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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UTeM



POSTGRADUATE ACADEMIC HANDBOOK 2025/2026

Faculty of Electrical Technology and Engineering



POSTGRADUATE ACADEMIC HANDBOOK 2025/2026

**FACULTY OF ELECTRICAL TECHNOLOGY AND ENGINEERING
UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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And all of the parties involved.

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TOP MANAGEMENT



**PROFESSOR DATUK
TS. DR. MASSILA BINTI KAMALRUDIN**
(VICE CHANCELLOR)



**PROFESSOR
DR. ZULKIFLIE BIN IBRAHIM**
DEPUTY VICE CHANCELLOR
(ACADEMIC AND INTERNATIONAL)



**PROFESSOR DR. ZAHRILADHA
BIN ZAKARIA**
DEPUTY VICE CHANCELLOR
(RESEARCH & INNOVATION)



**ASSOCIATE PROFESSOR DATUK
DR. SABRI BIN MOHAMAD SHARIF**
DEPUTY VICE CHANCELLOR
(STUDENT AFFAIRS AND ALUMNI)



**ASSOCIATE PROFESSOR
DR. MUSTHAFAH BIN MOHD TAHIR**
ASSISTANT VICE CHANCELLOR
(STRATEGIC AND GLOBAL SUSTAINABILITY)



**MR. MASDZARIF
BIN MAHAT**
(CHIEF OPERATING OFFICER)



**MRS. SABARINA
BINTI ABDULLAH**
(BURSAR)



**MRS. SITI SALUWA
BINTI JAMAL**
(CHIEF LIBRARIAN)



**MR. MOHD NIZAM
BIN PAVEL**
(LEGAL ADVISOR)



**PROFESSOR
DR. KHANAPI BIN ABD GHANI**
(CHIEF DIGITAL OFFICER)



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 country 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. With His mercy, the Academic Handbook of Postgraduate Studies for the Academic Session 2025/2026 has been successfully published by the Faculty of Electrical Technology and Engineering, Universiti Teknikal Malaysia Melaka (UTeM).

Firstly, I would like to extend my heartiest congratulations to all new students on your admission to UTeM, and a warm welcome to the Faculty of Electrical Technology and Engineering. You have chosen the right Institution of Higher Learning (IHL), where an enriching and meaningful academic journey awaits you.

In line with the faculty's motto, "Towards Academic Excellence", we remain steadfast in our commitment to producing competent, knowledgeable, capable, and ethical graduates who will contribute to the advancement of the nation's economy and the enhancement of societal well-being. To this end, the faculty has implemented an Outcome-Based Education (OBE) curriculum since July 2010, with the objective of equipping our students with the necessary knowledge and skills to excel in their future careers.

For the Academic Session 2025/2026, the faculty is offering three (3) types of postgraduate programmes, namely: research mode, mixed mode, and taught course mode — all of which are in full compliance with the requirements of the Malaysian Qualifications Agency (MQA). The Doctor of Philosophy (Ph.D.), Doctor of Engineering (D.Eng.), and Master of Science (M.Sc.) programmes are conducted via research mode.

The Master of Electrical Engineering (Industrial Power) [MEKP] is offered in mixed mode, combining both research and coursework. Meanwhile, the Master of Electrical Engineering (MEKG) and the Master of Mechatronics Engineering (MEKH) are conducted fully in taught course mode.

This handbook provides a comprehensive overview of the faculty, including entry requirements, duration of study, curriculum structure, Programme Educational Objectives (PEOs), Programme Outcomes (POs), and course summaries. It is intended to serve as a guiding reference for new students to systematically plan their studies, achieve academic excellence, and graduate on time with commendable results.

Finally, I wish to record my deepest appreciation to all committee members for their dedication, hard work, and commitment towards the successful publication of this handbook.

Wassalam.

