UNIVERSITI TEKNIKAL MALAYSIA MELAKA

POSTGRADUATE ACADEMIC HANDBOOK 2022/2023

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

POSTGRADUATE ACADEMIC HANDBOOK 2022/2023

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FIRST PUBLISHED 2022

Member of the Malaysian Scholarly Publishing Council (MAPIM)
Member of the Malaysian Book Publishers Association (MABOPA)

Published and Printed in Malaysia by:
Penerbit UTeM Press
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.
Tel: +606 270 1241 Faks: +606 270 1038

ACKNOWLEDGEMENT

The Faculty would like to extend our gratitude and appreciation to all who have contributed to the success of Academic Handbook Session 2022/2023 completion:

Ir. DR. ZAMANI BIN MD. SANI
DR. AZZIDDIN BIN MOHAMAD RAZALI
Ir. DR. ANUAR BIN MOHAMED KASSIM
DR. AINE IZZATI BINTI TARMIZI
ANIS NIZA BINTI RAMANI
MOHAMAD RIDUWAN BIN MD NAWAWI
DR. MUHAMAD KHAIRI BIN ARIPIN
MOHD WAHYUDI BIN MD HUSSAIN
SITI FATIMAH BINTI KAMARUDIN
NOR-ALIZA BINTI IBRAHIM

And all of the parties involved.


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CONTENTS

TOP MANAGEMENT

PROF. TS. DR. MASSILA
BINTI KAMALRUDIN
Vice Chancellor

PROF. DR. ZULKIFILIE
BIN IBRAHIM
Deputy Vice Chancellor,
Academic & International

PROF. IR. DR. GHAZALI
BIN OMAR
Deputy Vice Chancellor,
Research & Innovation

ASSOC. PROF. DATUK DR. SABRI
BIN MOHAMAD SHARIF
Deputy Vice Chancellor,
Student Affairs

ENCIK MASDZARIF
BIN MAHAT
Chief Operating Officer

ENCIK KHAIRUL
BIN TAIB
Bursar

ENCIK AZMAN
BIN HJ. AYUB
Chief Librarian

DATUK AZHAR
BIN MOHAMED
Legal Advisor

PROF. DR. MOHD KHANAPI
BIN ABD GHANI
Chief Information Office

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

VISION

To Be One of the World's Leading Innovative and Creative Technical Universities.

MISSION

UTeM is committed to pioneer and contribute towards the prosperity of the nation and the world by;

1. Promoting knowledge through innovative teaching and learning, research and technical scholarship.
2. Developing professional leaders with impeccable moral values.
3. Generating sustainable development through smart partnership with the community and industry.

MOTTO

Excellence Through Competency.

GENERAL EDUCATIONAL GOALS

1. To conduct academic and professional programmes based on relevant needs of the industries.

2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.

3. To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.

4. To foster development and innovation activities in collaboration with industries for the prosperity of the Nation.

5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.

6. To develop technopreneurship and managerial skills amongst graduates.

7. To instill an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.

WELCOMING SPEECH FROM DEAN FACULTY OF ELECTRICAL ENGINEERING

Bismillahir Rahmanir Rahim
Assalamu'alaikum and a Very Good Day

All praises are due to Allah SWT, the most Gracious, and with His Mercy the Academic Handbook of Postgraduate Studies for the Academic Session of 2022/2023 has been successfully published by the Faculty of Electrical Engineering, Universiti Teknikal Malaysia Melaka.

First, I would like to congratulate all new students on your admission to UTeM and welcome to Faculty of Electrical Engineering. I can assure you that you have come to the right Institution of Higher Learning (IHL) and an exciting learning experience awaits you at this faculty.

In line with the faculty's motto "Towards Academic Excellence", we strive hard to produce a competent, capable, knowledgeable and ethical human capital that is able to assist the government and the industry in pushing our country towards better economy and lifestyle. In order to achieve this, the faculty has implement Outcome Based Education (OBE) curriculum since July 2010. We hope this approach will better equip our students with the required skills upon their graduation.

This year, the faculty offers three (3) types of Postgraduate Programmes i.e. research mode, mixed-mode and taught course which comply with the Malaysia Qualification Agency (MQA) requirements. Programmes of Doctor of Philopsophy (Ph.D), Doctor of Engineering (D.Eng) and Master of Science (M.Sc) are conducted by research mode.

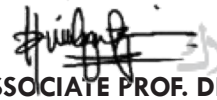
For programme Master of Electrical Engineering (Industrial Power) or MEKP, the combination of research and taught course or so called mixed-mode is offered in FKE. For Master of Electrical Engineering (MEKG) and Master of Mechatronics Engineering (MEKH), these 2 programmes are conducted in full taught course.

This handbook provides a brief overview about the faculty, entry requirement, duration of studies, curriculum structure, the PEOs and POs, and course summary which serves as a reference for the new intake of Academic Session of 2022/2023. Hopefully, it will provide guidance for students in planning their studies systematically in order to achieve academic excellence and eventually graduate on time with good grades.

Last but not least, I would like to extend my thanks and gratitude to all the committee members for their hard work, support and effort towards publishing this handbook.

Wassalam.

"Towards Academic Excellence"



ASSOCIATE PROF. DR. HIDAYAT BIN ZAINUDDIN
Dean,
Faculty of Electrical Engineering Universiti Teknikal Malaysia Melaka

FACULTY ORGANISATION STRUCTURE

ASSOCIATE PROF. DR. HIDAYAT BIN ZAINUDDIN
DEAN

Ir. DR. FAIRUL AZHAR BIN ABDUL SHUKOR
DEPUTY DEAN
(ACADEMIC

ASSOCIATE PROF. IR. DR. GAN CHIN KIM
DEPUTY DEAN (RESEARCH
&POSTGRADUATE STUDIES)

Ts. DR. HAZRIQ IZZUAN BIN JAAFAR
DEPUTY DEAN
(STUDENT DEVELOPMENT)

DR. AINAIN NUR BINTI HANAFI
HEAD OF DEPARTMENT
MECHATRONICS ENGINEERING

ASSOCIATE PROF. DR.
ROZAIMI BIN GHAZALI
HEAD OF DEPARTMENT
ELECTRICAL ENGINEERING

ASSOCIATE PROF. DR.
MUHAMMAD NIZAM BIN
KAMARUDIN
HEAD OF DEPARTMENT
DIPLOMA STUDIES

DR. KYAIRUL AZMI BIN
BAHARIN
LABORATORY
COORDINATOR

ASSOCIATE PROF. IR. DR.
AHMAD ZAKI BIN SHUKOR
POST GRADUATE
COORDINATOR

DR. FARHAN BIN HANAFFI
COORD NATOR
ELECTRICAL ENGINEERING

NOR-ALIZA BINTI IBRAHIM
SENIOR ASSISTANT REGISTRAR
ACADEMIC & STUDENTS'
DEVELOPMENT

RAIHATUL JANNAH BINTI ABDULLAH
SENIOR ASSISTANT REGISTRAR
ADMINISTRATION & FINANCE UNIT

FACULTY AT A GLANCE

Faculty of Electrical Engineering (FKE) was established in early 2001 and officially began to operate from 22nd June 2001 after obtaining an authorization from Ministry of Education. Initially, the faculty's temporary campus was situated at Taman Tasik Utama, Ayer Keroh and later was allocated to the UTeM's main campus at Durian Tunggal.

In order to uphold the academic pillar that being decended to the faculty, a managerial team leaded by the Dean was established and assisted by three (3) Deputy Deans, three (3) Heads of Department, two (2) Program Coordinator and two (2) Head of Taught Course Programme and two (2) Senior Assistant Registrar. Other than that, the combination of lecturers that excel in various fields provide a strong academic background inside faculty as well as high commitment in educating our new generation to become outstanding graduates that equipped with knowledge, technical competencies and well versed soft skills.

Besides the undergraduate programmes, the faculty offers three (3) types of Postgraduate Programmes:

1. Research Mode
   a) Doctor of Philosophy (Ph. D) - PEKA
   b) Doctor of Engineering (D. Eng)
   c) Master of Science (M.Sc.) in Electrical Engineering - MEKA
   d) Master of Science (M.Sc.) in Mechatronics Engineering - MEKM

2. Mixed-Mode
   a) Master of Electrical Engineering (Industrial Power) - MEKP

3. Taught Course Mode
   a) Master of Electrical Engineering - MEKG
   b) Master of Mechatronics Engineering - MEKH

FACULTY MISSION, MOTTO AND OBJECTIVES

FACULTY'S MISSION

The Faculty's mission is to provide quality technical education and professional services through broad-based knowledge, innovation and creativity based on expertise and latest technology in enhancing excellent work culture, mutual understanding and cooperation while upholding moral values in line with the national aspirations.

FACULTY'S MOTTO

Towards Academic Excellence

FACULTY'S OBJECTIVES

1. To conduct academic programs recognized by professional bodies that meet the global standards.
2. To produce competent and responsible professionals.
3. To provide balanced academic programs in terms of theory and practical based on Outcome Based Educations (OBE).
4. To enhance smart partnerships between the Faculty with the industry through services, consultancies, and research activities.
5. To create a conducive teaching and learning environment.
6. To produce knowledgeable, outstanding visionary individuals instilled with moral values.
7. To promote a culture of publication amongst academics.

1.0

MASTER PROGRAMME BY TAUGHT COURSE


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

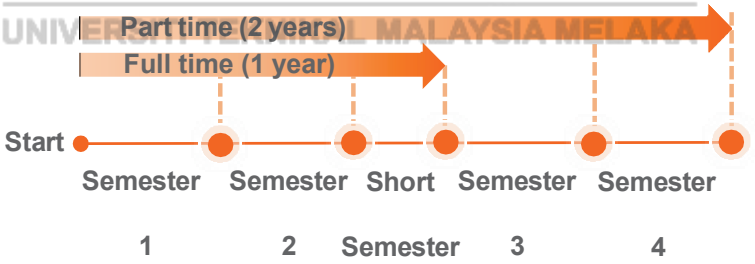
MASTER PROGRAMME BY TAUGHT COURSE

The Master programme by Taught Course (or coursework) is designed to extend the knowledge and skills gained from the first degree and to develop new professional skills of the graduates in the particular area of study. The programme involves lectures, seminars and project work. A minimum of 40 credit hours of taught subjects and a research report and a final Cumulative Grade Point Average (CGPA) of at least 3.0 are required for the award of the Master degree. The credit hour which comply with the Malaysia Qualification Agency (MQA), of study comprise a combination of compulsory subjects, electives and a Master's Project. Assessments are made through take home assignments, tests and final semester examinations. Students' progress and performance in the Master project is assessed through oral presentations and a written report.

