MOI UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF MANUFACTURING, INDUSTRIAL & TEXTILE ENGINEERING

DOCTORAL PROGRAMS

HANDBOOK

January 2020

Executive summary

This handbook is produced by the school of engineering of Moi University in conjunction with academic departments offering doctoral programmes. The handbook is normally updated after every curriculum review of the programmes. The Department of Manufacturing, Industrial and Textile Engineering in the School of Engineering, offers two doctoral programs:

- Doctor of Philosophy in Material and Textile engineering
- Doctor of Philosophy in Industrial Engineering

This handbook provides the following information concerning each doctoral program:

- Program summary
- Description of the programme
- Objectives of the programme
- Expected learning outcome of the programme
- Structure of the programme
- Admission requirements
- Examination requirements
- Graduation requirements
- Degree award
- Professional accreditation

Dean School of Engineering Head, MIT Department

1 DOCTOR OF PHILOSOPHY IN MATERIAL AND TEXTILE ENGINEERING PROGRAM

1.1 Program Summary

School	Engineering
Department	Manufacturing, Industrial & Textile Engineering
Contact	hodmit@mu.ac.ke
Campus	Main
Typical full duration	3 Years
Minimum Credit Units for Award	90
Award (s)	PhD in Material & Textile Engineering

1.2 Program Description

PhD in Material and Textile Engineering programme offers advanced training in two areas of specialization, that is, Material Engineering and Textile Engineering. The programme is designed to equip learners with knowledge, competences and skills within the chosen area of study and to encourage intellectual and personal development. The program produces graduates with industrial competences, design and research skills who are capable of solving industrial problems. Additionally, the training provides an advanced solid academic foundation to support all other levels of research and study that includes masters, bachelors, diploma and certificateas.

1.3 Objectives of the Programme

This programme is designed to:

1. Develop advanced professional capacity, specialised skills and in-depth discipline knowledge in Material and Textile Engineering.
2. Equip the learners with research skills, critical thinking and problem solving capacity necessary to solve appropriate Material and Textile Engineering problems.
3. Stimulate career and leadership readiness, self-awareness, teamwork and ethical competence.
4. Furnish the learners with an inquisitive mind-set and intelligence oriented towards innovation.

1.4 Learning Outcomes of the Programme

Upon the completion of the programme, the learners should be able to:

1. Formulate and implement research, publish results and evaluate solutions to Material and Textile Engineering problems.
2. Analyse and appraise contemporary and emerging issues in Material and Textile Engineering
3. Provide innovative engineering services in a professional and ethical manner through consultancy and teaching.
4. Adapt Material and Textile Engineering knowledge, expertise and workshop floor practice to integrate engineering concepts and develop innovative solutions to societal problems.

1.5 Programme Structure

The doctorate programme consists of course work, examination and thesis, normally extending over a period of three academic years distributed over six semesters with maximum study duration of six years. All coursework is done in year one of the study and consist of taught courses while research work is conducted in year two and year three of the study. The complete programme consists of 10 courses: 4 core courses, 3 elective courses, 2 research-based courses and a research thesis all amounting to 90 credit units. The taught courses (core + elective) carries 21 credit units while the research-based courses

carry 6 credit units while the research thesis carries 63 credit units. One (1) Credit Unit (CU) is equivalent to one (1) contact hour in a lecture session per week or two (2) contact hours in a tutorial session per week or three (3) contact hours in a laboratory session per week.

1.5.1 Core Courses

The following courses are compulsory for all students enrolled in the programme:

- MTE 901: Advanced Research Methods in Engineering (3 CU)
- MTE 902: Industrial Innovation and Entrepreneurship (3 CU)
- MTE 905: Statistics for Research (3 CU)
- MTE 910: Nanotechnology (3 CU) – Material Engineering Option
- MTE 960: Medical and Smart Textiles (3 CU) – Textile Engineering Option

1.5.2 Research-based Courses

The following courses are compulsory for all students enrolled in the programme:

- MTE 903: Research Seminar I (3 CU)
- MTE 904: Research Seminar II (3 CU)
- MTE 999: Thesis (63 CU)

1.5.3 Elective courses - Material Engineering Option

Choose three electives courses from the following list:

- MTE 911E: Advanced Composite Materials and Structures (3 CU)
- MTE 912E: Advanced Computational Techniques (3 CU)
- MTE 913E: Material Characterisation Techniques (3 CU)
- MTE 914E: Engineering Materials in Design and Society (3 CU)
- MTE 963E: Advanced Methods In Polymer Characterization (3 CU)
- MTE 812E: Mechanics of Materials (3 CU)

1.5.4 Elective courses - Textile Engineering Option

Choose three electives courses from the following list:

- MTE 961E: Geotextiles (3 CU)
- MTE 962E: Polymer Rheology and Processes (3 CU)
- MTE 963E: Advanced Methods In Polymer Characterization (3 CU)
- MTE 964E: Advanced Medical Textiles and Biomaterials (3 CU)
- MTE 965E: Advanced Woven and Non Woven Structures (3 CU)
- MTE 966E: Advanced Knitting Technology (3 CU)

