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IN ESTABLISHING A NEW COLLEGE OF ENGINEERING ACCREDITATION, VALIDATION, AND AUDIT – CONTRIBUTE TO ATTAINING NATIONAL AND INTERNATIONAL RECOGNITION

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ABSTRACT

A single-paragraph abstract of up to 150 words, outlining the aims, scope and conclusions of the paper.

Keywords: (up to five)

Subject area: (Please put a "X" as appropriate)

X	a)	Accreditation (In its broadest sense)
	b)	Research (related to Internationalisation either linked to students or partnerships with international establishments)
X	c)	Affiliation (with International partners involved in HE)
	d)	International students and sponsorship

Name of presenter/key speaker:

Professor Eugene Coyle

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ABSTRACT

Upon establishing a new university or college of higher learning, accreditation, validation, and audit of programmes of study and supporting college infrastructure are central to achieving the standards and recognition required in creating a solid foundation for the college. In the Sultanate of Oman, whether a private or public institution, it is imperative that the college registers under the auspices of the Ministry of Higher Education and prepares in advance for audit by the Oman Authority for Academic Accreditation and Quality Assurance of Education (OAAAQA). If partnering with a university from a different jurisdiction, the importance of mutual recognition in goal attainment and policy formation, is an extra requirement in setting the scene for the emerging college. A case study is presented of the early years in programme and educational infrastructure development at the new Military Technological College with exemplar of i) programmes developed, ii) routes to validation, audit and accreditation attainment, iii) experience gained, and iv) further provision, from commencement and first intake of students in 2013.

Keywords: Accreditation, affiliation, higher education in Oman

1. INTRODUCTION

The Military Technological College (MTC) has been created as a Centre of Excellence in the provision of education and training for the Ministry of Defence (MoD) and Civilian Technicians and Engineers in Oman. A unique feature of MTC is the intended use of military education and training as a national asset to educate and prepare graduates for lifelong employment in technology driven careers. Towards attaining the levels and standards envisioned to fulfilling its mission a decision was made by MTC to form an alliance with an internationally placed partner university who could assist in overseeing programme development, which, although unique to the specific requirements of the Military Technological College, would be carried out to meet and conform to Professional Engineering Institutions (PEI) international standard norms.

The college specific aims from the outset were to:

- Enable MoD technician-engineers to meet Training Needs Analysis (TNA)-defined MoD competencies and knowledge requirements.
- Help MoD technician-engineers to realise their full potential.
- Serve the technical education and knowledge needs of Oman.
- Provide Oman with an international standard engineering knowledge reference centre.

In line with the above aims, the intention was for MTC provision to be benchmarked against MoD, international academic and international professional accreditation and approval standards. MTC's Centre of Excellence claim would be founded in evidenced and acknowledged benchmark alignment, incorporating:

- Delivery of MoD identified TNA competencies.
- Achievement of European Aviation Safety Agency (EASA) (preferred world standard for aircraft maintenance technician qualification) 66/147/145 regulatory requirements.
- OAAAQA National Academic Accreditation.

- International Professional Engineering Institution (PEI) Accreditation - specifically Accreditation by UK Professional Engineering Institutions.
- International Academic Validation by way of University Partnership.

In line with MTC's Article of Governance on Academic and Professional Partnerships which stipulates that 'all programmes [of study] will comply with the partner university's [mature university] conferment requirements, the OQF (Oman Qualification Framework) and the QAA (Quality Assurance Agency) education quality framework and UK-SPEC', the College sought a partnership with a suitable UK-based partner higher education institution.

2. THE MILITARY TECHNOLOGICAL COLLEGE – PROGRAMMES

2.1 Affiliation and validation

Following a tendering exercise in 2012, the University of Portsmouth (UoP) emerged as the preferred partner institution, thus commencing an academic partnership between the Military Technological College and the University's Faculty of Technology (Schools of Engineering and Civil Engineering & Quantity Surveying). UoP has a track record of working with Armed Forces establishments in the UK. The School of Engineering had an approach to learning and teaching suited to the types of programmes delivered at MTC, and in particular its approach to applied practical applications and project-based learning. The University would assist in the development and validation of programmes developed at the MTC, leading to UoP - MTC graduate/diploma awards.