“Towards Academic Excellence”

ASSOCIATE PROFESSOR TS. DR. MOHAMAD FANI BIN SULAIMA

Dean,

Faculty of Electrical Technology and Engineering

Universiti Teknikal Malaysia Melaka

FACULTY ORGANISATION STRUCTURE



**Prof. Madya Ts. Dr.
Mohamad Fani bin Sulaima**
DEAN



**Ts. Dr. Suziana binti
Ahmad**
**DEPUTY DEAN
(ACADEMIC)**



**Prof. Madya Ir. Dr. Md
Hairul Nizam bin Talib**
**HEAD OF
DEPARTMENT
ENGINEERING**

**Ts. Dr. Mohamad Riduwan
bin Md Nawawi**
Head of Program
Bachelor of Electrical
Engineering with Honours

**Ts. Dr. Mohd Faid
bin Yahya**
Head of Program
Bachelor of Mechatronics
Engineering with Honours

**Dr. Azrita binti
Alias**
Head of Program
Bachelor of Electrical
Engineering with Honours
(Part Time)



**Ts. Dr. Mohd Firdaus
bin Mohd Ab Halim**
**HEAD OF
DEPARTMENT
ENGINEERING
TECHNOLOGY**

**Dr. Mohd Saifuzam
bin Jamri**
Head of Program
Bachelor of Electrical
Engineering Technology
with Honours

**Ts. Dr. Mohd Zaidi
bin Mohd Tumari**
Head of Program
Bachelor of Electrical
Engineering Technology
(Industrial Power) with
Honours

**Ts. Dr. Mohd Razali
bin Mohamad Saplee**
Head of Program
Bachelor of Electrical
Engineering Technology
(Automation, Industry and
Robotics) with Honours

**Ts. Intan Mastura
binti Saadon**
Head of Program
Bachelor of Electrical
Engineering Technology
(Industrial Power) with
Honours
(Part Time)



**Ts. Dr. Ahmad
Zubir bin Jamil**
**HEAD OF
DEPARTMENT
TECHNOLOGY**

**Ts. Dr. Sulaiman
bin Sabikan**
Head of Program
Bachelor of Electrical System
Maintenance Technology with
Honours

**Ts. Zailhasraf bin
Zakaria**
WBL Coordinator
Bachelor of Electrical System
Maintenance Technology with
Honours



**Ts. Dr. Mohamad
Faizal bin Baharom**
**HEAD OF DEPARTMENT
DIPLOMA**



**Ir. Ts. Muhammad
Falhan bin Bahari**
Laboratory Coordinator



Ir. Ts. Dr. Mohd Hafiz bin Jali
**DEPUTY DEAN
(RESEARCH AND GRADUATE STUDIES)**

**Ir. Ts. Dr. Mohd Shahri
bin Ahmad Khair**
Head of Program
Doctoral

**Dr. Emy Zairah
binti Ahmad**
Head of Program
Masters
Coursework/Mixed-
Mode

**Ir. Dr. Intan Azmira binti
Wan Abdul Razak**
Head of Program
Masters
Research



Ts. Dr. Hazriq Izzuan bin Jaafar
**DEPUTY DEAN
(STUDENT AND ALUMNI DEVELOPMENT)**

**Dr. Mohd Rusdy
bin Yaacob**
Coordinator
Student Affairs

**Dr. Rahifa
binti Ranom**
Coordinator
Alumni



**Pn. Suhaili binti
Sallehuddin**
SENIOR DEPUTY REGISTRAR

**Pn. Suhadawati
binti Ahmad**
Senior Assistant Registrar
Academic Unit
Engineering & Diploma

**Pn. Zailhasrah
binti Alias**
Senior Assistant Registrar
Administration & Finance Unit

Assistant Registrar
Academic, Technology
Engineering & Technology

FACULTY AT A GLANCE

Faculty of Electrical Technology and Engineering (FTKE) was established in early 2001 and officially began to operate from 22nd June 2001 after obtaining an authorization from Malaysia 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.

To uphold the academic pillars that define our faculty, a dedicated managerial team has been established, led by the Dean and supported by One (1) Deputy Deans responsible for research and postgraduate students. This leadership is further strengthened by three (3) Heads of Programme: Head of Programme for Doctoral (PhD/DEng), Head of Programme for Master's by Coursework/Mixed Mode, and Head of Programme for Master's by Research. Additionally, the team includes one (1) Senior Assistant Registrar.

At FTKE, our academic community is a blend of experienced lecturers, each excelling in diverse fields, ensuring a robust academic foundation. With their commitment, we aim to educate and mentor the next generation of outstanding graduates, equipping them with cutting-edge knowledge, technical expertise, and well-rounded soft skills to thrive in their professional journeys.

