

NAME OF INSTITUTION:	Cape Peninsula University of Technology
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Name of qualification	Master of Engineering in Engineering Management
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Is this qualification (a) a new qualification in an approved field of study, (b) a new qualification at a higher level in an approved field of study, (c) in a new field of study?	The qualification is a new qualification in an approved field of study
Indicate if the proposed qualification will be replacing any existing qualification/s on the approved PQM and if so state/ list this/ these qualification/s with expected last dates of enrolment.	New qualification not replacing any other
Indicate the delivery mode of the new qualification.	Contact
Indicate the number of credits that will be offered in (a) contact and (b) distance mode of delivery.	180
Indicate on which campus/es or site/s of delivery the new qualification will be offered.	Bellville Campus

Full title of proposed new qualification.	Masters of Engineering in Engineering Management
Abbreviation of title.	MEng Engineering Management
HEQSF qualification type (e.g. 240-or 360-credit Diploma, Advanced Diploma, 360-or 480-credit Professional Bachelor's degrees, Professional Master's degree etc.)	180 credit Master's degree
NQF exit level of qualification.	9
Credits: Give total credits at (a) qualification level; (b) each NQF level and (c) number of credits for research where appropriate.	(a) Qualification Level and NQF Level: 180 credits at NQF Level 9 (b) Number of credits for research: 90
Designator (for degrees only).	Engineering
If designator is not Arts, Commerce, Science or Social Science, indicate which first or second order CESM categories the proposed designator is consistent with.	0899: Engineering, Other
Qualifier 1 (state the field of specialisation).	Engineering Management
Qualifier 2 (optional).	N/A
Indicate in which second or third order CESM categories (a) Qualifier 1's field of specialisation falls, and (b) Qualifier 2's field of specialisation falls (if applicable).	Qualifier 1: 2nd order CESM Category: 0899: Engineering, Other
Indicate what % of the curriculum for the proposed qualification falls into (a) Qualifier 1's field of specialisation, and (b) Qualifier 2's field of specialisation. (Use the NQF credit values of courses for this calculation).	Qualifier 1 0899: Engineering, Other: 100%

Indicate what % of the curriculum for the final year of the proposed qualification falls into (a) Qualifier 1's field of specialisation, and (b) Qualifier 2's field of specialisation. (Use the NQF credit values of courses for this calculation).	Qualifier 1 0899: Engineering, Other: 100%
Specify the institution's minimum admission requirements for the proposed qualification.	The minimum admission requirement for the MEng in Engineering Management is as follows: • An appropriate NQF level 8, Bachelor Honours degree, 4-year Bachelor's degree or a Postgraduate Diploma qualification in engineering or cognates sciences, such as engineering design and synthesis or applied sciences degrees; • students must have a min of 60% overall average of their previous NQF level 8 qualification; • candidates that do not meet 60% average can be considered if they have at least 12 months relevant industrial experience RPL Students with working experience in engineering, but who do not meet admissions requirements stipulated above will be able to apply for admission via the route of RPL to gain access to the qualification.
Indicate the courses/ modules at entry level that facilitate vertical or diagonal articulation into the proposed qualification.	For vertical articulation, PGDip in an Engineering discipline, or a Bachelor of Technology Honours degree in Engineering disciplines will be required. These qualifications must have a mathematics and science background. For diagonal articulation, a 4-year Bachelor's degree or a Bachelor Honours degree in a cognate field of engineering will be required.
Indicate the type of Work Place Based Learning/Work Integrated Learning component for the proposed qualification.	N/A

OUTLINE OF PROGRAMME DESIGN

Engineering Management is a specialization that deals with the application of engineering principles in a business setting in this contemporary technological age. Furthermore, it is understood that Engineering Managers are needed by industry to offer a balanced understanding of best business practices and engineering sciences in our current technological age, known as the fourth industrial revolution (Industry 4.0). Underpinned by CPUT's institutional vision (which is *"to be at the heart of technological education and innovation in Africa"*), and mindful that a master's level degree demands a high level of theoretical engagement and intellectual independence, the proposed qualification is therefore aimed at preparing students for professional practice by enhancing in-depth knowledge and understanding of engineering and technological business principles and expertise, as well as specialist and contextual knowledge, cultivating a critical awareness of developments at the forefront of the field and developing a capacity in them to conduct research to meet the minimum entry requirement for admission to a NQF level 10 doctoral degree.