Faculty of Electrical Engineering offers two programme for Master of Electrical Engineering:

- Master of Electrical Engineering – MEKG
- Master of Mechatronics Engineering – MEKH

DURATION OF STUDIES



ENTRY REQUIREMENTS

Academics Requirement:

a) A bachelor's degree in the field or related fields with a minimum CGPA of 2.50 or equivalent, as accepted by the HEP Senate; or
b) A bachelor's degree in the field or related fields or equivalent with a minimum CGPA of 2.00 and not meeting a CGPA of 2.50, can be accepted subject to rigorous internal assessment.
c) Candidates without a qualification in the related fields or working experience in the relevant fields must undergo appropriate prerequisite courses determined by the HEP and meet the minimum CGPA based on (i) to (ii)

Language Requirement:

a) International applicants are required to present the Test of English as a Foreign Language (TOEFL) or the test administered by the International English Language Testing System (IELTS) with the minimum required score listed in Table 1

Table 1: Minimum English Requirement

Minimum TOEFL score	Minimum IELTS score
520	5.0

b) Applicants without TOEFL/IELTS or for those who obtained a score below the requirement above are required to undergo and pass the English language programme conducted by UTeM prior to commencement of the postgraduate programme.
c) Exemption may be given to those who have undertaken regular programmes of studies and graduated from universities that use English as the medium of instruction or who has graduated from UTeM in a programme with English as the medium of instruction.

Additional Requirements for International Students:

a) All international students are required to register as full time student and should have the financial capability to meet the course fees and living expenses.
b) Applicants need to submit a letter of certification from their Ministry of Education verifying nationality and academic qualifications of candidate.
c) Academic transcripts and supporting documents must be certified true copies by a senior public official from the applicant's country or from Malaysia.
d) Proof of financial ability to pursue their studies and live in Malaysia for the duration of study. A letter of financial guarantee/sponsorship or the most recent financial statement from applicant's bank is sufficient.
e) Have international passport with at least TWO (2) years validity and meet all immigration procedures.
f) Medical check-up by the health authorities.

Programme Outcomes (PO) – Master of Electrical Engineering

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Master of Electrical Engineering Programme:

Demonstrate continuing and advanced knowledge and have the capability to further develop or use these in electrical engineering field.

Analyse and evaluate problems in electrical critically particularly in situations with limited information and to provide solutions through the application of appropriate tools and techniques.

Appraise available information and research evidence and apply it in the electrical engineering context.

Conduct project and adhere to legal, ethical and professional codes of practice.

Demonstrate leadership qualities through communicating and working effectively with peers and stakeholders.

Generate solutions to problems using scientific and critical thinking skills.

Manage information and lifelong learning skills.

Programme Outcomes (PO) – Master of Mechatronics Engineering

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Master of Mechatronics Engineering Programme:

Demonstrate continuing and advanced knowledge and have the capability to further develop or use these in mechatronics engineering field..

Analyse and evaluate problems in mechatronics critically particularly in situations with limited information and to provide solutions through the application of appropriate tools and techniques.

Appraise available information and research evidence and apply it in the mechatronics engineering context.

Conduct project and adhere to legal, ethical and professional codes of practice.

Demonstrate leadership qualities through communicating and working effectively with peers and stakeholders.

Generate solutions to problems using scientific and critical thinking skills.

Manage information and lifelong learning skills.

Master of Electrical Engineering – MEKG

Master of Electrical Engineering (Taught course) is developed to instil a strong engineering foundation, to produce graduates that are proficient in solving electrical engineering problems. This will ensure the graduates of electrical engineering are able to practice their knowledge in their future career. The intention of this proposed programme are to blend the fundamental elements of advanced electrical and mechatronics with industrial and manufacturing related studies, provide the opportunity for student to specialize in areas related with advanced industrial power, power electronics & drives and control engineering, professional training on research methods and helping student from variety of science and engineering background meet their career ambition with the special aims of "employability in mind".

Programme Educational Objectives (PEO) – MEKG

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's Master Programme:

- Master knowledge acquired for innovation and creative scholarly activities in electrical engineering
- Practice professional leadership in related to electrical engineering field
- Engage with community and industry towards sustainable development and life-long learning

Master of Mechatronics Engineering – MEKH

Master of Mechatronics Engineering (Taught course) is developed to instil a strong engineering foundation, to produce graduates that are proficient in solving mechatronic engineering problems. This will ensure the graduates of mechatronic engineering are able to practice their knowledge in their future career. Master of Mechatronics Engineering programme by taught course with covers courses such as industrial robotics, Internet of Things-related controllers, mechatronics and control systems.

Programme Educational Objectives (PEO) – MEKH

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's Master Programme:

Master knowledge acquired for innovation and creative scholarly activities in mechatronics engineering

Practice professional leadership in related to mechatronics engineering field

Engage with community and industry towards sustainable development and life-long learning


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.0

COURSE IMPLEMENTATION MASTER PROGRAMME BY TAUGHT COURSE


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Master of Electrical Engineering – MEKG

Programme Structure

Full-time course

Semester	Course		Credit
1	MPSW 5013	Research Methodology	3
	MEKG 5123	Electrical Power System	3
	MEKC 5133	Modern Control Design	3
	MEKG 5143	Advanced Electrical Machines and Drives	3
	MEKG 5153	Insulation Coordination and Diagnostic Testing	3
	MEKG 5163	Energy Conversion	3
		Total Credit	**18**

Semester	Course		Credit
2	MPSW 5033	Engineering and Technology Management	3
	MEKG 5233	Sustainable Energy and Distributed Generation	3
	Elective I	Elective I	3
	Elective II	Elective II	3
	MEKG 5283	Master Project 1	3
		Total Credit	**15**

Semester	Course		Credit
Short Semester	MEKG 5397	Master Project 2	7
		Total Credit	7
		Total Credit Hours	**40**

Part-time course

Semester	Course		Credit
Year 1 Sem 1	MPSW 5013	Research Methodology	3
	MEKG 5123	Electrical Power System	3
	MEKC 5133	Modern Control Design	3
	MEKG 5153	Insulation Coordination and Diagnostic Testing	3
		Total Credit	**12**

Semester	Course		Credit
Year 1 Sem 2	MPSW 5033	Engineering and Technology Management	3
	MEKG 5163	Energy Conversion	3
	MEKG 5143	Advanced Electrical Machines & Drives	3
	Elective I	Elective I	3
		Total Credit	**12**

Semester	Course		Credit
Year 2 Sem 1	MEKG 5283	Master Project 1	3
	Elective II	Elective II	3
	MEKG 5233	Sustainable Energy and Distributed Generation	3
		Total Credit	**9**

Semester	Course		Credit
Year 2 Sem 2	MEKG 5397	Master Project 2	7
		Total Credit	7
		Total Credit Hours	**40**

Elective Courses

Course		Credit	Field
MEKE 5423	Advanced Drive Systems	3	Power Electronics & Drives
MEKE 5433	Electrical Machine Design	3	
MEKE 5443	Power Electronics for Renewable Energy Systems	3	
MEKC 5423	Nonlinear Control Systems	3	Control System Engineering
MEKC 5433	Intelligent Control	3	
MEKC 5443	Control Technology and Applications	3	
MEKP 5023	Power Systems Operation and Control	3	Power System Engineering
MEKP 5063	Power System Protection and Stability	3	
MEKP 5033	Power Quality and Energy Efficiency	3	
MEKP 5453	Lightning Protection and Grounding System	3	

Details

MPSW 5013
RESEARCH METHODOLOGY

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research programme at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

[1] Barbie, Earl R., 1998, Survey Research Methods, 2nd Edition, Waddsworth Publishing Company, California, USA, 1998.
[2] Linda Cooley and Jo Lewkowicz, 2003, Dissertation Writing in Practice, Turning Ideas into Text, 1st Edition, Hong Kong University Press.
[3] James, E.M., Jack, W.B., 2005, Guide to the Successful Thesis and Dissertation. 5 th Edition, Marcel Dekker, Inc., New York, USA.
[4] Syed, V.A., and Victor, B.L., 2005, The Art of Scientific Innovation, Cases of Classical Creativity, 1st Edition, Pearson Prentice Hall, New Jersey, USA.
[5] Blaxter, L. et al., 2001, How to Research, 1st Edition, Open University Press, Milton Keynes, Buckingham, UK.

MPSW 5033
ENGINEERING & TECHNOLOGY MANAGEMENT

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behaviour of engineering/ technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the subject will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

[1] Innovation Management and New Product Development (6th Edition) 6th Edition, Paul Trott (Author), Pearson; 6 Edition (2016).
[2] Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, John Wiley & Sons, (2011).
[3] Operations Management 13th Edition by William J Stevenson (Author) McGraw-Hill Education; (2017).
[4] Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma by Jim Hall, Tina Scott CreateSpace Independent Publishing Platform (2016).
[5] The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional Sharon Armstrong, Barbara Mitchell Weiser (2019).

MEKG 5123
ELECTRICAL POWER SYSTEM

This course will cover the calculation of transmission line constants, modelling of power system loads and power flow analysis in mesh and radial networks. Fundamental principles of Unit commitment and economic load dispatch operations also will be discussed. The course also covers the basic principles of power system stability such as power system steady- state and dynamic stability.

References:

[1] John J. Grainger, W.D. Stevenson, "Power System Analysis", McGraw-Hill, 1994.
[2] B.M. Weedy, B.J. Cory, "Electric Power Systems", Wiley, 5th ed. 2012.
[3] T. Gonen, Electric Power Distribution Engineering, CRC press, 3rd Edition, 2008.
[4] Kersting, W.H., Distribution system modeling and analysis, CRC Press, 2012.
[5] J. D. Glover, T. Overbye, and M. S. Sarma, Power System Analysis and Design: Cengage Learning, 2012.
[6] H. Saadat, Power System Analysis: PSA Publishing, 2010.

MEKG 5143
ADVANCED ELECTRICAL MACHINES & DRIVES

This course will discuss the construction and design of AC machines, development of dynamic model of AC motors, e.g. induction motor and BLDC motor, various control algorithms in improving dynamic control performances, e.g. Torque Hysteresis Control (THC) and Field Oriented Control (FOC). Students will experience PBL based on hands on approach, i.e. the AC control algorithm will be developed using modern engineering tools to verify the effectiveness and dynamic control improvements.

References:

[1] Bimal K. Bose, Modern Power Electronics and AC Drives, Prentice Hall, 2002.
[2] Haitham Abu-Rud, Atif Iqbal, Jaroslaw Guzinski, High Performance Control of AC Drives with Matlab/Simulink Models, 2012.
[3] Peter Vas, Sensorless Vector and Direct Torque Control,Oxford Science Publications, 1998.
[4] Austin Hughes, Bill Drury, Electric Motors and Drives Fundamentals, Types and Applications (5th ed.) 2013.

MEKG 5153
INSULATION COORDINATION AND DIAGNOSTIC TESTING

This course is intended give students deep knowledge about high voltage engineering it focusses on the characteristics of conduction and breakdown in gas, solid and liquid dielectrics. Generation of high voltages AC, DC and impulses, their measurements and testing techniques on materials and electrical apparatus according to standard are also covered. Students are also exposed to overvoltage phenomenon in electric power systems.

References:

[1] M.S Naidu & V. Kamaraju, High Voltage Engineering, 6th Ed, Mc Grawhill 2013.
[2] E. Kuffel, W.S Zaeng & J. Kuffel, High Voltage Engineering Fundamentals, Newnes, 2000.
[3] Dieter Kind & Kurt Faser, High Voltage Test Techniques, Newnes, 2001.
[4] A. Ravindra, M. Wolfgang, High voltage and electrical insulation engineering, Wiley, 2011.
[5] A. Kchler, High Voltage Engineering Fundamentals, Technology, Applications, Springer 2013.

