

ULSTER UNIVERSITY

REPORT OF A MEETING OF THE EVALUATION PANEL UNIT 16A2: MSc SMART MANUFACTURING SYSTEMS (FT/PT) (ME)

24 June 2019

PANEL:

Professor Suzanne Martin, Head of School of Health Sciences, Ulster University (Chair)  
Dr Walter Stanley, Lecturer, School of Engineering, University of Limerick  
Dr Parag Vichare, Lecturer, School of Engineering and Computing, University of the West of Scotland  
Ms Louise O'Boyle, Associate Head of the Belfast School of Art, Ulster University

REVALIDATION UNIT CO-ORDINATOR:

Dr Jim Harkin, Associate Head of the School of Computing, Engineering and Intelligent Systems, Ulster University

IN ATTENDANCE:

Mrs A Guarino, Academic Policy and Standards Officer, Academic Office, Ulster University

## 1 INTRODUCTION/BACKGROUND

The Panel was convened to consider the provision of Master of Science in Smart Manufacturing Systems (FT/PT). The provision is a collaboration between the School of Computing, Engineering and Intelligent Systems in the Faculty of Computing, Engineering and the Built Environment, and the Department of Global Business and Enterprise in the Ulster University Business School. The provision was designed in response to an identified opening in the marketplace for a postgraduate programme of study to meet the evolving demands of the manufacturing industry. It aims to equip students with expert knowledge across multi-disciplines in both the underlying science and application of manufacturing and mechanical engineering with the computing topics of intelligent data analytics and robotics. In addition, the programme aims to develop knowledge and skills to understand the nature of the global business environment and global business operations.

The proposed course will be offered at the Magee campus in full-time mode over one year (3 semesters) and part-time over three years (6 semesters). The course is comprised of six 20 credit-point modules and an additional 60 credit-point Master's project. All seven modules are compulsory. There is one exit award associated with the programme. A PgDip may be awarded to those exiting prior to undertaking the 60 credit-point Master's project and having successfully completed 120 credit points.

## 2 DOCUMENTATION

The Panel received the following documentation:

- Agenda and programme of the meeting;
- Course submission;
- Guidelines for Evaluation Panels;
- QAA subject benchmark statement for Engineering Master's (2015);
- Preliminary comments from panel members; and
- Reports from central University departments on Library and IT resource matters;

## 3 MEETING WITH SENIOR MANAGEMENT TEAM

### 3.1 Background and Rationale

The Panel asked the senior team to elaborate on how the programme sits within the strategic plans and priorities of the Faculty. The Head of School described the recent restructuring of the Faculty of Computing, Engineering and the Built Environment, explaining that the School of Computing, Engineering and Intelligent Systems, which is based in the Magee campus, is a result of a recent merger between the School of Computing and Intelligent Systems with the School of Engineering. The Panel noted that this put the School in a unique position to offer this specialised provision as its staff has experts from both the computing and engineering fields.

Civic engagement was also highlighted by the senior team, exemplified by the close links with local industry, the specific focus on employability, as well as the recent announcement of the Derry City Deal which, in partnership with Government, will contribute to the growth of the region. The senior team explained that investment in innovation was a core component of the City Deal's proposal and that the School will be taking a significant and active role in this aspect of the project.

The senior team assured the Panel that employability was at the heart of the University's strategic plan, and quoted a record number of 95% student employability within their mechanical courses.

The Panel noted that this programme will be one of three Master's programmes offered by the School, the other two being MSc Data Science and MSc Software Development. It will offer a sought after progression pathway for undergraduate students as well as an opportunity for re-skilling and upskilling for existing professionals, which are the ones who would normally opt for the part-time mode.

### 3.2 Stakeholders' Involvement

In response to the Panel's query regarding the stakeholders' involvement in the design of the provision, the senior team explained that following consultation with Skills NI as well as with local industry and the Employer Advisory Board, with which they meet with 3 times a year, a skills gap in the field of smart manufacturing was identified. The senior team explained that the provision was timely and was designed based on real needs of industry, which was the reason for the decision to offer the course starting from September 2019.