The purpose of the proposed Masters of Engineering in Engineering Management qualification is to develop Engineering Managers, across different fields of engineering who are able to contribute to the development of knowledge in their field of work, and ensure that they are prepared enough to operate at an advanced and professional level. Significantly, Duke University (2020) claims that the skills of Engineering Managers are in demand on a global level. Moreover, the field of engineering management is expected to grow nine percent through 2020 (GetEducated, 2020), which brings into sharp focus the importance of ensuring that successful graduates of this proposed qualification have advanced technical knowledge, excellent interpersonal communication skills, and expert business management and financial skills

Thus, the proposed qualification is comprised of modules that are geared towards the preparation of students to possess advanced technical knowledge (for example the modules Industry X.0 and Large Project Engineering), excellent interpersonal communication skills, and expert business management and financial skills (for example the modules Enterprise Management and Business for Engineers), to enable them able to contribute to the development of knowledge in the field of engineering management. Moreover, the specific learning standards, lesson plans, teaching materials (for online and in contact sessions) and assessments and assignments that will be used to teach a particular module and organise learning activities are specially selected to ensure that intended outcomes will be achieved. Continuous student feedback mechanisms and feedback from industry partners will also be used to guide and inform the department and thereby allow the department to assess the degree to which the intended outcomes are met.

Successful candidates with this qualification will meet the minimum requirement for entry to NQF level 10 Doctoral qualification. Thus the complexity of subjects' content in this qualification and the preparedness of Master of Engineering in Engineering Management students are in line with the SAQA Level 9 descriptors. This also highlights the importance of the Research Methods and Research Project modules which are part of the curriculum of this proposed qualification, as it will provide graduates with knowledge and skills at an advanced level that will help them to perform high quality research.

Holding Master of Engineering in Engineering Management students foremost in mind, cognizance was taken of the nuanced characteristics of the student profile (for example maturity level of target students having at least two years working experience, and the knowledge that the majority of the students will be full time employees needing to study flexibly) during the design of this proposed qualification. In addition, a student-centred flipped classroom blended learning teaching and assessment approach has been identified as the most appropriate for this proposed qualification. Student-centred learning entails the adoption of a wide variety of teaching and learning activities and academic-support strategies that are intended to address the distinct learning needs, interests, aspirations, or cultural backgrounds of individual students and groups of students. The flipped classroom blended learning element of the programme design provide students' with greater control over time, place, and pace of their learning. This will permit MEng Engineering Management students' the opportunity to create a customized and integrated approach to their learning. Consistent with this, and aligned with CPUT's mission, then Department of Industrial and Systems Engineering (DISE) aims to develop self-aware, independent thinking engineering managers who have the ability to question and critically interrogate facts, who are technologically competent, resilient and who possess problem-solving capabilities, relational capabilities and ethical capabilities.

The modules that make up the proposed qualification are as follows

Subject name	Third order CESM	NQF level of subject	SAQA credits of subject	HEMIS CREDIT	Compulsory or optional (elective)	Period of study (Year 1, 2, 3 & 4)	Total credits per year
Year 6, Semester 1 & 2							

Technology and Innovation Management (Sem 1)	0899	9	15	0,083	Compulsory	6	
Enterprise Management (Sem 1)	0899	9	15	0,083	Compulsory	6	
Business for Engineering (Sem 1)	0899	9	15	0,083	Compulsory	6	
Industry X.0 (Sem 2)	0899	9	15	0,083	Compulsory	6	
Research Methods (Sem 2)	0899	9	15	0,083	Compulsory	6	
Large Project Engineering	0899	9	15	0,085	Elective	6	
Supply Chain Management	0899	9	15	0,085	Elective	6	
							90
Year 6, Semester 1 & 2							
Research Project (Sem 1&2)	0899	9	90	0,5	Compulsory	6	
							90
						TOTAL:	180

Thus, rooted in the specific needs of a working professional cohort to accomplish these learner outcomes, a combination of face-to-face classes (block release contact sessions) and online learning tools (webinars, screencasts, online group activities and online discussion forums) will be used. Block release involves an intensive period of study, in a classroom on campus scheduled over one to two weeks of the teaching period (approximately 45 hours per subject semester). Every classroom will be well equipped, viz. window blinds, comfortable table and seating, adequate white boards, data projectors, adequate ventilation, etc.