MEKG 5163
ENERGY CONVERSION

Power electronics circuits are increasingly becoming an important component in various application from machine and drives, renewable energy and distributed generation systems. In this course, the use of power electronics devices such as rectifier, DC/DC converter and inverter for energy conversion which includes the device topology, modelling, control and switching technique, as well as power quality improvement is investigated. Students are also exposed to the use of engineering tool such as Matlab Simulink to analyze and evaluate the energy conversion system performance.

References:

[1] M.H.Rashid, "Power Electronics – Circuits, Devices and Applications", Fourth Edition, Pearson Education International, 2014.
[2] Andrzej M. Trzynadlowski," Introduction to Modern Power Electronics", Third Edition, Wiley, 2014.
[3] Daniel W. Hart, "Power Electronics", McGraw Hill, 2011.
[4] N.Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics – Converters, Applications and Design", Third Edition, John Wiley & Sons, 2004.

MEKG 5233
SUSTAINABLE ENERGY & DISTRIBUTED GENERATION

This course will discuss about the evolving sustainable energy and distributed generation in conventional electrical grids and advanced grid system. Besides that, the concepts behind the sustainable electricity as well as the main renewable in low carbon network will be introduced. The latest technology on Distributed Generation and energy management in integrated power system will be analysed. Finally an introduction on microgrid and its control will be discussed.

References:

[1] Juan Carlos Vasquez Quintero, Josep M Guerrero, Decentralized Control Management Applied to Power DGs in Microgrids. LAP Lambert Academic Publishing. 2016
[2] Leon Freris & David Infield, Renewable Energy in Power System, Wiley 2015.
[3] D.P Kothari, KC Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, Prentice Hall of India, 2015.
[4] Godfrey Boyle, renewable Energy: Power for Sustainable Future, Oxford 2014.

MEKG 5283
MASTER PROJECT 1

Student's work individual for project development in the specialized area under the guidance of supervisor. The work includes designing, evaluating, analysing components, assemblies, and/ or systems. Develop system/ experimental solution (s) demonstrating state-of-the-art technology in the respective electrical engineering field. A written proposal, one or more written progress reports, and final written report are required. An oral presentation is required upon completion of the course. A written Master Project report and an oral presentation are required to complete the course.

MEKG 5397
MASTER PROJECT 2

This course is a progression of Master Project I, focusing on enhancing the research abilities and skills in conducting project based on specialization area in electrical engineering design. It provides student with technical writing and presentation skill.

MEKC 5133
MODERN CONTROL DESIGN

This course begins with the review of classical control theory that covers the time-domain and frequency-domain analysis and classical controller design. Then, the design of the state feedback controllers and observers are introduced. In optimal control design, the optimal control problem is formulated at the beginning, and then the student is taught about typical types of optimal control performance. As the last chapter of this course, the robust control system is introduced. The system sensitivity and analysis of robust control system is explained. Then the design of robust control system, robust PID-Controlled system, and Pseudo-Quantitative feedback control system are designed and compared. Each of the chapters is ended with the design examples that solved by using the MATLAB and Simulink

References:

[1] Katshuhiko Ogata, "Modern Control Engineering", Prentice Hall, Fifth Ed., 2010.
[2] Richard C. Dorf, Robert H. Bishop, "Modern Control Systems", Prentice Hall, Thirteen Ed., 2017.
[3] K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
[4] F. Golnaraghi, B. C. Kuo, "Automatic Control System", Prentice Hall, Ninth Edition, 2010.
[5] Nise, S. Norman, Control Systems Engineering, 6th ed., Wiley 2015.

MEKC 5423
NONLINEAR CONTROL SYSTEMS

Concept of linear and nonlinear system, type of uncertainties, design and application of sliding mode control, Lyapunov stability, closed- loop and open-loop estimator, back-stepping, sliding mode control, model reference adaptive control and other nonlinear control techniques.

References:

[1] Jinkun Liu, Xinhua Wang, "Advanced Sliding Mode Control for Mechanical Systems: Design, Analysis and MATLAB Simulation", Tsinghua University Press, Beijing and Springer – Verlag Berlin Heidelberg, 2012.
[2] Zhou, Jing, Wen, Changyun, "Adaptive Backstepping Control of Uncertain Systems: Nonsmooth Nonlinearities, Interactions or Time-Variations" Springer, 2008.
[3] Shtessel, Y., Edwards, C., Fridman, L., Levant, A, "Sliding Mode Control and Observation", Birkhauser, 2014.
[4] Karl J. Astrom and Dr. Bjorn Wittenmark, "Adaptive Control: Second Edition (Dover Books on Electrical Engineering) Second Edition, 2014.
[5] Bernard Friedland, "Advanced Control System Design" 1st Edition, Prentice-Hall, 1996.
[6] Christopher Edwards and Sarah K. Spurgeon, "Sliding Mode Control: Theory and Applications", Taylor & Francis, 1998.

MEKC 5433
INTELLIGENT CONTROL

The area of intelligent control is a fusion of emerging areas in Systems and Control, Computer Science, Operation Research in opening new direction in a promising research area. The course will provide student with practical experience of using intelligent control techniques such as fuzzy control, neural networks, and evolutionary computation in solving complex and engineering problems.

References:

[1] Timothy J Ross, Fuzzy Logic with Engineering Applications, John Wiley & Sons, 2017.
[2] Alfred Silva, Intelligent systems: Modelling, Automation and Control, NY Research Press, 2016.
[3] David B. Fogel, Fundamentals of computational intelligence: Neural Network, Fuzzy Systems and Evolutionary Computation, IEEE Press, Wiley, 2016.
[4] Andries P. Engelbrecht, Computational Intelligence: An Introduction, John Wiley & Sons Ltd, 2007.

MEKC 5443
CONTROL TECHNOLOGY & APPLICATIONS

The students will apply the modern control technology into related practical application especially in evolving control technology and applications.

References:

[1] Katshuhiko Ogata, "Modern Control Engineering", Prentice Hall, Fifth Edition, 2010.
[2] Richard C. Dorf, Robert H. Bishop, "Modern Control Systems", Prentice Hall, Thirteen Ed., 2016.
[3] K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
[4] F. Golnaraghi, B. C. Kuo, "Automatic Control System", Prentice Hall, Ninth Edition, 2010.

MEKP 5033
POWER QUALITY & ENERGY EFFICIENCY

This course is aimed at providing student with basic knowledge on power quality and energy efficiency. The syllabus is designed to meet up with the rules and regulation on energy efficiency with Malaysian environment and scope. In addition, power quality section will discuss more on embedded system and renewable energy.

References:

[1] Website Kementerian Tenaga Teknologi Hijau dan Air (KeTTHA), www.kettha.gov. my
[2] Efficient Management of Electrical Energy Regulation 2008.
[3] Energy Commission Act 2001.
[4] Energy Efficiency and Conservation Guidelines for Malaysia Industries 2007.
[5] Renewable Energy in Power system, Leon Freris, John Wiley and Sons Limited, 2008.
[6] Masters, G.M, Renewable and efficient electric Power systems, John Wiley and Sons Limited, 2004.

MEKP 5453
LIGHTNING PROTECTION & GROUNDING SYSTEM

This course aims to introduce lightning protection and grounding system for electrical system. It covers the Lightning protection design based on rolling sphere method and angle protection, method as suggested in standard and regulation. The courses cover the requirement and fundamental for designing the grounding system. It also cover the measurement method and technique to measure ground resistivity and earth resistance.

References:
[1] V, Cooray, An Introduction to Lightning, Springer.
[2] M. Haddad and D. Warne, Advances in High Voltage Engineering, IET.
[3] P. Hasse, Overvoltage Protection of Low- voltage Systems, IET.
[4] International standard (BS 62305: 2011, BS 7430, BS EN 50522, IEEE-80-2000).

MEKP 5063
POWER SYSTEM PROTECTION AND STABILITY

This course aims to introduce the operating principles and main features of various types of protection schemes in power system networks. It also covers the calculation for the coordination and design of three mainly used protection schemes which are the overcurrent, distance and differential. The course also covers the fundamental in power system stability such as power system steady- state, dynamic stability, and transient stability analysis. It also covers power system voltage stability. It discusses various component models such as generators, transmission systems, loads, and several techniques for small- and large-perturbation stability analysis.

References:
[1] Khim Sang, Wong., Power Distribution and Protection, Second Edition, Prentice Hall 2003.
[2] Glover, Sarma, Power System Analysis and Design, Third Edition, Brooks/Cole 2011
[3] Y.G. Paithankar, Fundamentals of Power System Protection, Prentice Hall of India, 2004
[4] J. J. Grainger and W. D. Stevenson, Power system analysis: McGraw-Hill, 1994.
[5] Hadi Saadat, "Power System Analysis" 2nd Edition, Mc Graw Hill, 2009
[6] DP Kothari & IJ Nagrath "Modern Power System Analysis" 3rd Edition, Mc Graw Hill, 2005.

MEKP 5023
POWER SYSTEMS OPERATION AND CONTROL

Economics of the power system operation and control: operation and control of hydro, thermal and renewable generating units, aspects of interconnected operation among the generating units, transmission losses and techniques. Optimum economic operation of generation units and hydro-thermal coordination problems. Fuel management for thermal plants. Unit commitment and economic load dispatch operations, application of artificial intelligence in total generation costs optimization, fuel budgeting and generation planning, risk management for unit commitment and economic load dispatch, total production cost modelling, hydrothermal coordination modelling and optimizations, power system operation import/export interchange evaluation, power pools and governor, turbine and generator control schemes.

References:
[1] Khim Sang, Wong., Power Distribution and Protection, Second Edition, Prentice Hall 2003.
[2] Glover, Sarma, Power System Analysis and Design, Third Edition, Brooks/Cole 2011
[3] Y.G. Paithankar, Fundamentals of Power System Protection, Prentice Hall of India, 2004
[4] J. J. Grainger and W. D. Stevenson, Power system analysis: McGraw-Hill, 1994.
[5] Hadi Saadat, "Power System Analysis" 2nd Edition, Mc Graw Hill, 2009
[6] DP Kothari & IJ Nagrath "Modern Power System Analysis" 3rd Edition, Mc Graw Hill, 2005.

MEKE 5423
ADVANCED DRIVE SYSTEMS

The course introduces students to the fundamentals of electrical drives. The basics of electrical drives, such as four-quadrant operation, hysteresis current controller, small signal model, large signal model and design of PI controllers of DC motor drives are covered in the introduction section of the course. The analysis and controller design of PI controller of DC motor are studied with the help of MATLAB/SIMULINK simulation package. The dynamic modelling of induction machine is introduced. Using the dynamic model, the high-performance induction motor control schemes such as the field-oriented control and the direct torque control are presented and analysed using MATLAB/SIMULINK. Finally, the consideration on practical motor control design is discussed, which include gate driver circuits, dynamic braking, resolver, overvoltage protection, current regulator, and etc.

References:

[1] Haitam Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, "High Performance Control of AC Drives with MATLAB/Simulink Models", Wiley, 2012.
[2] Theodore Wildi, "Electrical Machines, Drives and Power Systems: Pearson New International Edition", Pearson, 2013.
[3] Ned Mohan, "Advanced Electric Drives: Analysis, Control and Modelling Using Matlab/Simulink", Wiley, 2014.