The Panel felt the valuable links with industry, including the close engagement with the Employer Advisory Board described by the senior team, were not clearly articulated in the course document and suggested these be included.

### 3.3 Projected Intake

The Panel asked for clarification on the proposed student intake referring to the projected intake table provided in the document. The senior team explained that the projected intake presented in the course document was a conservative one. The maximum student number was limited to 25-30 students. However, the senior team explained that this limit was set by the Faculty and that the available facilities and resources could easily accommodate further growth if required.

The senior team explained that the programme would be offered solely in the evening, between 4-9pm, to facilitate the part-time students, confirming that the full-time and part-time cohorts would be taught together.

### 3.4 Staff Resources

In response to a query from the Panel, the senior team outlined the staff recruitment plans for the delivery of the provision. They explained that additional teaching fellows would be hired to teach in the undergraduate provision, in order to free up the more specialised staff to teach in the proposed course.

### 3.5 Internationalisation

The Panel noted that the provision was very relevant internationally, and that the School would be looking at the Indian, Sri Lankan and Japanese markets for expansion. The senior team explained that the main intake of students in similar courses in other universities in England was international, mentioning that 10% of the existing MSc Data Science cohort was international.

## 4 MEETING WITH THE COURSE TEAM

### 4.1 Learning and Teaching

The Panel expressed concern in relation to the heavy reliance on more traditional methods of teaching, namely lecture, labs and coursework. The Panel was of the opinion that more innovative methods of teaching and assessment could be implemented to better reflect the subject area. The team gave examples of other teaching methods that would be employed such as the use of case studies to frame real-world problems into various module context, as in the case of Smart Embedded Systems module. The team mentioned that many of the modules will include a project, explaining that these projects would help crystallise the students' understanding of the modular content taught, and demonstrate the links between industry and academia. Links between the course and industry was further exemplified by engagement with Knowledge Transfer Partnerships (KTP).

The use of the University's virtual learning environment, electronic submission through Turnitin, online tests, use of flipped classroom feature and online feedback were mentioned by the team in response to the Panel seeking further examples of variety and innovation in teaching. The team also explained that a simulation style assessment was already being

used in the undergraduate programmes, and that interactive simulation would also be incorporated in the Advanced Manufacturing and Industrial Robotics module (MEC702) and in the Manufacturing Automation and Lean Operations Management module (MEC703).

#### 4.2 Student Support

The Panel queried how the team would provide support to students with such diverse backgrounds and skills. The team assured the Panel that they would have mechanisms in place to support students from different backgrounds. To help assess students' skill sets, identify gaps and address any variations among the student cohort, the team suggested offering a pre-induction boot camp a few days prior to the commencement of the course. The team explained that this boot camp was still at its design stages. The Panel recommended that the introduction of a pre-induction boot camp be included in the course document and any future promotional material.

The team advised that to ensure all students on the course had sufficient mathematics knowledge, the students would have access to mathematics tutorials, for example through peer assisted learning (PASS). These would be conducted in small groups with final year students tutoring first year ones. Another way to offer mathematics support would be delivered by an academic and second year mathematics students.

#### 4.3 The Global Business in Context Module

In response to the Panel's query the team explained that the Global Business in Context module (BUS700) was specifically designed for the provision and would have direct links to the subject of smart manufacturing, as it aims to help students gain understanding of the technology of smart manufacturing in the global context. The Team explained that as this was a contemporary module which relies on ever-evolving, global technological developments, it would lend itself to collaboration with the students and that the use of case studies would support the module coordination and online discussion.

The Panel was assured of the module's links to the provision and asked that the links to other modules delivered in the programme as well as the links to the programme as a whole, be articulated in the course document and in each relevant module description.

#### 4.4 Masters Project Module

The Panel asked the team to outline the students' preparation for the Masters Project module (COM865) which was delivered in the third semester for the full-time cohort. The team explained that students would be allocated a supervisor early on in the year and that clear guidance would be provided starting with the research induction workshop which was delivered in January jointly with the MSc Data Science students. The workshop would clarify the necessity of developing a research proposal, which would be submitted for assessment in March and would discuss such topics as: risk analysis, project management, ethics, research methodology and the format of paper. The Panel was assured of the strong collaboration between the supervisors and the students.