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) - EEKA
 - 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**

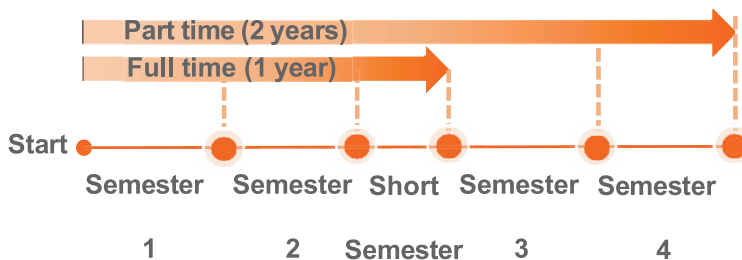
MASTER PROGRAMME BY TAUGHT COURSE

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 courses, 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 Technology and 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 (a) to (b).

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 Learning Outcomes (PLO) – Master of Electrical Engineering

Programme Learning Outcome (PLO) 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 in-depth and frontier knowledge and understanding in the electrical engineering field or practice.
- Critically and creatively apply knowledge in the electrical engineering field to resolve complex disciplinary and practical problems.
- Conduct credible problem solving or investigation to resolve complex issues and questions in the electrical engineering field or practice.
- Conduct research or investigation with minimal supervision adhering to legal, ethical, professional and sustainable practice.
- Demonstrate leadership qualities through collaboration with peers and others.
- Select and use suitable digital and analytical tool techniques to resolve problems.
- Manage information and lifelong learning skills.
- Demonstrate commitment to lifelong learning and personal development.

Programme Learning Outcomes (PLO) – Master of Mechatronics Engineering

Programme Learning Outcome (PLO) 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 in-depth and frontier knowledge and understanding in the mechatronics engineering field or practice.
- Critically and creatively apply knowledge in the mechatronics engineering field to resolve complex disciplinary and practical problems.
- Conduct credible problem solving or investigation to resolve complex issues and questions in the mechatronics engineering field or practice.
- Conduct research or investigation with minimal supervision adhering to legal, ethical, professional and sustainable practice.
- Demonstrate leadership qualities through collaboration with peers and others.
- Communicate and interact effectively with peers in the mechatronics engineering field as well as general audience.
- Select and use suitable digital and analytical tool techniques to resolve problems.
- Demonstrate commitment to lifelong learning and personal development.

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 Technology And Engineering's Master Programme:

- Master knowledge acquired for innovation and creative scholarly activities in electrical engineering.
- Practice professional leadership related to electrical engineering field.
- Engage with community and industry towards sustainable development goals 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 Technology And Engineering's Master Programme:

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

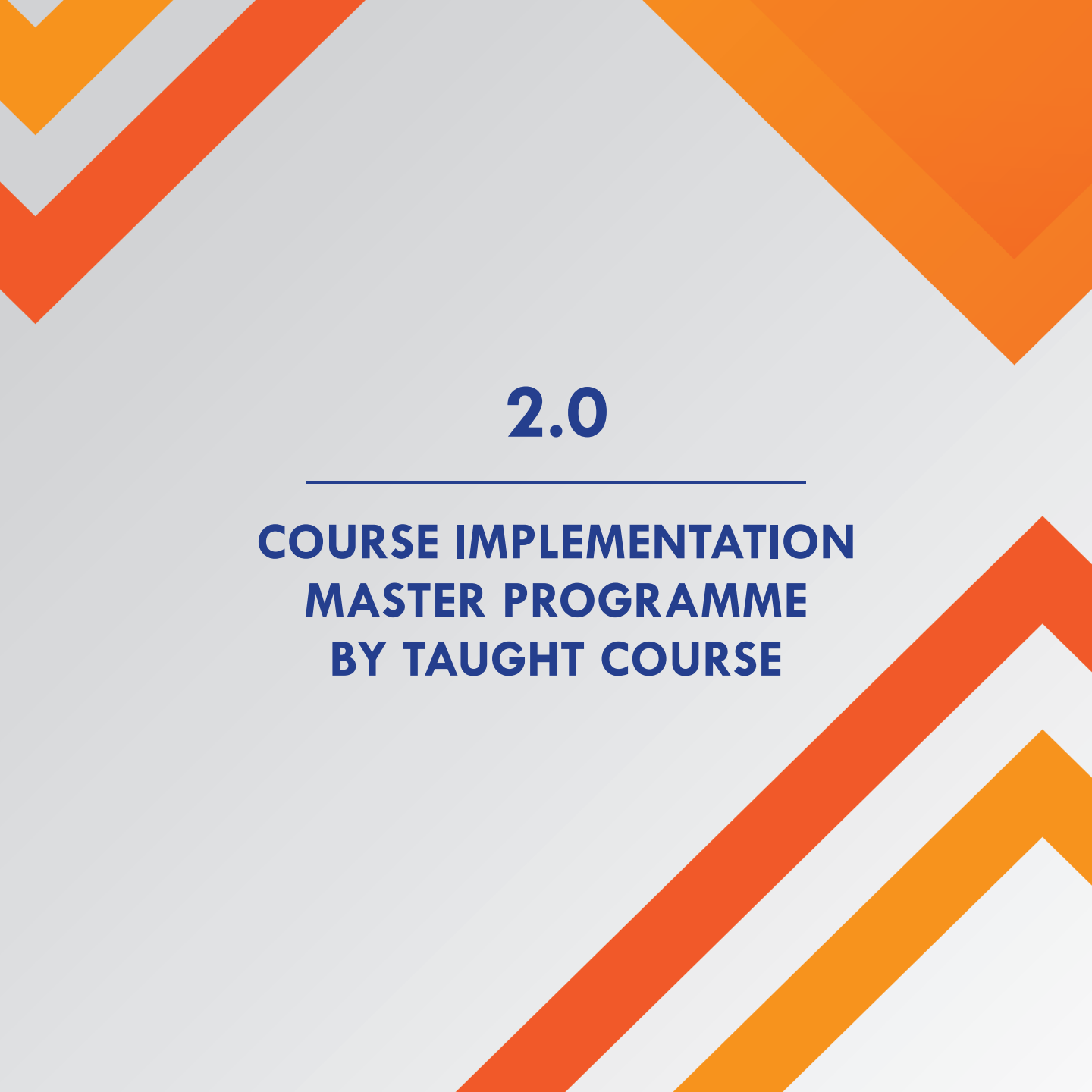
LISTS OF THE FACULTY'S EXTERNAL EXAMINER, VISITING PROFESSOR, ADJUNCT PROFESSOR AND INDUSTRIAL ADVISORY PANEL

Lists of Visiting Professor

VISITING PROFESSOR	QUALIFICATIONS	APPOINTMENT PERIOD	PROGRAM
Profesor Dr. Abdul Hamid Adom	PhD from Liverpool John Moores University, UK Professor at Faculty of Electrical Engineering & Technology, UniMAP	01.06.2023 – 31.05.2025	Postgraduate research studies in Mechatronic Engineering (PEKA, MEKM)
Profesor Dr Mohd Amran Mohd Radzi	PhD in Power Electronics, UM Professor at the Department of Electrical and Electronic Engineering, Faculty of Engineering, UPM	01.06. 2023 – 31.05.2025	Postgraduate research studies in Electrical Engineering (PEKA, MEKA, MEKP)

Lists of Industry Advisory Panel

INDUSTRIAL ADVISORY PANEL	POSITION	APPOINTMENT PERIOD	PROGRAM
Mohd Shahriman bin Shafein	Post: Director Company: MyHSR	Lantikan Baharu	MEKH
Muhammad Arif Bin Abdul Rahman	Post: Jurutera Company: Sime Darby Plantation	Lantikan Semula	MEKH
Dr. Siti Noor Aliah binti Baharom	Post: Penyelidik Company: MARDI	Lantikan Semula	MEKH
Ir. Lee Cheng Pay	Post: Director Company: Duriane Professionals Sdn. Bhd.	Lantikan Baharu	MEKG
Ir. Azharuddin bin Md Kassim	Post: Chief Executive Officer Company: Prestigious Discovery Sdn. Bhd.	Lantikan Semula	MEKG
Ir. Poon Kean Yuen	Post: Chief Executive Officer Company: CEO Solarvest Sdn. Bhd.	Lantikan Semula	MEKG



2.0

**COURSE IMPLEMENTATION
MASTER PROGRAMME
BY TAUGHT COURSE**

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.