MEKE 5433
ELECTRICAL MACHINE DESIGN

This module is a continuation of the material covered in electrical machines. The module will cover the machine sizing considering power electronic and mechanical issues, magnetic materials including soft and hard materials and winding design, operating principle and basic design principles of different machine types and topologies including transformer, surface and buried type permanent magnet radial machines, axial flux and reluctance machines.

References:

[1] Jacek F. Gieras, Permanent Magnet Motor Technology, Design and Applications, 3rd Edition, CRC Press, 2010.
[2] T. Wildi, "Electrical Machines, Drives and Power Systems", Pearson, International edition, 2014.
[3] J. Pyrhonen, T. Jokinen, V. Hrabovcova, "Design of Rotationg Electrical Machines", 2nd. Ed., John Wiley & Sons, 2014.

MEKE 5443
POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

Power electronics circuits are increasingly becoming important component in the renewable and distributed energy sources such as photovoltaic solar power, wind energy, fuel cells etc. for the distributed energy system are discussed. In this course, the use of power electronics for the energy conversion is detailed and issues on system topologies, control characteristics, efficiency and performance are analysed. Some advanced converter topologies, especially in the context of large and complex applications are also treated. Students are exposed on the use of engineering simulation tools such as MATLAB and PSIM to design and modelling the renewable energy conversion system.

References:

[1] R. Teodorescu, M. Liserre, P. Rodriguez, "Grid Converters for Photovoltaic and Wind Power System", John Wiley & Sons, 2011.
[2] H. A. Rub, M. Malinowski, K. Al-Haddad, "Power Electronics for renewable Energy Systems, Transportation and Industrial Applications, John Wiley &Sons, 2014.
[3] Nicola Femia et. Al., "Power Electronics and Control techniques for Maximum Energy Harvesting in Photovoltaic Systems", CRC Press, 2013.
[4] M.H. Rashid, "Power Electronics: Circuit, Devices & Applications", 4th Edition, Pearson Education, 2013.

Master of Mechatronics Engineering - MEKH

Programme Structure

Full-time course

Semester	Course		Credit
1	MPSW 5013	Research Methodology	3
	MEKH 5113	Advanced Mechatronics System Design	3
	MEKC 5133	Modern Control Design	3
	MEKH 5123	Applied System Modeling and Simulation	3
	MEKH 5133	System Dynamics	3
	MEKX 5XX3	Industrial Machine Vision or Industrial Robotics	3
		Total Credit	**18**

Semester	Course		Credit
2	MPSW 5033	Engineering and Technology Management	3
	MEKG 5143	Advanced Electrical Machines and Drives	3
	Elective I	Elective I	3
	Elective II	Elective II	3
	MEKH 5213	Master Project 1	3
		Total Credit	**15**

Semester	Course		Credit
Short Semester	MEKH 5317	Master Project 2	7
		Total Credit	7
		Total Credit Hours	**40**

Part-time course

Semester	Course		Credit
Year 1 Sem 1	MPSW 5013	Research Methodology	3
	MEKH 5113	Advanced Mechatronics System Design	3
	MEKH 5123	Applied System Modeling and Simulation	3
	MEKX 5XX3	Industrial Machine Vision or Intelligent Control	3
		Total Credit	**12**

Semester	Course		Credit
Year 1 Sem 2	MPSW 5033	Engineering and Technology Management	3
	MEKH 5133	System Dynamics	3
	MEKC 5133	Modern Control Design	3
	Elective II	Elective II	3
		Total Credit	**12**

Semester	Course		Credit
Year 2 Sem 1	MEKH 5213	Master Project 1	3
	Elective III	Elective III	3
	MEKG 5143	Advanced Electrical Machines and Drives	3
		Total Credit	**9**

Semester	Course		Credit
Year 2 Sem 2	MEKH 5317	Master Project 2	7
		Total Credit	7
		Total Credit Hours	**40**

Elective Courses

Course		Credit	Field
MEKC 5433	Industrial Robotics	3	Mechanical
MEKH 5473	Engineering Standards	3	
MEKH 5423	Advanced Embedded System	3	Internet of Things (IoT)
MEKH 5453	Industrial Machine Vision	3	
MEKH 5443	System Identification	3	Control System
MEKC 5453	Intelligent Control	3	
MEKH 5463	Advanced Industrial Automation	3	Mechatronic System
MEKH 5433	Bilateral Motion Control	3	

Details

MPSW 5013
RESEARCH METHODOLOGY

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research programme at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

[1] Barbie, Earl R., 1998, Survey Research Methods, 2nd Edition, Waddsworth Publishing Company, California, USA, 1998.
[2] Linda Cooley and Jo Lewkowicz, 2003, Dissertation writing in Practice, Turning Ideas into Text, 1st Edition, Hong Kong University Press.
[3] James, E.M., Jack, W.B., 2005, Guide to the Successful Thesis and Dissertation. 5 th Edition, Marcel Dekker, Inc., New York, USA.
[4] Syed, V.A., and Victor, B.L., 2005, The Art of Scientific Innovation, Cases of Classical Creativity, 1st Edition, Pearson Prentice Hall, New Jersey, USA.
[5] Blaxter, L. et al., 2001, How to Research, 1st Edition, Open University Press, Milton Keynes, Buckingham, UK

MPSW 5033
ENGINEERING & TECHNOLOGY MANAGEMENT

This course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/ technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the subject will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

[1] Innovation Management and New Product Development (6th Edition) 6th Edition, Paul Trott (Author), Pearson; 6 edition (2016)
[2] Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, John Wiley & Sons, 2011.
[3] Operations Management 13th Edition by William J Stevenson (Author) McGraw-Hill Education, 2017.
[4] Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma by Jim Hall, Tina Scott CreateSpace Independent Publishing Platform, 2016.
[5] The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional Sharon Armstrong, Barbara Mitchell Weiser (2019).

MEKH 5113
ADVANCED MECHATRONICS SYSTEM DESIGN

Mechatronics system design is a subject where students have to design a mechatronics engineering project, including project management, project planning, project feasibility study, design selection, design costing and sizing, analysis and evaluation. The subject focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including engineering proposals and drawings, specifications and bills of quantities, cost estimates of development projects given to students, working in groups. Apart from basic mechatronics design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) control systems engineering, sensors and actuators, structural analysis and design, including material selection and mechanical properties.

References:

[1] Dieter, G.E. & Schmidt, L.C. (2013). Engineering Design, 5th Edition, McGraw Hill.
[2] Ulrich, K.T. & Eppinger, S.D. (2008). Product Design and Development, 4th Edition, McGraw Hill.
[3] Shetty, D. & Kolk, R.A. (2011). Mechatronics System Design (2nd ed.), Global Engineering, USA.

MEKH 5123
APPLIED SYSTEM MODELING & SIMULATION

The course provides students with the skills to design and analyze systems using modelling and simulation techniques using a range of mathematical formulations. There are many modelling techniques to describe system characteristics. Students will learn to develop typical mathematical models. Case studies and software applications such as MATLAB is used to illustrate a variety of modelling techniques. Once the models are validated, it can be utilised to predict the behaviour of engineering systems including: mechanical, electrical, civil, environmental, fluid, magnetic, thermal and transport. At the end of the course, students will be capable to identify practical situations where simulation modelling can be helpful and how they would undertake such a project, develop and validate a model, analyze the simulation results and report thru findings. Students complete a project in groups of two or three, write a concise summary of what they have done and report their findings to the class. The project report at the end of this course should be a substantial document that is a record of a student's practical ability in simulation modelling, which can also become part of a portfolio or CV.

References:

[1] Larry B. Rainey, Andreas Tolk "Modelling and Simulation Support for System of Systems Engineering Application", 2015.
[2] Xin-She Yang, "Mathematical Modelling with Multidisciplinary Applications" Wiley, 2013.
[3] Abdelwahab Kjarab, Ronald B. Guenther, "An Introduction to Numerical Methods A MATLAB Approach", Chapman & Hall, 2012.
[4] Douglas C. Montgomery, George C.Runger, Applied Statistics and Probability for Engineers, 3rd Edition, John Wiley.

MEKH 5133
SYSTEM DYNAMICS

This subject will discuss the basic terminology of system dynamics, the two systems of units, methods for parameter estimation, rigid-body dynamics, solution methods for linear ordinary differential equations, Laplace transform and transfer function models, modelling of mechanical systems having stiffness and damping, state-variable model, modelling of electric circuits, operational amplifiers, electromechanical devices, sensors, and electroacoustic devices, analysis methods in the frequency domain and the time, analysing a system's frequency response.

References:

[1] W. J. Palm, System Dynamics, 3rd edition, 2013, Wiley.
[2] N. Lobontiu, System Dynamics for Engineering Students, 2010 Elsevier.

MEKH 5453
INDUSTRIAL MACHINE VISION

The course is intermediate level machine/ computer vision course, suitable for graduate student. It will cover the basic topics of machine vision and introduce some fundamental approaches/application for industrial machine vision research. Through the class, the students are expected to understand in-depth the state-of-the-art approaches to the topics to be selected jointly by the students and the lecturer. The students will also develop command skills that are vital to their graduate research study. The subject will discuss about the Overview of Machine Vision, Motion and Optical Flow, Camera Modeling and Calibration, Segmentation, Machine Learning for Computational Vision Applications and Visual Recognition with 3D Vision.

References:

[1] Simon J. D. Prince. Computer Vision: Models, Learning, and Inference, 1st Edition, Cambridge University Press, 2012.
[2] Jan Erik Solem. Programmeming Computer Vision with Python: Tools and algorithms for analyzing images, 1st Edition, O'Reilly Media. 2012
[3] Adrian Kaehler & Gary Bradski, Learning OpenCV 3: Computer Vision in C++ with the OpenCV Library,1st Edition, O'Relly Media. 2017.
[4] Richard Szeliski, Computer Vision: Algorithms and Applications (Texts in Computer Science), 2011 Edition, Springer. 2010
[5] Ian Goodfellow. Deep Learning (Adaptive Computation and Machine Learning Series). The MIT Press. 2016

MEKH 5213
MASTER PROJECT 1

Student's work individual for project development in the specialized area under the guidance of supervisor. The work includes designing, evaluating, analysing components, assemblies, and/ or systems. Develop system/ experimental solution (s) demonstrating state-of-the-art technology in the respective electrical engineering field. A written proposal, one or more written progress reports, and final written report are required. An oral presentation is required upon completion of the course. A written Master Progress, Final Project report and an oral presentation are required to complete the course.

MEKH 5317
MASTER PROJECT 2

Student's work individual for project development in the specialized area under the guidance of supervisor. The work includes designing, evaluating, analysing components, assemblies, and/ or systems. Develop system/ experimental solution (s) demonstrating state-of-the-art technology in the respective electrical engineering field. A written proposal, one or more written progress reports, and final written report are required. An oral presentation is required upon completion of the course. A written Master Project report and an oral presentation are required to complete the course.

MEKH 5473
ENGINEERING STANDARDS

This subject will discuss history, purpose, classification and examples of standards. General consensus standards for safety, reliability, standards for reduce cost, increased flexibility, ISO and IEC standards, American National Standards Institute accredited organizations such as ASME, ASTM and IEEE. Limited consensus standards such as NASA and FDA, jurisdictional standards, standards development process, standards interpretation and relief and characteristics of a good standard. The subject will also discuss national standards SIRIM.