As an active partner, UoP has assisted and continues to interact with the MTC to achieve the expected academic provision standards. This has translated into:

- Engagement initially by a UoP Academic Contact and invited subject experts from across the university in assisting and advising on process, including overseeing of module assessment boards (for receipt and confirmation of students' performance results on a per module basis), examination and award boards, and in conducting workshops and seminars in support of the academic development and delivery.
- Reciprocal visits between UoP and MTC staff (management, academic and administrative) to review and discuss developments and strategy.
- The review by appointed university experts of module descriptors developed by staff at MTC to ensure compliance with the partner university's requirements.
- The review of assessment artefacts via peer review feedback to ensure the quality of material developed by MTC staff.
- Assisting in the creation of academic framework and quality assurance documentation, tailored to the requirements of the MTC and conforming to the UoP (and thus, QAA) quality norms.
- Secondment from the university of an experienced academic to lead the quality assurance team at MTC.

2.2 Academic Programmes

The Military Technological College aimed from the outset to be an internationally recognised, modern higher education institution whose graduates are trained to meet the current as well as the future needs of the Sultanate of Oman in its societal and technological development. Therefore, curricula were designed to reflect modern and internationally recognized engineering programmes of study. To achieve this goal, the MTC Academic Framework document articulates five building blocks of curriculum design, namely:

- Problem-centred learning: This is an approach in which students tackle a carefully constructed set of problems, generally engineering projects of growing scale and complexity. The problems are so structured that they require the students to acquire particular scientific, mathematical and other Engineering knowledge.
- The 'upside-down' curriculum: A blended learning approach whereby material on engineering applications is introduced, where possible, to the earlier stages of education in order to motivate students' interest in fundamental mathematics and science that can otherwise seem dry and

indigestible.

- Mathematics in context: The teaching of Engineering Mathematics by engineers and presented in an 'applied' setting, rather by mathematicians only in a more rigorous 'proof-oriented' style that is ultimately less accessible.
- Design orientation: Engineering students need design experience and in particular should, from an early stage, be working on 'real problems' with 'real customers' and in interdisciplinary teams, such as they would experience in the workplace. To this end design in the course will be allied to the MoD service discipline the student is enrolled upon.
- Combining simulation and laboratory: The use of sophisticated simulation in tandem with laboratory facilities and an active workshop environment to provide the settings to engender student confidence and stimulate their creativity.

The above five blocks are all connected through the central themes of *safety and sustainability*, *transferable skills development* and *management and entrepreneurship*.

Following a period of research and analysis of international standards in engineering education, including the Accreditation Board for Engineering and Technology **ABET** (USA), Conceive Design Implement and Operate **CDIO** (Australia), it was decided that the curriculum of MTC would be designed to meet the accreditation standards of the Engineering Council EC (UK). This necessitates that the curriculum must adhere to **six** key areas of learning, as specified in the latest Accreditation of Higher Education Programmes (currently, version 4), namely:

- Science and mathematics,
- Engineering analysis,
- Design,
- Economic, legal, social, ethical and environmental context,
- Engineering practice,
- Additional general skills.

The collaboration established with the UoP ensured that curricula of study comply with UK standards. MTC staff were able to seek advice and validation on detailed curriculum content and modifications. This relationship is well established and is part of the partnership agreement.

Furthermore, it was decided from the outset that the programmes of study of the College would be accredited by the Engineering Council UK, through appropriate UK PEIs, leading to professional Incorporated and Chartered Engineer status, this further details the expected students' achievements in the six key areas of learning listed above.

2.3 Learning & Teaching Strategy

Based on the aims of the College, a focused learning and teaching strategy was developed which outlines an integrated approach to learning and teaching across the functions of the College with a commitment to excellent teaching and to enabling College students to achieve challenging learning outcomes.
More specifically, the Strategy contains key aims with the intent of:

- Imbuing general competencies to students, to facilitate attainment of transferable skills including health and safety and entrepreneurship
- Addressing the requirements of employers, namely Oman Armed Forces
- Engaging students with an appreciation of research from an early stage in their education
- Rewarding achievement of academic excellence'
- Providing an appropriate environment to enable staff to grow by way of 'academic development and training'
- Acknowledging and rewarding 'teaching excellence'

The policy details the required actions to achieve these aims, with inclusion of key performance indicators to facilitate assessment of attainment.