During these contact sessions, students will be introduced to the main concepts in each subject taken that particular semester. Contact sessions will not be used to deliver content but rather to engage with important concepts and problem-solving activities. In this regard, a flipped classroom approach will be used, which is suitable for a NQF level 9 qualification. The students will also be given an introductory lesson on the LMS, (at present Blackboard is used), since the LMS will be a fundamental tool that they will use to progress through the rest of material in each subject. The learner outcomes, assessment methodology, weights, rubrics, tentative dates and other related information will also be communicated to students during the contact sessions. Contact sessions will then be consolidated with follow-up online group discussions, webinars and formative self- and peer review assessments to ensure that the students meet the intended outcomes of each subject. Blackboard software makes it possible for course presenters record a webinar which students will be able to download at a later stage and watch again, should they have missed it or need a refresher. The Blackboard LMS also allows course presenters to design comprehensive rubrics that allow students to accurately self and peer-assess and thereby critically reflect on assessment tasks that they are given. It is noted that the functions performed by the Blackboard software tools are not unique features, therefore should the CPUT at a later stage decide to use a different LMS, it would be possible to perform these same functions on a different platform, for example Moodle.

Furthermore, since 60% of the course work in the proposed qualification has been designated as self-study, a selection of appropriately designed online resources that will enable the students to do this. An example of an interactive online tool that will be used to assist students is interactive screencasts made with H5P software. This software allows the course presenters to convert PowerPoint presentations of lessons into screencast videos and add critical questions at designated intervals so that students can evaluate if they understand a particular section of the course work being presented before they are allowed to watch the rest of the video.

Where appropriate, industry partners (guest lecturers) will be approach to assist with the design and development of course materials so that the contents of the subjects stay relevant and as updated as possible.

Notably, there is a significant proportion of online activities that comprise the blended learning mode of delivery, therefore it is important that students be given valid, reliable and constructive feedback on activities and

assessments. Feedback will be given to students via the LMS Discussion Boards and after each assessment. This is facilitated by the LMS.

Finally, group work will also be used as a tool to assist students to meet their intended course outcomes and simultaneously develop institutional and ECSA graduate attributes. Graduate attributes will be assessed through the group project component of each subject. Learning is a social activity (Neff 2019) and group work promotes peer learning. Therefore, course presenters will facilitate the formation of syndicate groups during the contact sessions and course presenters will use the LMS to facilitate the formation of online groups and the group work activity that takes place during the rest of the year.

The teaching methods and mode of delivery discussed above are designed to accommodate learners who have full-time employment and study part-time, with the intention of providing opportunities for support or enriching their learning experience off campus. Specific courses are designed so that some knowledge gained in previous courses is used in subsequent courses, thereby allowing students to learn holistically and thereby develop graduate attributes. Furthermore, the incorporation of high-quality teaching and learning materials will add depth and richness to the learning opportunities.

Duke University. 2020. *Is Engineering Management Right For Me?* (online). Available online at: <https://memp.pratt.duke.edu/apply/engineering-management-right-me> (Accessed 31 March 2020).

GetEducated. 2020. *Engineering Manager*. Available from: <https://www.geteducated.com/careercenter/detail/engineering-manager/> (Accessed 14 March 2020)

Neff, L. S., 2019. *Lee Vygotsky and Social Learning Theories*. Available from: <https://jan.ucc.nau.edu/lsn/educator/edtech/learningtheorieswebsite/vygotsky.htm> (Accessed 28 February 2020).

BRIEF JUSTIFICATION FOR THE APPLICATION

Duke University (2020) argues that with the contemporary technological challenges facing humanity on a global level, there is a critical need for organizations to integrate technological skills with business acumen to solve these difficult problems. They specifically claim that Master of Engineering Management graduates are able to fill this gap.