References:

[1] M.H. Jawad, O.R. Greulich, Primer on Engineering Standards, 2014, ASME Press.
[2] IEC Standards – and Conformity Assessment, www.iec.ch/emc [accessed 13 April 2017].
[3] International Standards - ISO, www.iec. org/ standards.html [accessed 13 April 2017].

MEKH 5423
ADVANCED EMBEDDED SYSTEM

This subject will discuss embedded system components, interfacing electronics and programmeming on embedded systems, interfacing embedded control with inputs and outputs, interacting embedded controllers with physical environment and other embedded controllers. The subject also discuss Internet of Things with embedded system, wireless communication and control with embedded system, images, video and audio processing with embedded controllers and kernel programmming.

References:

[1] J.C. Shovic, Raspberry Pi IoT Projects: Prototyping Experiments for Makers: 2016, Apress
[2] D. Molloy, Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux 2016
[3] Wiley. Karl J. Astrom and Dr. Bjorn Wittenmark, "Adaptive Control: Second Edition (Dover Books on Electrical Engineering) Second Edition, 2014.

MEKH 5443
SYSTEM IDENTIFICATION

This course is an introduction to the system identification and parameter estimation. The course covers an introduction to system identification, acquiring and pre-processing data, nonparametric model estimation methods, parametric model estimation methods, partially known estimation methods, model estimation methods in closed loop systems, recursive model estimation methods, analyzing, validating, and converting models and system identification case study. This requires an in-depth understanding of control system engineering, modern control

system and digital control system. The emphasis will be on the theoretical basis as well as practical implementations. Key components studied in details are time response analysis, frequency response analysis, correlation analysis, power spectrum density analysis, model structure, parametric model, parameter estimation method, test signals and model validation methods.

References:

[1] Ljung L. and T. Glad. Modeling of Dynamic Systems, Prentice Hall, Englewood Cliffs, N.J. 1994.
[2] Ljung L. System Identification - Theory for the User, Prentice Hall, Upper Saddle River, N.J. 2nd edition, 1999.
[3] Söderström T. and P. Stoica. System Identification, Prentice Hall International, London. 1989.
[4] Oppenheim J. and A.S. Willsky. Signals and Systems, Prentice Hall, Englewood Cliffs, N.J. 1985.

MEKH 5463
ADVANCED INDUSTRIAL AUTOMATION

This subject will discuss the various types of actuators that can be used in industrial automation, which includes, electrical, pneumatic and hydraulic linear and rotational actuators, different types, construction/concept and interface with various sensors which includes position, temperature, pressure, force, torque, acceleration, vibration and density. Next it will discuss electrical ladder diagrams, PLC and pneumatic/hydraulic control circuits. Finally this subject will conclude with system integration using CAN-bus, Internet of Things (IoT) and Supervisory Control and Data Acquisition (SCADA).

References:

[1] B.R. Mehta, Y.J. Reddy, Fundamentals of Industrial Instrumentation and Process Control, Elsevier, 2015.
[2] T.A. Weedon, Instrumentation and Process Control Workbook Sixth Edition, Elsevier, 2014.
[3] S.A. Boyer, Scada: Supervisory Control And Data Acquisition, Fourth Edition, ISA, 2009.

MEKH 5433
BILATERAL MOTION CONTROL

This subject will discuss the concept of haptics and its related applications, introduce the disturbance observer-based control system to construct a reaction force observer for force estimation, establish a model for a master- slave bilateral actuation system, conduct simulations on the model of bilateral system, analyse the performance of position and force control of bilateral systems, compare between different scaling of bilateral systems and evaluate the effectiveness of different bilateral systems.

References:

[1] C. Hatzfeld, T.A. Kern, Engineering Haptic Devices: A Beginner's Guide, 2014, Springer
[2] A. Sabanovic and K. Ohnishi, Motion Control Systems, 2011 Wiley-IEEE Press.
[3] S. Li, J. Yang, WH Chen, X. Chen, Disturbance Observer-Based Control: Methods and Applications, 2014, CRC Press.
[4] M.H. Jamaluddin, T. Shimono, N. Motoi, Force-based compliance controller utilizing visual information for motion navigation in haptic bilateral control system, IEEJ Journal of Industry Applications 3 (3), pp 227-235, 2014.

MEKG 5133
MODERN CONTROL DESIGN

This course begins with the review of classical control theory that covers the time-domain and frequency-domain analysis and classical controller design. Then, the design of the state feedback controllers and observers are introduced. In optimal control design, the optimal control problem is formulated at the beginning, and then the student is taught about typical types of optimal control performance. As the last chapter of this course, the robust control system is introduced. The system sensitivity and analysis of robust control system is explained. Then the design of robust control system, robust PID-Controlled system, and Pseudo-Quantitative feedback control system are designed and compared. Each of the chapters is ended with the design examples that solved by using the MATLAB and Simulink.

References:

[1] Katshuhiko Ogata, "Modern Control Engineering", Prentice Hall, Fifth Ed., 2010.
[2] Richard C. Dorf, Robert H. Bishop, "Modern Control Systems", Prentice Hall, Thirteen Ed., 2016.
[3] K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
[4] F. Golnaraghi, B. C. Kuo, "Automatic Control System", Prentice Hall, Ninth Ed., 2010.
[5] Graham C. Goodwin, Stefan f. Graebe, Mario E. Salqado, "Control System Design', Prentice Hall, 2001.

MEKG 5143
ADVANCED ELECTRICAL MACHINES & DRIVES

Introduction to selected type of both DC and AC electrical machines which cover physical construction, equivalent electrical circuit diagrams and working principles. The machine performances like torque, speed and efficiency are investigated. The starting and control techniques are also investigated for a better machine selection of appropriate application. On the drive aspect, the course will discuss the electric drives, switch-mode converters, quadrants operation, current-controlled converters, modeling and transfer function of DC motor, converters of DC drive, closed-loop control of DC drives. It also covers the basic operations and dynamic modeling of induction motor, including scalar control, vector control and implementation of motor drive using microprocessor.

References:

[1] M.H.Rashid, "Power Electronics – Circuits, Devices and Applications", Fourth Edition, Pearson Education International, 2013.
[2] Daniel W. Hart, Power Electronics, McGraw Hill, International Edition, 2011.
[3] Seung-Ki Sul, Control of Electric Machine Drive System, John Wiley & Sons, 2011.
[4] Piotr Wach, Dynamics and control of electrical drives, Springer 2011.

MEKC 5433
INDUSTRIAL ROBOTICS

This subject will discuss the forward and inverse kinematics of industrial robots, manipulator mechanism design for a robot manipulator workspace, workspace trajectory planning, geometric problems with Cartesian paths, path generation at run time, robot programmeming languages and systems and robot manipulator control which includes linear and non-linear control and Cartesian schemes.

References:

[1] Craig, J. J., Introduction to Robotics, Mechanics and Control, 4rd Ed., Pearson, 2018.
[2] Man Zhihong, Robotics, Prentice Hall, 2nd ed., 2005.

MEKC 5453
INTELLIGENT CONTROL

The area of intelligent control is a fusion of emerging areas in Systems and Control, Computer Science, Operation Research in opening new direction in a promising research area. The course will provide student with practical experience of using intelligent control techniques such as fuzzy control, neural networks, and evolutionary computation in solving complex and engineering problems. The course content will involve (i) gaining an understanding of the functional operation of a variety of intelligent controls (fuzzy control and / or neural network) and modern heuristic optimization techniques, (ii) the study of control theoretic foundations of intelligent control systems, and (iii) use of the computer for simulation and evaluation of computational intelligence techniques.

References:

[1] Timothy J Ross, Fuzzy Logic with Engineering Applications, John Wiley & Sons, 2017.
[2] Alfred Silva, Intelligent systems: Modelling, Automation and Control, NY Research Press, 2016.
[3] David B. Fogel, Fundamentals of computational intelligence: Neural Network, Fuzzy Systems and Evolutionary Computation, IEEE Press, Wiley, 2016.
[4] Andries P. Engelbrecht, Computational Intelligence: An Introduction, John Wiley & Sons Ltd, 2007.


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.0

MASTER PROGRAMME BY MIXED MODE


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MASTER PROGRAMME BY MIXED MODE

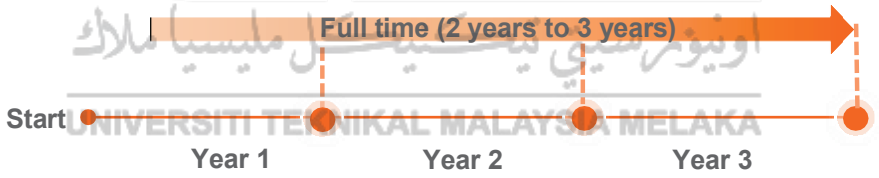
Mixed Mode refers to the combination of taught course and research activities. The assessment depends upon both the coursework and dissertation (research work). The component for the coursework is 50% and the dissertation contributes the other 50%. The Mixed Mode programme develops the research skill of the students on top of enhancing the theoretical knowledge of the subject area.

Faculty of Electrical Engineering offers ONE programme for Master of Electrical Engineering:

- Master of Electrical Engineering – Industrial Power (MEKP)

DURATION OF STUDIES

Candidates intending to study by research may submit their application for admission throughout the year.



ENTRY REQUIREMENTS

Academics Requirement:

a) A bachelor's degree in the field or related fields with a minimum CGPA of 2.75 or equivalent, as accepted by the HEP Senate; or
b) A bachelor's degree in the field or related fields or equivalent with a minimum CGPA of 2.50 and not meeting CGPA of 2.75, can be accepted subject to rigorous internal assessment; or
c) A bachelor's degree in the field or related fields or equivalent with minimum CGPA of 2.00 and not meeting CGPA of 2.50, can be accepted subject to a minimum of 5 years working experience in the relevant field and rigorous internal assessment.

Language Requirement:

a) International applicants are required to present the Test of English as a Foreign Language (TOEFL) or the test administered by the International English Language Testing System (IELTS) with the minimum required score listed in Table 1:

Table 1: Minimum English Requirement

Minimum TOEFL score	Minimum IELTS score
520	5.0

b) Applicants without TOEFL/IELTS or for those who obtained a score below the requirement above are required to undergo and pass the English language programme conducted by UTeM prior to commencement of the postgraduate programme.
c) Exemption may be given to those who have undertaken regular programme of studies and graduated from universities that use English as the medium of instruction or who has graduated from UTeM in a programme with English as the medium of instruction.

Additional Requirements for International Students:

a) All international students are required to register as full time student and should have the financial capability to meet the course fees and living expenses.
b) Applicants need to submit a letter of certification from their Ministry of Education verifying nationality and academic qualifications of candidate.
c) Academic transcripts and supporting documents must be certified true copies by a senior public official from the applicant's country or from Malaysia.
d) Proof of financial ability to pursue their studies and live in Malaysia for the duration of study. A letter of financial guarantee/sponsorship or the most recent financial statement from applicant's bank is sufficient.
e) Have international passport with at least TWO (2) years validity and meet all immigration procedures.
f) Medical check-up by the health authorities.