1.5.5 Recommended Study Plan

Normally, the study plan for students enrolled in the programme is as follow:

Year 1		Year 2		Year 3	
Semester 1	**Semester 2**	**Semester 1**	**Semester 2**	**Semester 1**	**Semester 2**
MTE 901	MTE 902	MTE 999	MTE 999	MTE 999	MTE 999
MTE 903	MTE 904				
MTE 905	MTE 999				
MTE 910/ MTE 960	Elective				
Elective	Elective				

1.6 Admission Requirements

To qualify for admission into the programme, a candidate must be a holder of a Bachelor's degree in Engineering or a closely related discipline. In addition, the candidate must have:

- Master of Science degree in Industrial Engineering or Textile Engineering or Industrial Technology or Textile Technology or Mechanical and Production Engineering or Chemical Engineering or Industrial and Textile Engineering or Materials Engineering or Electrical and Communications Engineering or any other relevant Masters degree in Engineering of Moi University.
- A relevant Master's degree of any other accredited University recognized by Moi University Senate.

1.7 Examination Regulations

- The Common Examination regulations for Doctor of Philosophy of Moi University shall apply.
- The Moi University postgraduate rules and regulations shall apply in the evaluation of PhD thesis after submission of the same by the candidate.
- In order to graduate, candidates shall be expected to publish at least two scientific publications in refereed journals.

1.8 Graduation Requirements

To qualify for graduation, a candidate must complete and pass a minimum of ninety (90) credit units from a minimum of ten courses consisting of nine (9) prescribed courses and a thesis.

1.9 Degree Award

Upon successful completion of the programme and satisfying all the requirements as stated by the Moi University senate, the candidate will be awarded a Doctor of Philosophy in Material and Textile Engineering.

1.10 Professional Accreditation

The PhD programme in Material & Textile Engineering is approved and accredited by Commission for University Education (Kenya).

2 DOCTOR OF PHILOSOPHY IN INDUSTRIAL ENGINEERING PROGRAM

2.1 Program Summary

School	Engineering
Department	Manufacturing, Industrial & Textile Engineering
Contact	hodmit@mu.ac.ke
Campus	Main
Typical full duration	3 Years
Minimum Credit Units for Award	90
Award (s)	PhD in Industrial Engineering

2.2 Program Description

PhD in Industrial Engineering program offers advanced training in five areas of specialization namely: manufacturing systems and processes; engineering materials and technology; industrial innovation and development; industrial management; Sustainable energy and environment. The doctoral program is rigorous and it is intended to create the highest level of scholarship, research and development capability in a specialized area of Industrial Engineering. The emphasis of this doctoral program is innovative research, and the goal is to produce high-quality specialists. The program is designed to create the highest level of formal scholarship in a specialized area of Industrial Engineering. Graduates of the program should be able to utilize the acquired knowledge and practical skills to pursue successful high-level professional and leadership careers in the industry as well as in research, innovation, development and teaching.

2.3 Objectives of the Programme

This programme is designed to:

- Equip the learners with research skills necessary to evaluate and solve appropriate industrial and manufacturing problem.
- Stimulate applied and advanced research for industrial development.
- Develop advanced professional capacity in industrial and manufacturing engineering.
- Support an inquisitive mind-set oriented towards innovation.

2.4 Learning Outcomes of the Programme

The program is designed to cover aspects of materials, manufacturing, environment and management in industrial and manufacturing engineering with a strong emphasis on applied industrial research and innovation. Upon the completion of the programme, the learners should be able to:

- Conduct research and execute industrial and manufacturing projects using the acquired practical research skills.
- Derive knowledge in advanced research techniques and tools.
- Develop skills and attitudes to offer professional ethical services, teaching and consultancy in industrial and manufacturing engineering.
- Choose and justify innovative engineering solutions for industrial and societal problems.

2.5 Programme Structure

The doctorate programme consists of course work, examination and thesis, normally extending over a period of three academic years distributed over six semesters with maximum study duration of six years. All coursework is done in year one of the study and consist of taught courses while research work is conducted in year two and year three of the study. The complete programme consists of 10 courses: 5 core courses, 2 elective courses, 2 research-based courses and a research thesis all amounting to 90 credit units. The taught courses (core + elective) carries 21 credit units while the research-based courses carry 9 credit units while the research thesis carries 60 credit units. One (1) Credit Unit (CU) is equivalent to one (1) contact hour in a lecture session per week or two (2) contact hours in a tutorial session per week or three (3) contact hours in a laboratory session per week.