Engineering managers are responsible for hiring staff, supervising employees, setting budgets and goals for projects, leading research and development projects, and also checking the accuracy of the work produced under their supervision. Since the work they perform is located in the engineering discipline, it is critical that they have appropriate technical knowledge and rational skills in the relevant engineering discipline, in addition to several cross-functional skills (for example project management skills, enterprise management skills and the ability to analyse big data) to be able to adequately fulfil the role of an engineering manager. Engineering management is a career that brings together the technological problem-solving ability of engineering and the organizational, administrative, and planning abilities of management in order to oversee the operational performance of complex engineering driven enterprises.

Essentially, successful engineering managers understand that they must take an integrated view of management in order to streamline operational activities, meet deliverables on time, and achieve organization goals. As engineers progress in their respective engineering careers (industrial, mechanical, electrical, civil, chemical etc.), the skills required from them by industry becomes more complex. Increasing seniority of the roles they fulfil in organizations necessitates skills that are classically regarded as more management skills than technical skills (Kettering University 2020).

Research by Schrimgeour (2019) indicates that globally the field of engineering remains a male dominated field, and significantly, this proposed qualification to be offered at CPUT will be oriented toward widening access to

female students through advertising, selection and bursaries geared towards women. The proposed qualification is intended to deepen the knowledge of students who already have a background in engineering with suitable industry experience, and enable them to become experts at the interface between engineering and management through the development of the ability to apply contemporary principles and practice to a greater extent. Ultimately, twenty-first century engineers all over the world require an interdisciplinary approach to solve today's complex problems. Consultation between DISE and industry partners from 2017 to 2020 confirmed this. DISE industry partners included Advisory Board representatives, selected South Africa universities (including University of Cape Town (UCT), Stellenbosch University (SU), University of Johannesburg (UJ)), CPUT alumni and prospective employers of our graduates. Notably, the envisaged (target) student intake will thus be professionals who have previously qualified as an engineer, and are already working (estimated to have at least two years' experience working) in an engineering discipline.

Aside from the above-mentioned, this proposed qualification was developed within a consortium partnership agreement between CPUT, three South African Universities of Technology (UoTs) and four European Universities. The South African partners are Durban University of Technology [DUT], Tshwane University of Technology [TUT], and Vaal University of Technology [VUT]. The international university partners are Wismar University [HSW], (Germany), Hochschule Flensburg [HSFL], (Germany), Uniwersytet Szczeciński [USZ], (Poland) and Universitatea Lucian Blaga Din Sibiu [ULBS], Romania. This project, known as Personalised Engineering Education in South Africa (PEESA III), was funded by the European Commission, and focused on the design of engineering degree programmes at Southern African partners, aligned with EUR-ACE standards, integrating flexible learning path, effective use of ICT, transversal skills (such as entrepreneurship, social responsibility, leadership, communication), to promote gender balance and close University - Business - Society cooperation. This proposed Masters of Engineering in Engineering Management at CPUT will be an independent offering and will not offered as a dual qualification with any other institution, however one module on this qualification has been developed by HSW and will be offered at CPUT by lecturers from HSW.

Thus, this proposed qualification was developed for more than one reason. The predominant and significant driver behind the development of this proposed qualification was however, an expression from industry partners (survey conducted in 2020) which highlighted the importance of managing cross-disciplinary engineering projects. An example of this is a mechanical engineer who is employed as the head of department in an international services organisation that provides critical asset support to both the energy and infrastructure sectors. Such an organisation may provide an array of services such as training, the production of mechanical or electrical equipment, equipment rental, commissioning, the design of hydraulics, pipelines and subsea solutions for clients and integrity management inter alia (see www.enermech.com). Although a mechanical engineer is mentioned in the example, this person could also be either an electrical, civil, chemical or industrial engineer as all engineering disciplines are the target of this proposed qualification. Furthermore, an engineering manager could even be the business owner of such an organisation. Thus, the engineering manager need to be able to integrate technical engineering expertise, savvy business acumen, and effective interpersonal communication skills to develop innovative ideas and solutions to problems that are socially conscious and sustainable.