Programme Outcomes (PO)

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Faculty of Electrical Engineering's Master's Programme:


Demonstrate mastery of knowledge in electrical engineering.


Apply advanced skills acquired in practical electrical engineering situation.


Relate ideas to societal issues in electrical engineering.


Conduct project and adhere to legal, ethical and professional codes of practice.


Demonstrate leadership qualities through communicating and working effectively with peers and stakeholders.


Generate solutions to problems using scientific and critical thinking skills.


Manage information and lifelong learning skills.

Master of Electrical Engineering – Industrial Power

Master of Electrical Engineering (Industrial Power) involves the areas connected to the electricity system aspects such as generation, transmission, power distribution, power system protection, electrical energy, load management, including regulatory affairs and energy components such as circuit breakers, transformer control equipment and so on.

Programme Educational Objectives (PEO) – MEKP

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation.

Below are the PEO for the Faculty of Electrical Engineering's Master Programme:

- Master knowledge acquired for innovation and creative scholarly activities in electrical engineering.
- Practice professional leadership in related to electrical engineering field.
- Engage with community and industry towards sustainable development and life-long learning.


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.0

COURSE IMPLEMENTATION MASTER PROGRAMME BY MIXED MODE


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Master of Electrical Engineering

Programme Structure

Semester	Course		Credit
1	MPSW 5013	Research Methodology	3
	MEKP 5033	Power Quality and Energy Efficiency	3
	MEKC 5023	Advanced Control Systems	3
	MEKP 5043	Power System Modelling	3
		Total Credit	**12**

Semester	Course		Credit
2	MPSW 5033	Engineering and Technology Management	3
	MEKP 5063	Power System Protection and Stability	3
	MEKP 5023	Power System Operation and Control	3
		Total Credit	**9**

Semester	Course		Credit
3 and 4	MEKP 5921	Research and Dissertation	21
		Total Credit	21
		Total Credit Hours	**42**

Details

MPSW 5013
RESEARCH METHODOLOGY

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research programme at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

[1] Barbie, Earl R., 1998, Survey Research Methods, 2nd Edition, Waddsworth Publishing Company, California, USA, 1998.
[2] Linda Cooley and Jo Lewkowicz, 2003, Dissertation writing in Practice, Turning Ideas into Text, 1st Edition, Hong Kong University Press.
[3] James, E.M., Jack, W.B., 2005, Guide to the Successful Thesis and Dissertation. 5 th Edition, Marcel Dekker, Inc., New York, USA.
[4] Syed, V.A., and Victor, B.L., 2005, The Art of Scientific Innovation, Cases of Classical Creativity, 1st Edition, Pearson Prentice Hall, New Jersey, USA.
[5] Blaxter, L. et al., 2001, How to Research, 1st Edition, Open University Press, Milton Keynes, Buckingham, UK.

MPSW 5033
ENGINEERING & TECHNOLOGY MANAGEMENT

The subject consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/ technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the subject will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

[1] Lucy C. Morse and Daniel L. Babcock (2010) Managing Engineering and Technology, Pearson.
[2] Trott, P. (2005), Innovation Management and New Product Development, Prentice Hall.
[3] Naushad Forbes, David Wield (2002) From Followers to Leaders – Managing Technology and Innovation, Routledge.
[4] Edosomwan, J (1995), Integrating Productivity and Quality Management, 2nd Edition, Routledge.
[5] Patrick D. T. O'Connor, (2008), The new management of engineering, Lulu Publications.

MEKP 5033
POWER QUALITY & ENERGY EFFICIENCY

Two components will be taught to the students: PQ and EE. For Energy efficiency (EE) and conservation for industries, the act and regulation related to EE and it is importance will be discussed. The management of EE scenario and its economy effects. Energy management systems and electrical energy use equipment guideline.

Quality of supply; power quality: monitoring, analysis & mitigations; harmonics in electrical system and the effects of voltage and current harmonics in power system; under-voltages and over-voltages and their effects on electrical system; Power Quality in embedded system and renewable energy distributed generation.

References:

[1] Website Kementerian Tenaga Teknologi Hijau danAir (KeTTHA) www.kettha.gov. my
[2] Efficient Management of Electrical Energy Regulation 2008.
[3] Energy Commission Act 2001.
[4] Energy Efficiency and Conservation Guidelines for Malaysia Industries 2007.
[5] Renewable Energy in Power system, Leon Freris, John Wiley and Sons Limited, 2008.
[6] Masters, G.M, Renewable and efficient electric Power systems, John Wiley and Sons Limited, 2004.

MEKP 5043
POWER SYSTEM MODELLING

This subject will discuss about the calculation of line constants and modelling of symmetrical components; equivalent circuit and operating characteristics of a synchronous machine; modelling of three-phase transformers; modelling of power system loads; reactive power and transmission power flow analysis; distribution network analysis; power system fault calculations.

References:

[1] John J. Grainger, W.D. Stevenson, "Power System Analysis", McGraw-Hill, 1994.
[2] B.M. Weedy, B.J. Cory, "Electric Power Systems", Wiley, 5th ed. 2012.
[3] T. Gonen, Electric Power Distribution Engineering, CRC press, 3rd Edition, 2014.
[4] Kersting, W.H., Distribution system modeling and analysis, CRC Press, 2002.
[5] Tleis, N. D., Power systems modelling and fault analysis: theory and practice, Newnes, 2007.

MEKP 5063
POWER SYSTEM PROTECTION & STABILITY

This course aims to introduce the operating principles and main features of various types of protection schemes in power system networks. It also covers the calculation for the coordination and design of three mainly used protection schemes which are the overcurrent, distance and differential. The course also covers the fundamental in power system stability such as power system steady- state, dynamic stability, and transient stability analysis. It also covers power system voltage stability. It discusses various component models such as generators, transmission systems, loads, and several techniques for small- and large-perturbation stability analysis

References:

[1] Khim Sang, Wong., Power Distribution and Protection, Second Edition, Prentice Hall 2003.
[2] Glover, Sarma, Power System Analysis and Design, Third Edition, Brooks/Cole 2011.
[3] Y.G. Paithankar, Fundamentals of Power System Protection, Prentice Hall of India, 2004.
[4] J. J. Grainger and W. D. Stevenson, Power system analysis: McGraw-Hill, 1994.
[5] Hadi Saadat, "Power System Analysis" 2nd Edition, Mc Graw Hill, 2009.
[6] DP Kothari & IJ Nagrath "Modern Power System Analysis" 3rd Edition, Mc Graw Hill, 2005.

MEKP 5023
POWER SYSTEM OPERATION & CONTROL

Economics of the power system operation and control: operation and control of hydro, thermal and renewable generating units, aspects of interconnected operation among the generating units, transmission losses and techniques. Optimum economic operation of generation units and hydro-thermal coordination problems. Fuel management for thermal plants. Unit commitment and economic load dispatch operations, application of artificial intelligence in total generation costs optimization, fuel budgeting and generation planning, risk management for unit commitment and economic load dispatch, total production cost modelling, hydrothermal coordination modelling and optimizations, power system operation import/export interchange evaluation, power pools and governor, turbine and generator control schemes.

References:

[1] Allen J. Wood, Bruce F. Wollenberg, Power Generation, Operation and Control, 3rd ed. Wiley, 2013.
[2] Weedy, B.M and Cory, B.J, Jenkin, N., Electric Power System, 5th ed. New York, John Wiley Sons, 2012.
[3] Saccomanno, F. Electric Power System: Analysis & Control, John Wiley Sons, New Jersey, 2003.
[4] Graiger, J.J and Stevenson Jr, Power System Analysis. Mc Graw Hill, 2003.
[5] Chakrabarti, A., Halder, S., Power System Analysis: Operation and Control, PHI Learning Pvt. Ltd., 2010.

MEKC 5023
ADVANCED CONTROL SYSTEMS

This subject is about advanced control systems that focus on several control system design implementations. Early topics of this subject give an idea in adaptive and self-tuning control systems, the design and implementation of model reference adaptive control mechanism and self-tuning control methods. The current technologies also have adopted, i.e. intelligent control systems. This covers fuzzy logic and neural network control systems including its application in industry

References:

[1] R. S. Burns,Advanced Control Engineering, Butterworth Heinemann, 2001.
[2] J. Astrom and Dr. Bjorn Wittenmark, "Adaptive Control: Second Edition (Dover Books on Electrical Engineering) Second Edition, 2014.
[3] David B. Fogel, Fundamentals of computational intelligence: Neural Network, Fuzzy Systems and Evolutionary Computation, IEEE Press, Wiley, 2016.
[4] Timothy J Ross, Fuzzy Logic with Engineering Applications, John Wiley & Sons, 2017.
[5] Gang Tao, Adaptive Control Design and Analysis, Wiley-Interscience, 2003.

MEKP 5921
DISSERTATION

Student's work individual for project development in the specialized area under the guidance of supervisor. The work includes designing, evaluating, analysing components, assemblies, and/ or systems. Develop system/ experimental solution (s) demonstrating state-of-the-art technology in the respective electrical engineering field. A written proposal, one or more written progress reports, and final written report are required. An oral presentation is required upon completion of the course. A written dissertation and an oral presentation are required to complete the course.


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

5.0

MASTER PROGRAMME BY RESEARCH


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MASTER PROGRAMME BY RESEARCH

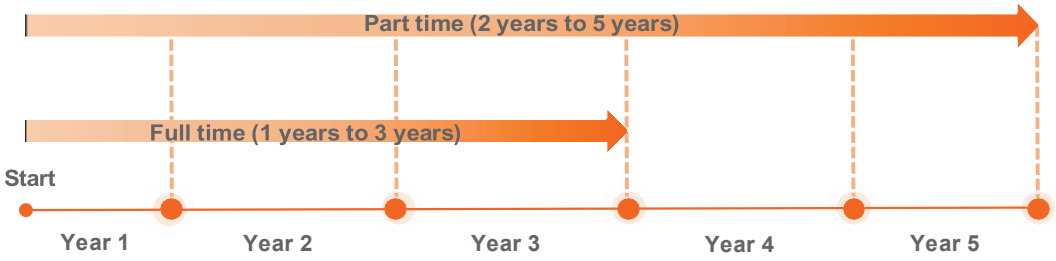
The Master of Science candidate is supervised by an academic staff (or a panel of supervisors) from the faculty. The directed research work will focus on a particular subject that introduces candidates to the processes by which new knowledge is developed or/ and applied accordingly. The specific topic of investigation will be agreed upon by the supervisor (or panel of supervisors) and the candidate. The academic progress of a candidate is assessed through a research. Progress Report submitted at the end of each semester. The degree is awarded based on an oral examination (viva-voce) of the thesis submitted by the candidate on completion of the study. Candidates intending to study by research may submit their application for admission throughout the year.

Faculty of Electrical Engineering offers two programme for Master of Science:

- Master of Science in Electrical Engineering (MEKA)
- Master of Science in Mechatronics Engineering (MEKM)

DURATION OF STUDIES

Candidates intending to study by research may submit their application for admission throughout the year.