2.4 MTC Student Study path

The study-path of an MTC student-recruit is designed as follows:

- Upon enrolling at MTC, students first complete a General Foundation Programme (GFP). This Programme has two main objectives; firstly, to equip the student with sufficient level of knowledge in Physics, Mathematics and IT to meet entry requirements of an internationally recognised university (based on the UK entry standard, namely UoP (partner university), and comparable to USA entry standards). Secondly, to acquire a sufficient level of English to achieve an IELTS 5.0 band score or above in each individual component of the IELTS test (reading, writing, listening, speaking).
- Following completion of the GFP students enrol into one of the College's four Engineering Departments: Aeronautical Engineering, Systems Engineering, Marine Engineering and Civil Engineering & Quantity Surveying.
- In each Engineering Department, students are further divided into pathways of study, determined in such a way that the Training Needs Analysis (TNA) elements of study are best aligned with academic programme modules.
- For each pathway of study, the diet of modules was established, to meet the criteria of the required graduate profile (meeting international Engineering Council UK standards) and taking into account the goals specified in MTC's Academic Framework document.
- Each module of study was described in terms of aims, learning outcomes, syllabus, learning strategy (including contact hours), and assessment strategy, in the associated Module Descriptor (MD) document.
- Additional practical skills required by the Sultan's Armed Forces, if not fully catered for in the academic curriculum, are further developed by way of additional Training Needs workshop activities. (These activities approximate on average to 5 hours per week).

The descriptions of programmes of study are provided in Programme Specification Documents. Towards meeting the aims of the programmes of study, the curriculum contains both theoretical delivery (lectures and tutorials) and practical delivery (intensive laboratory and workshop activities).

2.5 Training Needs Analysis (TNA)

As MTC was established to prepare technicians and engineers for employment with the Armed Forces of the Sultanate of Oman, the first principle in design of the curriculum of study would be to meet the requirements of the Training Needs Analysis for the individual (and collective) Armed Force Service Divisions.de

A principal strategic approach in programme design was to develop a 'real-world' curriculum with intent to ensure that students would graduate with an integrated understanding of both the theory and practice of applied engineering. This necessitated an extensive assessment of the training needs of the various MoD Armed Force Divisions, in preparation for ready-able graduate recruits. This necessity would therefore inform and assist in the development of the MTC engineering syllabi and course programmes.

A Training Needs Department (TNA) was established at MTC with membership from, and linkage to the host Armed Force Divisions – in particular, the Royal Army (RAO), Royal Air Force (RAFO), Royal Navy (RNO), and Ministry of Defence Engineering Services (MODES). An extensive study of practice within the services was conducted, followed by a mapping of trade competencies which would help inform programme design and development at MTC. The TNA Department is an integral component department of MTC, working in tandem with academic engineering departments.

From commencement, the College placed a high priority on achieving international best practice in delivery of vocational workshop activities for both staff and students. A Technical Committee was established with remit to lead and advise in equipment choice, suitability and procurement. This resulted in a multi-million Rial investment with provision of laboratory and workshop facilities of the highest international standard.

Students ultimately graduate from MTC with dual MTC-UoP awards. In addition, students receive a further certificate attesting that they have acquired the technical skills as part of their TNA training and related to applied capability for real-time performance in the field.

2.6 Professional Engineering Institutions

The Engineering Departments at MTC mirror the major service units of His Majesty's Ministry of Defence Armed Forces; namely, Department of Aeronautical Engineering, Department of Systems Engineering, Department of Marine Engineering, and Department of Civil Engineering & Quantity Surveying. A study conducted at inception of the college revealed that eighteen (18) individual diploma/degree 'discipline pathways' would be required in order to meet the range of engineering expertise across the military spectrum. A major exercise was undertaken in design of the required programmes, commencing in 2012/13. This exercise was completed and validated by the University of Portsmouth select committee in 2015 and was deemed to have achieved the requirements of the UK Quality Code for Higher Education and the Framework for Higher Education Qualifications (FHEQ).