Page (2020) confirms that there is a great demand for engineering managers on a global scale. Moreover, the advent of Industry 4.0 has brought this particular career into sharp focus, and CPUT finds itself in a position (due to it historically offering a wide range on engineering qualifications in the past, for example, degrees in mechanical, civil, chemical, electrical and industrial engineering) of being able to widen access to this career path to alumni. Although students from other universities or colleges (and students via the RPL route) will also be accepted into this proposed qualification, it is worth noting that CPUT's student profile consists predominantly of students from disadvantaged groups. CPUT is sensitive to regional and national needs and is therefore committed to providing widening access to this group. This is aligned with the CPUT Faculty of Engineering and Built Environment (FEBE) Strategic Plan of 2015 in which FEBE has committed itself to the provision of study programmes that are industry relevant and responsive to community needs.

Significantly, the most recent DHET list of qualifications in high demand (Government Gazette, June 2018) lists 'engineering manager' (OFO code 132104) as one of the occupations in the highest demand category in

South Africa. In addition, the South African National Development Plan 2030 (NDP 2030) which is an all-encompassing plan that offers a long-term perspective across all spheres of South African society, identifies the role that different sectors should play in overcoming poverty and inequality and reducing employment, and the implications these have for skills development and illustrates that the economic growth of country depends on the availability of highly skilled personnel at all levels. This foregrounds the importance of higher education and this proposed qualification (Masters of Engineering in Engineering Management), as this qualification will provide an articulation route for development of cumulative knowledge and expertise in the important field of engineering management. It is also worth noting that the latest accessible Government National Scarce Skills List of 2014 (Government Gazette, May 2014) lists 14 different engineering occupations (including electrical, mechanical, chemical and civil engineering) in the top 20 positions. The proposed Master of Engineering in Engineering Management qualification will support the further development of graduates in this area in South Africa.

An international and national comparability analysis which entailed the scrutiny qualifications that currently offered at other institutions against the proposed qualification. This benchmarking exercise has been instrumental in the development of this proposed qualification, as it has aided in the identification and confirmation of specific content areas that required in engineering management, in particular the modules Enterprise Management and Industry 4.0 (also referred to as Industry X.0). Moreover, it brought into sharp focus the importance of offering a research methods module at Master's level. All other qualifications that were compared had a research project module.

Internationally, there are several public and private universities (too many to all list) that offer an MEng Engineering or an equivalent Master's level degree specializing in Engineering Management. The great number of universities that offer this qualification demonstrates that on both an international there is a great demand for this proposed qualification. This is believed to stem from the great demand from industry on a global level for engineers with high level skills to manage cross-disciplinary operations, especially aligned with the increasing requirements of Industry 4.0. It is believed that increasing demand for the skills of graduates of this proposed qualification are also needed in South Africa.

For this comparability analysis six universities that are renowned for the quality of their qualifications, or for their engineering expertise, from different global geographical regions institutions were selected. This exercise revealed that the design of the proposed qualification is similar to the degrees offered at these institutions in terms of the amount of credits being offered, the duration of qualification, the subject content and entrance requirements. International universities include:

IUBH University of Applied Science (Germany) – MEng – contact sessions full time (1yr) course work consists of nine subjects and a research project. The subjects are The Internet of Things, Manufacturing Methods Industry 4.0, Leadership, Current Issues in Engineering Management, International Marketing Management, Product Development, Performance Measurement and Management, Quality Management and Environment and Strategic Management. Minimum entrance requirement is a four year Bachelor's degree in engineering (or a three-year Bachelor's degree with a TASC exam) See:

<https://www.iubh.de/en/master/degree-programmes/ma-engineering-management/>

Vienna University of Technology (Austria)- MSc contact sessions (2yrs) part time course work – ten compulsory subjects and a research project. Subjects are Probability and Statistics, Production Systems, Project Management and Statistics, Technology, Computing, IT and Production, Accounting, Financing, Marketing, Operations Management, Management Information Systems, International Law and Research Project. Minimum entrance requirement for this qualification is a Bachelor's degree or equivalent education diploma and professional qualifications. See:

https://cec.tuwien.ac.at/programs/engineering_school/engineering_management/EN/

University of Leeds (United Kingdom) – MSc online (2yrs – 4yrs) part time course work – nine subjects, (four compulsory and five electives) – Compulsory subjects are Innovation, Design and Creative Engineering, Business Strategy for Engineers, Enterprise and Business Planning, Engineering Management Project. Electives are, Managing Major Engineering Projects, Continuous Improvement in Engineering Supply Chains, Decision Making for Engineering Managers, Emerging and Disruptive Technologies, People and

Organizational Performance, Social and Corporate Responsibility). Minimum entrance requirement for this qualification is a UK 2:2 (hons) Bachelor's degree in Engineering, Physical Sciences or a related engineering or technological discipline where relevant subject areas have been studied, or equivalent. See:

<https://courses.leeds.ac.uk/d974/engineering-management-msc>

University of Ontario Institute of Technology (Canada) – MEng contact sessions (2yrs) part time course work – Website indicates that students study topics in planning, allocating resources, and directing and controlling activities that have an engineering or technological component. Subjects include Energy Systems Management, Engineering Project Management, Occupational Health and Safety, Production Planning and Operations Management, Quality Control and Applied Risk Analysis and Regulatory Affairs and Licensing. Minimum entrance requirements for this qualification is (worth noting minimum entrance requirement 73% for Bachelors) See:

https://gradstudies.ontariotechu.ca/future_students/programs/masters_programs/engineering_management/index.php#tab_program_about

Duke University (United States) MEM online (2yrs) part time course work – eight subjects (four compulsory and four electives) Compulsory subjects are Marketing, Intellectual Property, Business Law and Entrepreneurship, Finance in High-Tech Industries, Management of High-Tech Industries. Electives are Customer Experience and Product Design, Data Analytics and Machine Learning, Operations and Supply Chain Management, Product Management, Technology Management and Commercialization. Minimum entrance requirement for this qualification is a four-year Bachelor's degree in Engineering or Science. See:

<https://sites.duke.edu/dukeengineeringppm/master-of-engineering-management-mem/>

Southern Cross University (Australia) MEM online (16 months) full or part time course work – six subjects and a project (three are compulsory and three are electives) Compulsory subjects are Engineering for a sustainable future, Stakeholder Engagement, Strategic Infrastructure Asset Management. Electives include Organizational Behaviour, Entrepreneurship and Marketing, Economics and Quantitative Analysis, Project Management Principles, Project Management: Initiation and Planning, Project Management: Quality Control and Risk, Accounting for Managers, Finance for Managers, Global Business, Managing Digital Enterprise, Information Systems Analysis and Design, The Positive Leader and Corporate Governance for Leaders. Minimum entrance requirements for this degree are a four-year Bachelor's degree in Engineering or cognate discipline, or a three-year Bachelor's degree in Engineering or cognate discipline with at least two years relevant working experience. See: <https://www.scu.edu.au/study-at-scu/courses/master-of-engineeringmanagement-1209100/>

It is worth noting that all course providers evaluated offer this qualification as course work based which is the same as CPUT's proposed Master of Engineering in Engineering Management. Evaluation of the information obtained from the global comparability analysis (presented above), in addition to information obtained from industry partners assisted with the finalisation of the modules that were developed for this proposed qualification.

On a national level there are three universities that currently offer a 180 SAQA credit Master of Engineering in Engineering Management qualification in South Africa, however only two of these universities offer a coursebased Master's degree such as this proposed qualification. Equally important, neither of the universities that offer a course-based Master of Engineering in Engineering Management are located in the Western Cape.