2.5.1 Core Courses (CC)

The following courses are common and compulsory for all students enrolled in the programme regardless of their specialization options:

- MIE 901: Advanced Research Methods and Techniques (3 CU)
- MIE 903: Statistics for Research (3 CU)
- MIE 902: Industrial Innovation and Entrepreneurship (3 CU)

The following courses are compulsory for all enrolled students in *Engineering Materials and Technology* Option:

- MIE 910: Advanced Engineering Materials in Design and Society (3 CU)
- MIE 911: Advanced Composite Materials and Structures (3 CU)

The following courses are compulsory for all enrolled students in *Industrial Innovation and Development* Option:

- MIE 920: Technological Innovation Management (3 CU)
- MIE 921: Theory of Innovative Problem Solving (3 CU)

The following courses are compulsory for all enrolled students in *Manufacturing Systems and Processes* Option:

- MIE 930: Systems Engineering (3 CU)
- MIE 931: Concurrent Engineering (3 CU)

The following courses are compulsory for all enrolled students in *Industrial Management* Option:

- MIE 940: Engineering and Innovations Management (3 CU)
- MIE 941: Risk Assessment and Management (3 CU)

The following courses are compulsory for all enrolled students in *Sustainable Energy and Environment* Option:

- MIE 950: Energy and Society (3 CU)
- MIE 951: Energy and the Environment (3 CU)

2.5.2 Research-based Courses

The following courses are compulsory for all students enrolled in the programme:

- MIE 905: Research Seminar (3 CU)
- MIE 906: Research Proposal (6 CU)
- MIE 999: Thesis (60 CU)

2.5.3 Elective courses (EC) - *Engineering Materials and Technology* Option

Choose two electives courses from the following list:

MIE 912E: Nanotechnology (3 CU)
MIE 913E: Impact of Engineering Materials Technology on Society (3 CU)
MIE 914E: Material Characterisation Techniques (3 CU)
MIE 915E: Advanced Computational Techniques for Engineering Materials (3 CU)
MIE 916E: Mechanics of Materials and Finite Element Analysis (3 CU)

2.5.4 Elective courses - *Industrial Innovation and Development* Option

Choose two electives courses from the following list:

MIE 922E: Quality Design and Control (3 CU)
MIE 923E: Maintenance Engineering (3 CU)
MIE 924E: Industrial Innovation and Development I (3 CU)
MIE 925E: Industrial Innovation and Development II (3 CU)
MIE 926E: Maintenance, Replacement and Reliability Engineering (3 CU)

2.5.5 Elective courses - *Manufacturing Systems and Processes* Option

Choose two electives courses from the following list:

MIE 932E: Advanced Lean Manufacturing (3 CU)
MIE 933E: Industrial Forecasting Techniques and Simulation Modelling (3 CU)
MIE 934E: Industrial and Manufacturing Systems (3 CU)
MIE 935E: Industrial Processes (3 CU)

2.5.6 Elective courses - *Industrial Management* Option

Choose two electives courses from the following list:

MIE 942E: Engineering Logistics (3 CU)
MIE 943E: Total Quality Management (3 CU)
MIE 944E: Marketing of Technology (3 CU)
MIE 945E: Engineering Economy for Decision Making (3 CU)

2.5.7 Elective courses - *Sustainable Energy and Environment* Option

Choose two electives courses from the following list:

MIE 952E: Hybrid Energy Technologies (3 CU)
MIE 953E: Renewable Energy for Sustainable Development (3 CU)
MIE 954E: Bioenergy Systems (3 CU)
MIE 955E: Environmental Impact Assessment and Audit (3 CU)
MIE 956E: Cleaner Production and Life Cycle Engineering (3 CU)

2.5.8 Recommended Study Plan

Normally, the study plan for students enrolled in the programme is as follow:

Year 1		Year 2		Year 3	
Semester 1	**Semester 2**	**Semester 1**	**Semester 2**	**Semester 1**	**Semester 2**
MIE 901	MIE 902	MIE 999	MIE 999	MIE 999	MIE 999
MIE 903	MIE 906				
MIE 905	Option CC 2				
Option CC 1	Option EC 2				
Option EC 1					

2.6 Admission Requirements

To qualify for admission into the programme, a candidate must be a holder of a Bachelor's degree in Engineering or a closely related discipline. In addition, the candidate must have:

- Master of Science degree in Industrial Engineering or Textile Engineering or Industrial Technology or Textile Technology or Mechanical and Production Engineering or Chemical Engineering or Industrial and Textile Engineering or Materials Engineering or Electrical and Communications Engineering or any other relevant Masters degree in Engineering of Moi University.
- A relevant Master's degree of any other accredited University recognized by Moi University Senate.

2.7 Examination Regulations

- The Common Examination regulations for Doctor of Philosophy of Moi University shall apply.
- The Moi University postgraduate rules and regulations shall apply in the evaluation of PhD thesis after submission of the same by the candidate.
- In order to graduate, candidates shall be expected to publish at least two scientific publications in refereed journals.

2.8 Graduation Requirements

To qualify for graduation, a candidate must complete and pass a minimum of ninety (90) credit units from a minimum of ten courses consisting of nine (9) prescribed courses and a thesis.

2.9 Degree Award

Upon successful completion of the programme and satisfying all the requirements as stated by the Moi University senate, the candidate will be awarded a Doctor of Philosophy in Industrial Engineering.

2.10 Professional Accreditation

The PhD programme in Industrial Engineering is approved and accredited by Commission for University Education (Kenya).