Further, towards achieving the objective of gaining international accreditation of engineering programmes, MTC also commenced engagement with a consortium of UK PEIs in 2012/13. These included the Institution of Mechanical Engineers (IMechE), the Royal Aeronautical Society (RAeS), the Institution of Engineering and Technology (IET), the Institution of Marine Engineering Science and Technology (IMarEST), the Energy Institute (EI), the Institution of Civil Engineering (ICE), and the Royal Institute of Chartered Surveyors (RICS). A progressive engagement in the ensuing seven years has resulted in successful accreditations of Incorporated Engineer (IEng.) for degree pathway programmes and (Partial) Incorporated Engineer (ParIEng.) for Diploma pathway programmes. This has been a very fruitful journey which has necessitated careful design and integration of resources across and between individual departments at MTC.

2.7 European Aviation Safety Agency

In respect of programmes offered by the Department of Aeronautical Engineering (Avionics, and Mechanical Engineering), a further achievement has been that of award by the European Aviation Safety Agency (EASA) Licence. By virtue of this achievement MTC is a designated Maintenance Training and Examination Organisation (Aeroplane-turbine, Avionics, and Helicopter-turbine). Most graduates of Aeronautical Engineering at MTC take up service as technicians and engineers in the Royal Air Force of Oman (RAFO). Programmes in aeronautical engineering were therefore designed to comply with both EASA licence requirements and Royal Aeronautical Society (RAeS) UK Specification standards.

2.8 MoHE Licensing

Concurrently with its accreditation efforts, MTC made an application to the Ministry of Higher Education which resulted in granting of licence for its 18 programme pathways. This ensured that the college programmes are nationally and internationally recognised and of high standing. It also facilitated granting of Dual Award status by the University of Portsmouth and the Military Technological College, which is an attractive feature for students and graduates of MTC.

3. QUALITY ASSURANCE

A key element to attainment of national and international standards required for recognition, validation, licensing, and accreditation has been the establishment at MTC of a system of Quality Assurance which is pervasive throughout the institution and is perceived as 'everyone's business'. This has helped create a culture whereby all actors may understand the reasons underpinning the requirements and the processes associated with excellence in quality assurance. This section outlines how the college created and implemented a robust and effective quality assurance framework.

3.1 QA Framework

An important initial step in the creation of MTC was to create the Quality Assurance Framework (QAF) document. This would lay down broad guidelines to ensure the quality of learning and student experience at MTC. The key components of this Framework included at the outset the Annual Monitoring (of Modules and Programmes) to ensure their currency and appropriateness in terms of syllabus and assessment. The monitoring reports also serve the purpose of monitoring compliance with partner university processes. They provide an opportunity for the noting of key issues at module and programme levels, culminating in a report to the College Learning and Teaching Committee which enables appropriate action for improvement to be identified, acted upon, and reported back to Departments for wider dissemination.

Quinquennial Programme and Departmental Reviews enable, in the case of the former, the assessment of impact of developments in programmes over the review period by drawing on the evidence provided by the four previous annual programme monitoring review reports. In the case of the latter, the purpose of this review is for departments to assess their operations in relation to college statements of policy and good practice which appear in the relevant policy and procedural documents. The Process is intended to be a developmental process which provides an opportunity for departments to review and, in partnership with the review team, identify opportunities for improving their existing quality assurance structures and systems.

The QAF also outlines Programme Specification Document Annual Reviews. Programme Specification Documents (PSDs) for each of its programmes of study provide a concise description of intended learning outcomes, and the means by which those outcomes are achieved and demonstrated by its students. Their revision takes place, alongside module descriptors with the approval of the Learning and Teaching Committee..

The QAF covers the important topic of student feedback to inform improvement of module and programme delivery, as well the adequacy of resources such as the library and laboratory facilities. Obtaining, considering and responding to the views of students is a key process which operates in tandem with the system of staff-student consultative committees at Department level and student representation on various other fora.