The universities that currently offer a course-based Master's degree are both located in Gauteng. They are:

University of Johannesburg – 180 SAQA credits MEng Engineering Management contact sessions (course work), or 180 SAQA credits MEng Eng Man (research based), All 1yr – 2yrs (1yr = full time, 2yrs = part time) – The course work options involve six subjects and a project. The subjects are Engineering Management, Advanced Engineering Economics, Engineering Systems Management, Project Management, Product Design and Marketing, Reliability Management (No PGDip – only Masters). Minimum entrance requirements are a four-year Bachelor's degree in Engineering or a Baccalaureus Technologiae, Engineering or an equivalent qualification of an equivalent standard with at least 1.5 year's work experience. See:

<https://www.uj.ac.za/faculties/febe/Documents/Engineering%20Management%20Flyer.pdf>

Tshwane University of Technology – 180 SAQA credits MEng Engineering Management blended learning (2yrs – 4yrs) course work – ten subjects and a research project (four are compulsory subjects and six are electives). Compulsory subjects are Engineering Business Dynamics, Engineering Data Analysis, Research

Methodology, Technology Venture Creation. Electives are Engineering Product Management, Life Cycle Management, Maintenance Engineering, Quality Engineering and Supply Chain Management. Minimum entrance requirements for this degree include any Baccalaureus Technologiae in Engineering, or a Bachelor Honours of Engineering Technology in Engineering, or a Bachelor of Engineering or a Bachelor of Science in Engineering, or a NQF Level 8 qualification in Engineering (or related field), obtained from an accredited South African university, with an aggregate of 60% for the final year of study. Candidates with a Baccalaureus Technologiae, will be required to complete bridging modules: Engineering Project Management, Quality Engineering and Systems Modelling and (or their equivalents). Candidates who have not completed these bridging modules before registration, will be required to complete them concurrently with this qualification. See: https://www.tut.ac.za/ProspectusDocuments/2018/8.%20M_Eng_EngMan_Structured_2018.pdf

The remaining university that offers a Master of Engineering in Engineering Management is a pure research Master's degree. This university is located in the Western Cape:

Stellenbosch University – 180 SAQA credits MEng Engineering Management – research-based offering. See: <https://www0.sun.ac.za/pgstudies/postgraduate-programmes/faculty-of-engineering/qualifications-andfields-of-study-8.html>

This highlights the need for the proposed professional MEng in Engineering Management at CPUT, since research earlier in this section indicates that there is a growing need for Engineering Managers and there is no equivalent qualification currently being offered in the Western Cape. Thus, in the design of this proposed qualification care is taken to ensure mobility and articulation to a higher level at another university where possible.

Notably, in keeping with the purpose of this proposed qualification, and aligned with CHE HEQSF guidance document (2013), and CPUT graduate attributes, that the intended exit level outcomes of the proposed HEQSFaligned MEng in Engineering Management graduates are:

1. Demonstrate specialist knowledge to enable engagement with and critique of current engineering management practices in industry
2. Manage engineering management systems and associated processes in unfamiliar and variable contexts, recognising that problem solving within the system of processes being managed, is contextual.
3. Evaluate, products and processes in systems of an engineering management network, and assess the social, legal, health, safety and environmental impact of systems on each other and where applicable, benefits of the relationships within the context of the engineering management discipline.
4. Critically appraise research methods to manage engineering management research projects, as well as technology and information technology for application in engineering research projects that constitutes socially responsible research to local and other communities.
5. Plan and manage engineering management research projects using the available resources assigned to the research project within a prescribed timeframe and demonstrate an underlying fundamental knowledge, understanding and insight into engineering management principles and concepts, as well as the application of theory.
6. Conduct a review of literature pertinent to an engineering management or associated problem and demonstrate the ability to communicate effectively to specialist (engineering) and non-specialist (nonengineering) audiences using appropriate academic structure, style and graphical support.
7. Draw conclusions and present the results of a research project in the field of engineering management.
8. Manages him/herself and his/her academic activities responsibly, effectively, professionally and ethically and takes responsibility within his/her own limits of competence and to exercise judgement commensurate with knowledge and expertise, pertaining to the field of research
9. Effectively work with others as a member of a team, group, organisation, community or in multidisciplinary environments in the chosen field of research

Furthermore, the enrolment plan for Masters of Engineering in Engineering Management for 2021 – 2025 is as follows:

Year / **Student No.**

2021 / **20**
 2022 / **22**
 2023 / **25**
 2024 / **30**
 2025 / **30**

The enrolment plan refers to first time enrolments and the considerations for these number were the following:

- Significant feeder groups from existing students who have completed NQF Level 8 qualifications in various engineering disciplines within CPUT, as well as other institutions offer NQF Level 8 engineering qualifications, but who do not offer MEng in Engineering Management, and
- feedback from industry partners for this qualification via the department's Advisory Committee, and CPUT marketing channels will advertise and reach out to prospective students.