ENTRY REQUIREMENTS

Academics Requirement:

a) A bachelor's degree in the field or related fields with a minimum CGPA of 2.75 or equivalent, as accepted by the HEP Senate; or
b) A bachelor's degree in the field or related fields or equivalent with a minimum CGPA of 2.50 and not meeting CGPA of 2.75, can be accepted subject to rigorous internal assessment; or
c) A bachelor's degree in the field or related fields or equivalent with minimum CGPA of 2.00 and not meeting CGPA of 2.50, can be accepted subject to a minimum of 5 years working experience in the relevant field and rigorous internal assessment.
d) Candidates without a qualification in the related fields or relevant working experience must undergo appropriate prerequisite courses determined by the HEP and meet the minimum CGPA based on (i) to (iii)

Language Requirement:

a) International applicants are required to present the Test of English as a Foreign Language (TOEFL) or the test administered by the International English Language Testing System (IELTS) with the minimum required score listed in Table 1:

Table 1: Minimum English Requirement

Minimum TOEFL score	Minimum IELTS score
520	5.0

b) Applicants without TOEFL/IELTS or for those who obtained a score below the requirement above are required to undergo and pass the English language programme conducted by UTeM prior to commencement of the postgraduate programme.
c) Exemption may be given to those who have undertaken regular programmes of studies and graduated from universities that use English as the medium of instruction or who has graduated from UTeM in a programme with English as the medium of instruction.

Additional Requirements for International Students:

a) All international students are required to register as full time student and should have the financial capability to meet the course fees and living expenses.
b) Applicants need to submit a letter of certification from their Ministry of Education verifying nationality and academic qualifications of candidate.
c) Academic transcripts and supporting documents must be certified true copies by a senior public official from the applicant's country or from Malaysia.
d) Proof of financial ability to pursue their studies and live in Malaysia for the duration of study. A letter of financial guarantee/sponsorship or the most recent financial statement from applicant's bank is sufficient.
e) Have international passport with at least TWO (2) years validity and meet all immigration procedures and Medical check-up by the health authorities.

Programme Outcomes (PO) – Master Programme

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Faculty of Electrical Engineering's Master's Programme:


Demonstrate mastery of knowledge in electrical engineering.


Apply advanced skills acquired in practical electrical engineering situation.


Relate ideas to societal issues in electrical engineering.


Conduct project and adhere to legal, ethical and professional codes of practice.


Demonstrate leadership qualities through communicating and working effectively with peers and stakeholders.


Generate solutions to problems using scientific and critical thinking skills.


Manage information and lifelong learning skills.

Master of Science in Electrical Engineering – MEKA

Electrical engineering forms the fundamental study to the generation, distribution and utilisation of energy efficiently. There will be significant growth in research, development and manufacturing activities in the field of electrical engineering and it constitutes the basis for valuable and worthwhile careers for well-qualified graduates.

Programme Educational Objectives (PEO) – MEKA

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's MEKA Programme:

Master knowledge acquired for innovation and creative scholarly activities in electrical engineering.

Practice professional leadership in related to electrical engineering field.

Engage with community and industry towards sustainable development and life-long learning.

Master of Science in Mechatronics Engineering - MEKM

The Faculty offers a wide range of laboratories, fully equipped with the latest teaching and learning equipment with the ratio of TWO (2) to THREE (3) students per station. This arrangement will suit the teaching and learning concepts based on problem cantered, action learning and practical application as stipulated in the Practice and Application Oriented approach.

Programme Educational Objectives (PEO) – MEKM

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's MEKM Programme:

- Master knowledge acquired for innovation and creative scholarly activities in mechatronics engineering.
- Practice professional leadership in related to mechatronic engineering field.
- Engage with community and industry towards sustainable development and life-long learning.

6.0

COURSE IMPLEMENTATION MASTER PROGRAMME BY RESEARCH


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Programme Structure

The programme structure for both MEKA and MEKM are as follows:

Course	Course	Credit
Compulsory Course	Research Methodology	3
Elective course (Choose one)	Entrepreneurship	3
	Engineering and Technology Management	3
	Project Management	3
	Quality Systems Management	3
Thesis		84
Total Credit Hours		**90**

Details

MPSW 5013
RESEARCH METHODOLOGY

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research programme at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

[1] Barbie, Earl R., 1998, Survey Research Methods, 2nd Edition, Waddsworth Publishing Company, California, USA, 1998.
[2] Linda Cooley and Jo Lewkowicz, 2003, Dissertation Writing in Practice, Turning Ideas into Text, 1st Edition, Hong Kong University Press.
[3] James, E.M., Jack, W.B., 2005, Guide to the Successful Thesis and Dissertation. 5 th Edition, Marcel Dekker, Inc., New York, USA.
[4] Syed, V.A., and Victor, B.L., 2005, The Art of Scientific Innovation, Cases of Classical Creativity, 1st Edition, Pearson Prentice Hall, New Jersey, USA.
[5] Blaxter, L. et al., 2001, How to Research, 1st Edition, Open University Press, Milton Keynes, Buckingham, UK

MPSW 6063
ENTREPRENEURSHIP

This course is designed for ambitious new competences, engineers and scientists in creating acquiring and existing business, or working in industries serving the entrepreneurs, or postgrads interested in acquiring and developing their talent as well as familiarising with the concepts, issues, and techniques of new venture creation. It addresses challenging issues on high technology venturing, intellectual property and intellectual property development, the installation of innovative organisation, the effective control of the innovation, and the management of the supply chain.

A key element of the Entrepreneurship programme is the development of business plan by individual, and case study analysis aiming to create new ventures. Topics include development of successful ideas, developing a profitable business models, writing a business plan, market opportunities for high-tech products enabled by technology, technology and innovation, intellectual property rights, inventions inventors and invention ownership, strategic control for new ventures and venture legal aspects.

References:

[1] Bruce R. Barringer & R. Duanne Ireland. (2006). Entrepreneurship: The Successful Launch of New Ventures, (1st Edition). Prentice Hall
[2] Bygrave & Zacharakis (2008), Entrepreneurship, John Wiley & Son
[3] Mary Coulter. (2003). Entrepreneurship in Action (2nd Edition) Prentice Hall.
[4] Kuratko & Hodgetts (2004), Entrepreneurship (3rd Edition), Dryden Press.
[5] Lupiyoadi (2007), Entrepreneurship: from Mindset to Strategy (3rd Edition), Lembaga Penerbitan Fakultas Ekonomi Universitas Indonesia.

MPSW 5033
ENGINEERING & TECHNOLOGY MANAGEMENT

The subject consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/ technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the subject will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

[1] Innovation Management and New Product Development (6th Edition) 6th Edition, Paul Trott (Author), Pearson; 6 Edition, 2016.
[2] Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, John Wiley & Sons, 2011.
[3] Operations Management 13th Edition by William J Stevenson (Author) McGraw-Hill Education; 2017.
[4] Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma by Jim Hall, Tina Scott CreateSpace Independent Publishing Platform, 2016.
[5] The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional Sharon Armstrong, Barbara Mitchell Weiser, 2019.

MPSW 6073
PROJECT MANAGEMENT

This subject focuses on the principles of project management including the importance and interrelationship of all its components. Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risks and procurement). Various tools for supporting the analysis of works in engineering project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, creating budget and work breakdown structure, managing uncertainty & risk, building project plan, implementing and revising project plan, completing the project and contract laws

References:

[1] Meredith, Mantel, Shafer and Sutton (2001). Core Concepts: Project Management in practice, John Wiley & Sons.
[2] Rosenau, M. (2005). Successful Project Management, 3 Ed. John Wiley & Sons.
[3] Pinto, K. Jeffrey. (2007). Project Management, Achieving Competitive Advantage. Pennsylvania State University, Prentice Hall.
[4] Gray, C.F and Larson, E.W, (2006). Project Management; A Managerial Perspective. McGrawHill
[5] Meredith, J., Mantel, S. and Mantel, S. Jr. (2005). Project Management: A Managerial Approach. New York, John Wiley & Sons Inc.

MPSW 6053
QUALITY MANAGEMENT SYSTEM

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method, failure mode and effect analysis (FMEA) and quality function deployment. Several quality control tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

[1] Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
[2] Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
[3] Oakland, J. S., TQM with Cases, 3rd Ed., Butterworth-Heinemann, 2003.
[4] Kolarik, Creating Quality Concepts, Systems, Strategies & Tools, McGraw Hill, 1995.
[5] Bergman and Klefsjo, Quality from Customer Needs to Customer Satisfaction, McGraw Hill, 1994.

7.0

PhD & DEng PROGRAMME

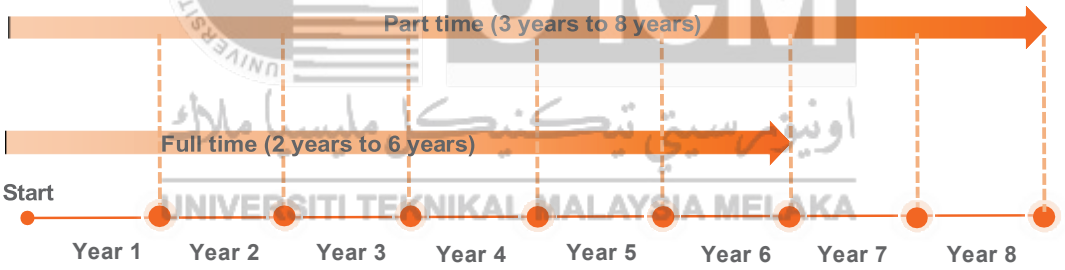

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DOCTOR OF PHILOSOPHY (PhD)

The Doctoral candidate by research is supervised by an academic staff (or a panel of supervisors) from the faculty. The directed research work will focus on a particular subject that introduces candidate to the processes by which new knowledge is developed or/ and applied accordingly. The specific topic of investigation will be agreed upon by the supervisor (or panel of supervisors) and the candidate. Progress report is submitted at the end of each semester. The degree is awarded based on an oral examination (viva- voce) of the thesis submitted by the candidate on completion of the study.

DURATION OF STUDIES

Candidates intending to study by research may submit their application for admission throughout the year.



ENTRY REQUIREMENTS

Academics Requirement:

a) A master's degree in the field or related fields accepted by the HEP Senate; or
b) Other qualifications equivalent to a master's degree recognised by the Government of Malaysia.
c) Candidates without a related qualification in the field/s or working experience in the relevant fields must undergo appropriate prerequisite courses determined by the HEP.

A Bachelor's degree with the following conditions:

a) A bachelor's degree in the field or related fields with first-class (CGPA of 3.67 or higher) or its equivalent from an academic or Technical and Vocational Education and Training (TVET) programme;
b) Undergo internal assessment; and
c) Any other requirements of the HEP.

Bachelor's degree candidates who are registered for master's degree programmes may apply to convert to the doctoral degree programmes subjected to the following conditions:

a) Within 1 year for full time and within 2 years for part-time candidates;
b) Having shown competency and capability in conducting research at doctoral level through rigorous internal evaluation by the HEP; and
c) Approval of the HEP Senate.

PhD by Retrospective or Prior Publications

The applicant must have publications that contribute to the scholarship of knowledge in the field and are acknowledged by academic peers. A formal application must be submitted to the HEP and must include:

a) Minimum of 5 publications or equivalent works in alignment with the theme of the specialization;
b) An executive summary of the above publications to demonstrate the applicant's contribution to knowledge in the field; and
c) A list of scholarly published work.