The College makes full and effective use of independent external examiners for the validation of its assessment (coursework and examination) processes, substance and appropriateness. The contribution of external examiners to the College's internal processes (by scrutiny, moderation and reporting) is crucial to the assurance of the standards and quality of the College's awards and is an integral part of its quality assurance processes. External Examiners are responsible for ensuring that:

- The standard of a programme of study offered by the College is appropriate for the award of the degree concerned.
- The standard of the degree in the field of study concerned is consistent with the highest standards of the national/international university system.
- The College's assessment procedures have been carried out and the decisions leading to the award of degrees are arrived at in a proper and impartial manner.

Finally, the QAF outlines the process for ensuring that the classroom delivery process is appropriate. The College uses a teaching observation and evaluation system whereby all teaching staff within the College are observed while they are teaching and evaluated on their performance. Teaching observation and evaluation, which contributes to the staff appraisal process, apply to all lecturers who are involved in any activities that contribute to student learning, e.g., small group teaching, tutorials for groups and individuals, and lectures to larger groups. Teaching observation and evaluation aim to improve the effectiveness of teaching and learning across the College whilst providing opportunities for lecturers to discuss issues of pedagogy resulting from direct observation. They also help identify staff development needs as well as provide support for new teachers.

3.2 Improving the QA Framework

The Quality Assurance Framework (QAF) was designed at inception and includes the essentials in terms of ensuring the quality of the academic delivery in the institution. Over time, the portfolio of responsibilities and activities carried out by the Quality Assurance Department (QAD) has grown beyond those described in the original QAF. These activities, which contribute to the improvement and maintenance of the quality of the processes in the college (*e.g.,* the review of assessment artefacts, coursework, and examination papers, before their review by the partner institution and subsequently to independent external examiners) are not described in the QAF. The Department is also involved in staff development through the organisation of seminars and workshops to address themes relevant to academic provision such as plagiarism, and learning outcomes coverage in assessment. This is key to ensuring good practice and best in field provision of education.

The Institution has therefore identified the need to upgrade the Quality Assurance Department to a Directorate to cover all areas which have an impact on academic provision as well as update its QA Framework to formalise the new arrangements.

4. ACHIEVEMENTS

4.1 Dual awards

Through its endeavours MTC has to date managed to successfully establish a portfolio of programmes which are not validated by its international affiliate partner, the University of Portsmouth (UK), but also licensed by the Ministry of Higher Education in Oman. Graduates of MTC receive a dual award from UoP and MTC.

4.2 Accreditation by OAAAQAE Accreditation - Completion of Stage 1 Audit

The College has also successfully undergone the Stage 1 Quality Audit in January 2018 by the OAAAQAE following submission of the self-study report to authority in October 2017. This thorough reflective self-analysis of the College proved to be extremely beneficial to the College as a whole, resulting in communication between individuals who may not necessarily have interacted previously, and the realisation that quality assurance is the business of all, not just a select few.

The College is currently undertaking steps to prepare for Stage 2 Institutional Standards Assessment exercise.

4.3 Programme Accreditation

MTC has managed to secure accreditation for its programmes by the seven named professional engineering institutions (section 2.6). This has been a very engaging and fruitful experience for all. As with all new undertakings in presenting for professional accreditation, achieving accreditation was a challenging process. As MTC was engaging concurrently with multiple PEIs, this ensured that several programmes have received accreditation via more than one PEI. This enhances the reputation of the college, and it has helped raise standards beneficial to both staff and students. Staff and student membership of PEIs is also valued by MTC.

4.4 Certification of Vocational Training

MTC is certified by EASA as a provider of training (147 Training Organisation; EASA 66, Aircraft Technician Licence 66).

4.5 CONCLUSION

The MTC is in its ninth year since its commencement and has seen four annual graduations at Bachelor of Engineering level and five at Advanced Diploma.

Central to the success of the MTC is the endeavour to establish academic programmes which are recognised both nationally and internationally and the development of rigorous processes which make quality assurance the responsibility of all in the institution. The partnering with an experienced external university has also been key to achieving this objective.

The College is preparing for the next stage of its development of postgraduate provision as well as further establishment of its research and innovation to inform and enrich its academic provision as well as its stakeholders and the community at large.

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