Emphasis will be placed on attracting and recruiting female students and students from disadvantaged backgrounds. Significantly, the CPUT student profile represents one of the most historically disadvantaged communities. As the primary feeder group fundamentally originates from this demographic, the proposed qualification will continue to promote the concept of wider access to these students.

Furthermore, there are planned diagonal and horizontal articulation routes into this qualification for prospective students who meet the minimum admission requirements as well as the RPL procedure, which may enable students from other institutions to also access the proposed qualification. Enrolment plan based on demographics may be seen below:

Year / Male Student / Female / Total Student No.

2021/ 7 / 13 / **20**
 2022/ 8 / 14 / **22**
 2023/ 9 / 16/ **25**
2024/ 12 / 18 / 30
 2025/ 12 / 18 / **30**

Year / African / Coloured / White / Indian / Total Student No.

2021/ 12 / 5 / 2/ 1 / **20**
 2022/ 13 / 6 / 2 /1 / **22**
 2023/ 15 / 7 / 2/ 1 / **25**
 2024/ 18 / 8/ 2 / 2 / **30**
 2025/ 18 / 8 / 2 / 2 / **30**

Finally, the staff envisaged for the proposed qualification can be seen in the table below:

Name	Position in Department	Qualification	Years of Teaching Experience
Prof Stephen Bosman	Head of Department (Acting)	DPhil Industrial Engineering	7
Mr Bharet Morar	Head of Programme Industrial Engineering	MSc Engineering Management	20
Mrs Lucrecia Valentine	Head of Programme Quality	MTech Quality	11
Mrs Desiree Jaftha	Lecturer	MTech Quality	14
Ms Maleecka Harris	Lecturer	MTech Quality	12
Mr Willy Ngitch	Lecturer	MTech Quality	11
Dr Bronwyn Swartz	Lecturer	DPhil Quality Management	8
Mr Willy Mkendi	Lecturer	MTech Mechanical	17

Mr Dennit Adams	Lecturer	MTech Industrial Engineering	4
Mr Tinashe Tendayi	Lecturer	MSc Engineering: Industrial	4
Mrs Lilian Ganduri	Lecturer	MEng Manufacturing and Operations	11
Mr Lungile Nyanga	Lecturer	MEng Manufacturing Systems and Operations Management	11
Lecturers with a Master's degree will co-supervise Masters' students. External supervisors being appointed to supplement supervisor capacity.			

The department has a focus on growing the capability and capacity of staff. Organically, seven staff members are currently busy with their doctoral studies and are at different rates of completion. The areas of research are related to the department and what needs to be developed from an engineering education perspective. In addition to these studies, the departmental training plan has taken the proposed subject matter into consideration and staff will undergo training that is relevant to the course work. An important theme of "Industry 4.0" underpins much of the theory and staff have been encouraged to raise their knowledge accordingly.

The additional coursework will require more capacity in the short to medium term and will strain the workload of the department. It is foreseen that some part-time and even new permanent/fixed contract staff will be required.

Duke Univeristy. 2020. *Is Engineering Management Right For Me?* (online). Available online at: <https://memp.pratt.duke.edu/apply/engineering-management-right-me> (Accessed 31 March 2020).

Kettering Univeristy. 2020. *Why study Engineering Management* (online). Available online at: <https://online.kettering.edu/news/2016/10/11/why-study-engineering-management> (Accessed 16 February 2020).

National Planning Commission. 2020. National Development Plan 2030 (online). Available online at: <https://www.gov.za/sites/default/files/Executive%20Summary-NDP%202030%20-%20Our%20future%20-%20make%20it%20work.pdf> (Accessed 16 February 2020).

Page. M. 2020. The World's Most in Demand Professions. Available online at: <https://www.michaelpageafrica.com/minisite/most-in-demand-professions/> (Accessed 16 March 2020).