MPSW 5013 RESEARCH METHODOLOGY

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 1, 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 Rotating 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 Industrial Robotics	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 I	Elective I	3
	Total Credit		12

Semester	Course		Credit
Year 2 Sem 1	MEKH 5213	Master Project 1	3
	Elective II	Elective II	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, Wadsworth 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. Programmemeing 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'Reilly 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 5473 ENGINEERING STANDARDS

This subject will discuss embedded system components, interfacing electronics and programming 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 programming.

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. Salgado, "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 programming 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.

MEKG 5143
ADVANCED ELECTRICAL MACHINES & DRIVES

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.



3.0

**MASTER PROGRAMME BY
MIXED MODE**

MASTER PROGRAMME BY MIXED MODE

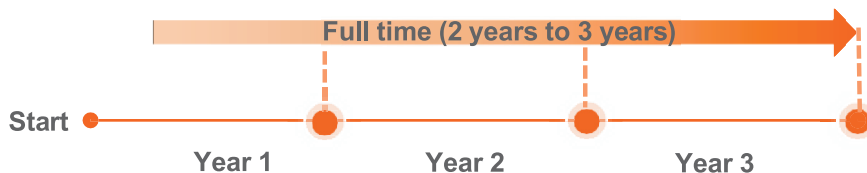
Mixed Mode refers to the combination of taught course and research activities. The assessment depends upon both the coursework and dissertation (research work). The component for the coursework is 50% and the dissertation contributes the other 50%. The Mixed Mode programme develops the research skill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

Faculty of Electrical Technology and 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 Learning Outcomes (PLO)

Programme Learning Outcome (PLO) 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 Learning Outcomes for Faculty Of Electrical Technology And Engineering's Master by Mixed Mode 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 Technology And Engineering's Master Programme by Mixed Mode:



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.



4.0

**COURSE IMPLEMENTATION
MASTER PROGRAMME
BY MIXED MODE**

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, Wadsworth 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 its 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 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 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.

**MEKP 5023
POWER SYSTEM OPERATION & CONTROL**

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 5023
POWER SYSTEM OPERATION & CONTROL**

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.



5.0

**MASTER PROGRAMME BY
RESEARCH**

MASTER PROGRAMME BY RESEARCH

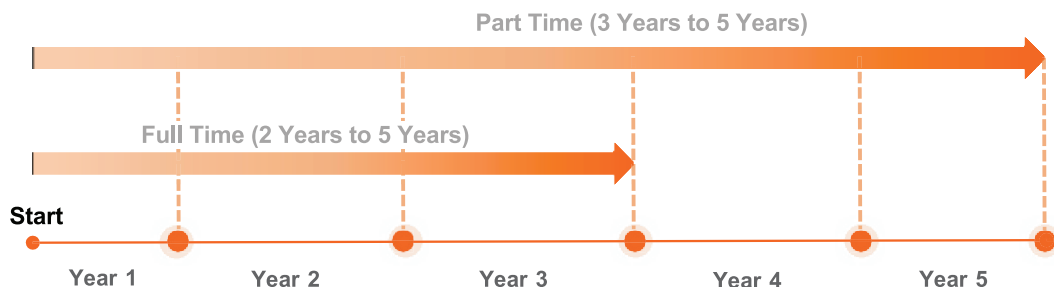
The Master of Science candidate is supervised by an academic staff (or a panel of supervisors) from the faculty. The directed research work will focus on a particular subject that introduces candidates to the processes by which new knowledge is developed or/ and applied accordingly. The specific topic 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 Technology and 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 (a) to (c)

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 Learning Outcomes (PLO) – Master Programme

Programme Learning Outcome (PLO) 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 Learning Outcomes (PLO) for Faculty of Electrical Technology and Engineering's Master 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 Technology and 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 centered, 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 Technology and 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**

Programme Structure

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

Course	Course	Credit
Compulsory Course	Research Methodology	3
Thesis		33
Total Credit Hours		36

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, Wadsworth 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:

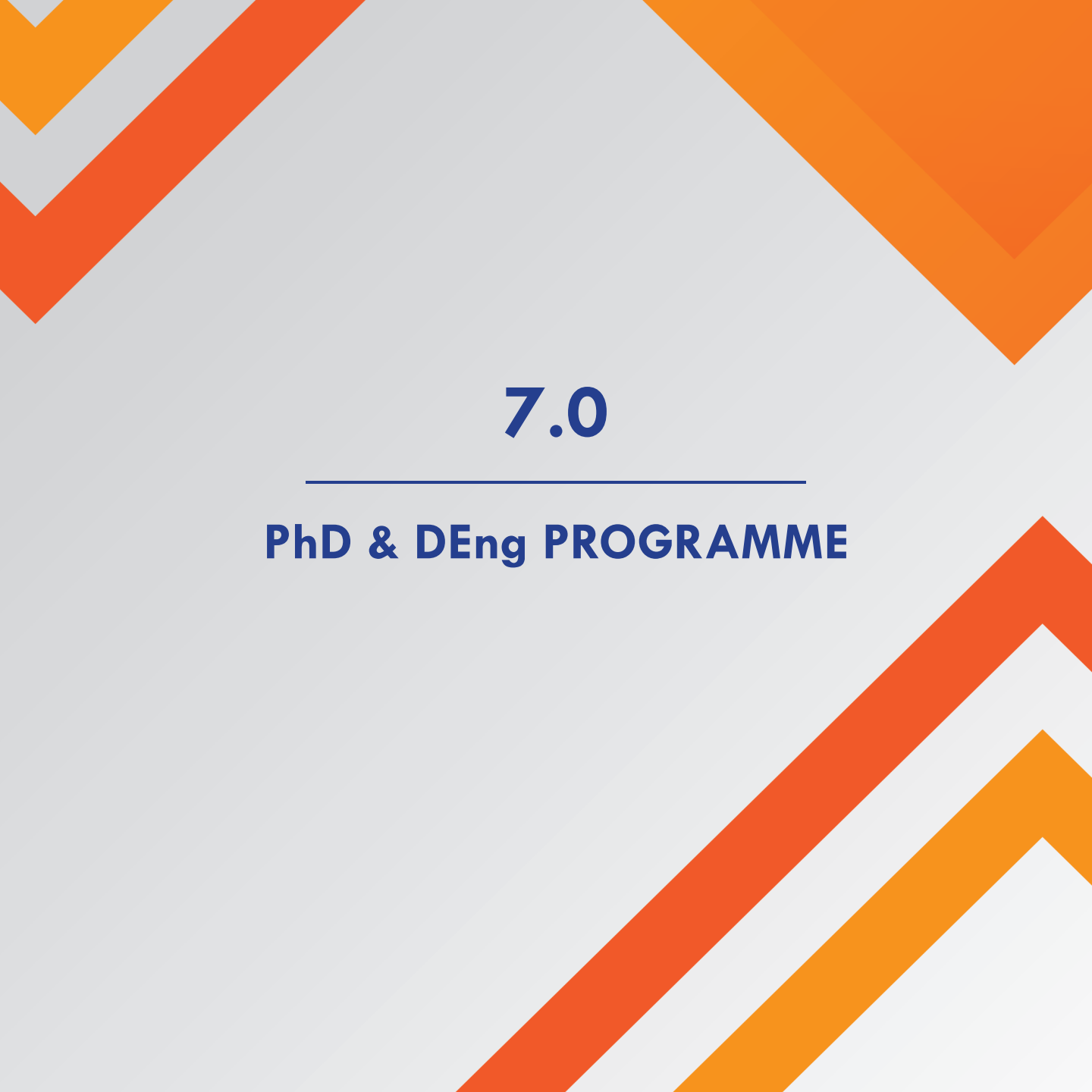
- [1] Meredith, Mantel, Shafer and Sutton (2001). Core Concepts: Project Management in practice, John Wiley & Sons.
- [2] Rosenau, M. (2005). Successful Project Management, 3 Ed. John Wiley & Sons.
- [3] Pinto, K. Jeffrey. (2007). Project Management, Achieving Competitive Advantage. Pennsylvania State 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