The team also explained that research skills would be developed by other modules, many of which would require the students to conduct smaller projects. These skills would include research methodology, project management, practical skills required and more. The Panel was of the opinion that this was not reflected in the document and requested this be clearly articulated in the relevant module descriptions.

#### 4.5 Differentiation Between Modules

The Panel asked for clarification on the differentiation between the Manufacturing Automation and Lean Operations Management module (MEC703) and the Advanced Manufacturing and Industrial Robotics module (MEC702). The team replied that while the former provides a broad overview of the manufacturing process at a higher level, focuses on the system at its entirety and clarifies the need for automation, the latter's main focus is on the manufacturing process itself, including industrial robotics and simulation.

The Panel recommended the team review the content of both modules to avoid any content overlap and change the title of MEC703 to reflect its broad nature, suggesting a title change to "Smart Factories".

#### 4.7 Computer Aided Engineering and Manufacturing Module

The Panel was concerned the Computer Aided Engineering and Manufacturing module (MEC704) was content heavy, explaining that it would be challenging to achieve depth in each of the topics listed. The Panel suggested the team review content to provide broader knowledge across the topics listed.

#### 4.8 Course Design

The Panel was informed that the MSc Smart Manufacturing Systems had been informed by industry needs and feedback from key stakeholders. The team conducted exhaustive consultations with industry stakeholders as well as students to identify regional skill gaps which formed the basis for the course content. This was to ensure that businesses in the North West region would have access to the skilled personnel required. A further consultation with staff helped design the course structure to address these regional requirements, assuring the Panel that in designing the provision they had taken cognisance of Ulster University's curriculum design principles.

#### 4.9 Reading Lists

The Panel queried the presentation of the reading lists in the module descriptions, specifically listing journal titles rather than narrowing the reading list to specific articles within them. The team suggested the need to search for relevant articles would help student acquire and develop their research skills, and agreed to include specific articles, although those would need to be reviewed and revised annually due to the nature of this rapidly changing field.

### 5 CONCLUSIONS

The Panel commended the team on the following aspects evident from the evaluation:

- The close links with industry and funders and the regional responsiveness;
- The creation of a consolidated Master's programme which accommodates students from diverse discipline areas and backgrounds;
- The design of an industry relevant Master's programme which addresses the knowledge and skills' deficits in the region.

The Panel agreed to recommend to the Academic Standards and Quality Enhancement Committee that the provision be approved for a period of five years (intakes 2019/20 – 2023/24), subject to the conditions and recommendations of the Panel being addressed and a satisfactory response and a revised submission being forwarded to the Academic Office by 15 July 2019 for approval by the Chair of the Panel.

### Conditions

- i) Address matters of detail and clarification as identified in the notes by the Academic Office to the Panel;
- ii) Elaborate in the course document on the research induction workshop; describe in the Masters Project module how the research methodology and project management aspects would be covered by other modules; and include in each relevant module description a reference to the research skills developed; and
- iii) Change the title of the module MEC703 to “Smart Factories” or a similar relevant module title, and avoid overlap of the content between module MEC702 and MEC703.

### Recommendations

- i) Include in the course document and future promotional material the introduction of a pre-induction boot camp as discussed with the Panel;
- ii) Explicitly highlight in the module descriptions the different methods of Learning and Teaching used, including VLE;
- iii) Articulate clearly the links between module BUS700 and the other modules delivered in the programme as well as the links to the programme as a whole, both in the course document and in each relevant module description;
- iv) Elaborate in the course document on the links with industry, including the Employer Advisory Board;
- v) Specify in the course document the array of civic engagement; and
- vi) Rebalance depth and breadth of content in module MEC704.

## 6 APPRECIATION

The Chair thanked the Panel members and, in particular, the external members, for their valuable contribution to the validation process.