside work commitments.

The programme has also been designed to conform to the requirements of Engineering Council UK-SPEC and will be submitted to the IED and IMechE during 2012 for accreditation for the academic requirements of IEng and CEng as appropriate. As many staff members in the School of DEC are Chartered Engineers this will provide the opportunity for students working at the appropriate level with their employers to be mentored as they prepare applications for IEng/CEng while completing their academic qualifications, enabling them to become professionally qualified very soon after receiving their academic qualifications.
**PROGRAMME DIAGRAM**

BEng/MEng Engineering (part-time)

### Year 5/6/Level M

**Core units (compulsory)**
- MEng Project (40)
- Project Management (20)

**Option units**
Choose 3 of the following from your theme:
- Design Management (20)
- Design for Waste Minimisation (20)
- Materials Failure & Prevention (20)
- Design Simulation (20)

**Exit qualification:** MEng Engineering
Requires 120 Level M credits

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### Year 3/4/Level H

**Core units (compulsory)**
- Advanced Engineering (20)
- BEng Project (40)
- Business Development (20)

**Option units**
Choose 2 of the following from your theme:
- Mechanical Design Analysis (20)
- Manufacturing Operations (20)
- Advanced Computer Applications (20)

**Progression requirements**
Requires BEng award at 2:2 or above

**Exit qualification:** BEng Engineering
Requires 120 Level I credits and 120 Level H credits

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### Year 1/2/Level I

**Core units (Compulsory)**
- Design for Production (20)
- Design Management & Commercialisation (20)
- Maths for Engineers (20)

**Option units**
Choose 3 of the following from your theme:
- Design Visualisation (20)
- Mechanical Design Applications* (20)
- Industrial Robotics *(20)
- Quality Management *(20)
- Engineering Simulation (20)

**Progression requirements**
Requires 120 credits at Level I

**Exit qualification:** DipHE Engineering
Requires 120 level I credits

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*Indicates unit delivered by Bournemouth & Poole College

**Figure 1 Programme structure**
Assessment
Assessment of the taught units will also take place largely online. The BU VLE allows students to upload coursework as a variety of file types, potentially including Computer Aided Design (CAD) software files. The VLE also allows students to sit tests and examinations online for both formative and summative assessment. Indeed, current full-time students on some technical units already utilise online assessment. The use of online assessment will enable the student to remain remotely located geographically while engaging in a full range of assessment types.

Evaluation
Views from industry were collected through informal discussions with students and their employers studying on the part time FdSc Engineering running at BPC and through informal discussions with specific industry partners for the part-time route, namely BAE Surface Fleet and Paragon Skills Ltd. The Engineering Divisional Director of Paragon Skills Ltd provided further evidence of demand: “As a provider we are developing HE options as the continuation of training/education is essential to the engineering industry as technology and practices develop over time. We welcome this opportunity and will play an active role driving forward the link and continuation of developing skills for the future.” Similarly, the Research and Technology Manager of BAE indicated: “As you know, I am a great believer in having courses that meet the needs of industry both now and in the future. Therefore I would be very happy to support this initiative and I would welcome the opportunity to discuss the matter in more detail.”

A questionnaire was delivered to 30 representatives of local employers at a ‘business breakfast’ to disseminate information on this development held at BU on 6 December 2011. Table 1 gives a summary of the responses.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Summary of the 12 responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would you or staff in your company be interested in enrolling on an MEng programme?</td>
<td>8 said yes</td>
</tr>
<tr>
<td>At what level of study would you be looking to enter?</td>
<td>4 starting at Level I</td>
</tr>
<tr>
<td>- 2nd year (i.e. from HNC)</td>
<td>1 starting at Level H</td>
</tr>
<tr>
<td>- BEng (i.e. with HND or FdSc)</td>
<td>2 starting at all levels</td>
</tr>
<tr>
<td>- MEng (i.e. with BSc or BEng)</td>
<td>1 Robotics - higher than Level I</td>
</tr>
<tr>
<td>Are there any topics or areas of study that you would wish to study that are not included in the courses presented?</td>
<td>1 Electronics</td>
</tr>
<tr>
<td>Are there other modes of delivery that would be more suitable for you or your company?</td>
<td>4 Composites</td>
</tr>
<tr>
<td>Do you consider professional qualifications to be important for your staff/company?</td>
<td>4 mentioned day release as an option</td>
</tr>
<tr>
<td></td>
<td>7 regarded professional qualifications as important</td>
</tr>
</tbody>
</table>
Discussion, summary
The development of this flexible programme will enable engineers currently in employment with level 4 qualifications to increase their skill sets while gaining academic qualifications to level 6 and 7, which together can lead to professional qualifications and potential career progression opportunities. The development of these engineers also benefits their employers, as the programme will provide them with a leading edge skill set in engineering simulation which can be transferred to business advantage for their employers. Additionally, the engagement of their employees with an HEI provides the potential for exploring other knowledge transfer opportunities for HEI/industry engagement.

It should be noted that, alongside the development of this part-time programme, BU has taken the opportunity to develop a new full-time BEng/MEng engineering course. This course enables the traditional entry after ‘A’ level or equivalent qualifications and will also become the ‘top-up’ Honours qualification for the newly validated full-time FdSc engineering programmes at BPC. The development of the part-time and full-time routes simultaneously means that students can be offered flexibility to swap between modes of delivery depending on their employment situation at any particular time.

Further development
The programme will continue to be developed with additional optionality being offered in response to demand from industry. It is envisaged that electronics options will be offered in the foreseeable future as there is already indication of demand in this subject area.

References


Further reading/bibliography
IED, Non-standard routes to membership, accessible at http://www.ied.org.uk/non-standard-routes
IMechE, Further Learning, accessible at http://www.imeche.org/membership/professional-registration/eligibility/academic-requirements/further-learning/further-learning

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