A Selection Committee must be established to review the formal application for PhD by Retrospective or Prior Publication and recommend to the Senate on the admission.

The minimum language proficiency of the candidates must be determined by the HEP consistent with applicable programme standards or based on the needs of the programme i.e., learning outcomes and the medium of instruction.

Language Requirement:

a) International applicants are required to present the Test of English as a Foreign Language (TOEFL) or the test administered by the International English Language Testing System (IELTS) with the minimum required score listed in Table 1:

Table 1: Minimum English Requirement

Minimum TOEFL score	Minimum IELTS score
520	5.0

b) Applicants without TOEFL/IELTS or for those who obtained a score below the requirement above are required to undergo and pass the English language programme conducted by UTeM prior to commencement of the postgraduate programme.

c) Exemption may be given to those who have undertaken regular programme of studies and graduated from universities that use English as the medium of instruction or who has graduated from UTeM in a programme with English as the medium of instruction.

Additional Requirements for International Students:

a) All international students are required to register as full time student and should have the financial capability to meet the course fees and living expenses.
b) Applicants need to submit a letter of certification from their Ministry of Education verifying nationality and academic qualifications of candidate.
c) Academic transcripts and supporting documents must be certified true copies by a senior public official from the applicant's country or from Malaysia.
d) Proof of financial ability to pursue their studies and live in Malaysia for the duration of study. A letter of financial guarantee/sponsorship or the most recent financial statement from applicant's bank is sufficient.
e) Have international passport with at least TWO (2) years validity and meet all immigration procedures.
f) Medical check-up by the health authorities.

DOCTOR OF ENGINEERING (DEng)

The Doctor of Engineering (DEng) is a 4 years doctoral level programme combining academic research and scholarship with industrial problem-solving and project management. The programme incorporates the industrial relevant research, team leadership and unique university-industry partnership. The academic degree awarded on the basis of advanced study and research in engineering is equivalent to a PhD degree in engineering/ applied sciences. The candidate will normally be advised by one academic supervisor and one industrial supervisor. The topic for the research will be jointly decided by the faculty and the participating company. It can be a single project, or a series of projects, firmly based on a real industrial problem and having significant challenging and innovative engineering content.

DURATION OF STUDIES

ENTRY REQUIREMENTS

Academics Requirement:

a) A Master degree (or equivalent) from any institution of higher learning recognized by the Malaysian Government with CGPA of at least 2.75; AND
b) Have at least 3 years of working experience AND
c) Has obtained the approval from employer to accommodate the research project in the workplace OR
d) A Master degree student who has obtained Senate approval to enrol for the programme

Programme Outcomes (PO) – PhD and DEng Programme

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Faculty of Electrical Engineering's PhD and DEng Programme:


Synthesise knowledge and contribute to original research that broadens the frontier of knowledge in the relevant field.


Adapt practical skills leading to innovative ideas in the relevant field.


Provide expert advice to society in the relevant field.


Conduct research independently and adhere to legal, ethical and professional codes of practice.


Display leadership qualities through communicating and working effectively with peers and stakeholders.


Appraise problems in the relevant field critically using scientific skills.


Integrate information for lifelong learning.

Programme Educational Objectives (PEO) – PhD Programme

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's PhD Programme:

Integrate original contribution of knowledge acquired for innovative and creative scientific process in scholarly activities.

Practice professional leadership in respective discipline.

Engage with community and industry towards sustainable development and lifelong learning

Programme Educational Objectives (PEO) – DEng Programme

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's DEng Programme:

Integrate knowledge acquired for innovative and creative scientific process engineering application(s).

Practice professional leadership in respective discipline.

Engage with community and industry towards sustainable development and lifelong learning.


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

8.0

COURSE IMPLEMENTATION
PhD & DEng PROGRAMME


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

PhD and DEng

Programme Structure

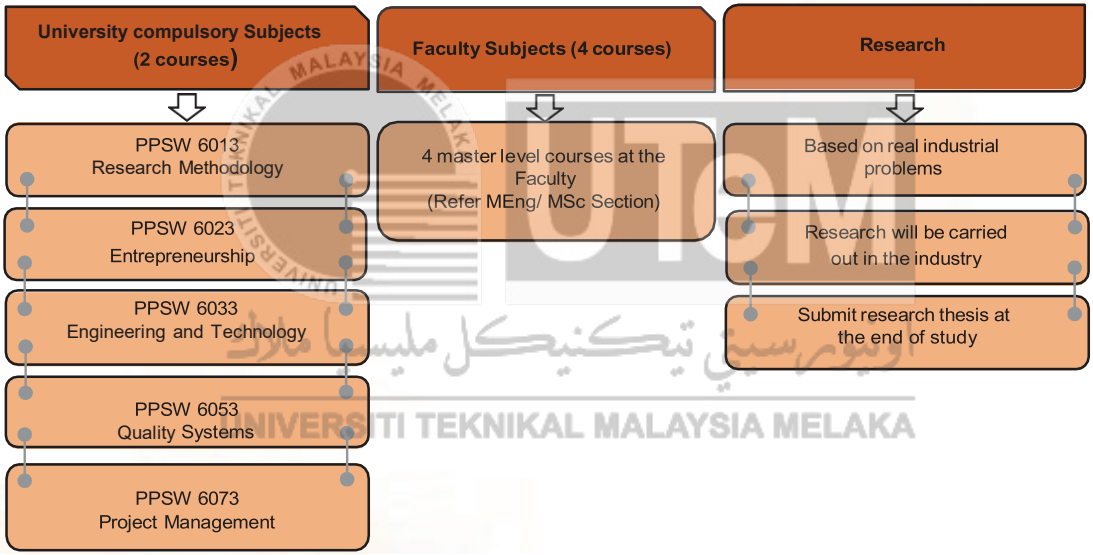
Course	Credit
Research Methodology (Compulsory course)	3
Entrepreneurship	3
Engineering & Technology Management	3
Project Management	3
Quality Systems Management	3
Thesis	84
Total Credit Hours	90

Programme Structure

Taught Course:

Candidates in this programme are expected to undertake 18 credit hours of courses while doing their industrial based research.

The course components are as below:



The candidate will normally be advised by one academic supervisor and one industrial supervisor. The topic for the research will be jointly decided by the faculty and the participating company. It can be a single project, or a series of projects, firmly based on a real industrial problem and having significant challenging and innovative engineering content. The candidate will spend majority of his/ her time (about 80%) with the collaborating company.

Details

PPSW 6013
RESEARCH METHODOLOGY

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research programme at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

[1] Barbie, Earl R., 1998, Survey Research Methods, 2nd Edition, Waddsworth Publishing Company, California, USA, 1998.
[2] Linda Cooley and Jo Lewkowicz, 2003, Dissertation Writing in Practice, Turning Ideas into Text, 1st Edition, Hong Kong University Press.
[3] James, E.M., Jack, W.B., 2005, Guide to the Successful Thesis and Dissertation. 5 th Edition, Marcel Dekker, Inc., New York, USA.
[4] Syed, V.A., and Victor, B.L., 2005, The Art of Scientific Innovation, Cases of Classical Creativity, 1st Edition, Pearson Prentice Hall, New Jersey, USA.
[5] Blaxter, L. et al., 2001, How to Research, 1st Edition, Open University Press, Milton Keynes, Buckingham, UK.

PPSW 6063
ENTREPRENEURSHIP

This course is designed for ambitious new competences, engineers and scientists in creating acquiring and existing business, or working in industries serving the entrepreneurs, or postgrads interested in acquiring and developing their talent as well as familiarising with the concepts, issues, and techniques of new venture creation. It addresses challenging issues on high technology venturing, intellectual property and intellectual property development, the installation of innovative organisation, the effective control of the innovation, and the management of the supply chain. A key element of the Entrepreneurship programme is the development of business plan by individual, and case study analysis aiming to create new ventures. Topics include development of successful ideas, developing a profitable business models, writing a business plan, market opportunities for high-tech products enabled by technology, technology and innovation, intellectual property rights, inventions inventors and invention ownership, strategic control for new ventures and venture legal aspects.

References:

[1] Bruce R. Barringer & R. Duanne Ireland. (2006). Entrepreneurship: The Successful Launch of New Ventures, (1st Edition). Prentice Hall.
[2] Bygrave & Zacharakis (2008), Entrepreneurship, John Wiley & Son
[3] Mary Coulter. (2003). Entrepreneurship in Action (2nd Edition) Prentice Hall.
[4] Kuratko & Hodgetts (2004), Entrepreneurship (3rd Edition), Dryden Press.
[5] Lupiyoadi (2007), Entrepreneurship: from Mindset to Strategy (3rd Edition), Lembaga Penerbitan Fakultas Ekonomi Universitas Indonesia.

PPSW 6033
ENGINEERING & TECHNOLOGY MANAGEMENT

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/ technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the subject will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

[1] Lucy C. Morse and Daniel L. Babcock (2010) Managing Engineering and Technology, Pearson.
[2] Trott, P. (2005), Innovation Management and New Product Development, Prentice Hall.
[3] Naushad Forbes, David Wield (2002) From Followers to Leaders – Managing Technology and Innovation, Routledge.
[4] Edosomwan, J (1995), Integrating Productivity and Quality Management, 2nd Edition, Routledge.
[5] Patrick D. T. O'Connor, (2008), The new management of engineering, Lulu Publications

PPSW 6073
PROJECT MANAGEMENT

This subject focuses on the principles of project management including the importance and interrelationship of all its components. Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risks and procurement). Various tools for supporting the analysis of works in engineering project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, creating budget and work breakdown structure, managing uncertainty & risk, building project plan, implementing and revising project plan, completing the project and contract laws

References:

[1] Meredith, Mantel, Shafer and Sutton (2001). Core Concepts: Project Management in practice, John Wiley & Sons.
[2] Rosenau, M. (2005). Successful Project Management, 3 Ed. John Wiley & Sons.
[3] Pinto, K. Jeffrey. (2007). Project Management, Achieving Competitive Advantage. Pennsylvania State University, Prentice Hall.
[4] Gray, C.F and Larson, E.W, (2006). Project Management; A Managerial Perspective. McGrawHill
[5] Meredith, J., Mantel, S. and Mantel, S. Jr. (2005). Project Management: A Managerial Approach. New York, John Wiley & Sons Inc.

PPSW 6053
QUALITY SYSTEMS MANAGEMENT

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method, failure mode and effect analysis (FMEA) and quality function deployment. Several quality control tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

[1] Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
[2] Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
[3] Oakland, J. S., TQM with Cases, 3rd Ed., Butterworth-Heinemann, 2003.
[4] Kolarik, Creating Quality Concepts, Systems, Strategies & Tools, McGraw Hill, 1995.
[5] Bergman and Klefsjo, Quality from Customer Needs to Customer Satisfaction, McGraw Hill, 1994.

FACULTY OF ELECTRICAL ENGINEERING
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya, 76100 Durian Tunggal,
Melaka, Malaysia.

email: fke@utem.edu.my
phone: +606 - 270 2112
Website: https://fke.utem.edu.my

PENERBIT UTeM Press

Website : **www.utem.edu.my/penerbit**
Books Online : **utembooks.utem.edu.my**
Email : **penerbit@utem.edu.my**