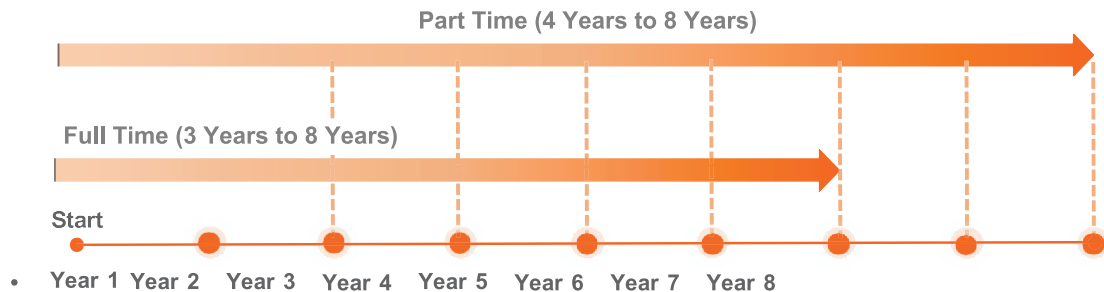
PhD & DEng PROGRAMME

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:

1. Master's Degree Entry Pathway
 - a) Possess a recognised Master's degree or equivalent; and
 - b) Must have completed at least one (1) of the earlier degrees (either Bachelor's or Master's) in Engineering or Engineering Technology
 - c) Candidates without a related qualification in the field(s) or without relevant working experience must undergo appropriate prerequisite courses as determined by the Higher Education Provider (HEP).
 - d) Candidates with a non-related degree but with relevant industrial experience in Engineering/ Engineering Technology may be accepted, subject to a Rigorous Internal Assessment by the HEP.
2. Bachelor's Degree (Direct Entry) Pathway
 - a) Possess a Bachelor's degree in the field or related fields with First-Class Honours (CGPA of 3.67 or higher) or its equivalent, from an academic or Technical and Vocational Education and Training (TVET) programme;
 - b) Passed Rigorous Internal Evaluation (RIE) by the HEP; and
 - c) Fulfil any other requirements as determined by the HEP.
3. Conversion from Master's to Doctoral Programme
 - a) Application must be made within 1 year (for full-time) or within 2 years (for part-time) enrolment in the Master's programme;
 - b) Demonstrate competency and capability in conducting research at the doctoral level, verified through a rigorous internal evaluation by the HEP; and
 - c) Obtain approval from the HEP Senate.

PhD by Published Work

A Selection Committee must be established to review the formal application for PhD by Published Work and recommend to the Senate on the admission.

For PhD by published work, the programme structure must meet the following requirements:

- a) The minimum duration of candidature is SIX (6) months and must not exceed TWO (2) years.
- b) Published work must encompass high impact factor journals, monographs, books, research-based chapters in books, high impact and high quality electronic publications, creative works, and artifacts in the field.
- c) The articles must be published within a period not exceeding TEN (10) years from the date of submission.
- d) For the FIVE (5) nominated publications, the candidate must be either the principal author or second author.

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 applicants those who have completed a regular programme of study and graduated from universities where English is the medium of instruction or have graduated from UTeM in a programme conducted in English. Applicants must also provide supporting evidence to SPS.

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 industry-relevant research, team leadership, and unique university-industry partnerships. 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 innovative research output from the programme is expected to be immediately useful to the participating company. The DEng programme offers an opportunity for outstanding engineers to enhance their qualifications through a mix of broadly based technical and professional training while completing an industry-based research project. Successful researchers after completing the programme not only graduate with a title Doctor of Engineering but also with the important mix of professional skills, technical knowledge, and research experience that will enable them to progress to senior positions within the industry at an acceleration rate.

DURATION OF STUDIES



ENTRY REQUIREMENTS

Academics Requirement:

- Possess a relevant Master's degree from a higher learning institution recognised by the Government of Malaysia; or
- Hold other qualifications equivalent to a Master's degree, or possess relevant qualifications and experience recognised by the HEP
- Be currently employed as a professional, executive, engineer, researcher, or in an equivalent role within the industry
- Have obtained formal approval from their employer to accommodate the research project within the workplace.

Programme Learning Outcomes (PLO) – PhD and DEng Programme

Programme Learning Outcome (PLO) 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 Learning Outcomes for Faculty Of Electrical Technology And 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 Technology And 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 Technology And Engineering's DEng Programme:



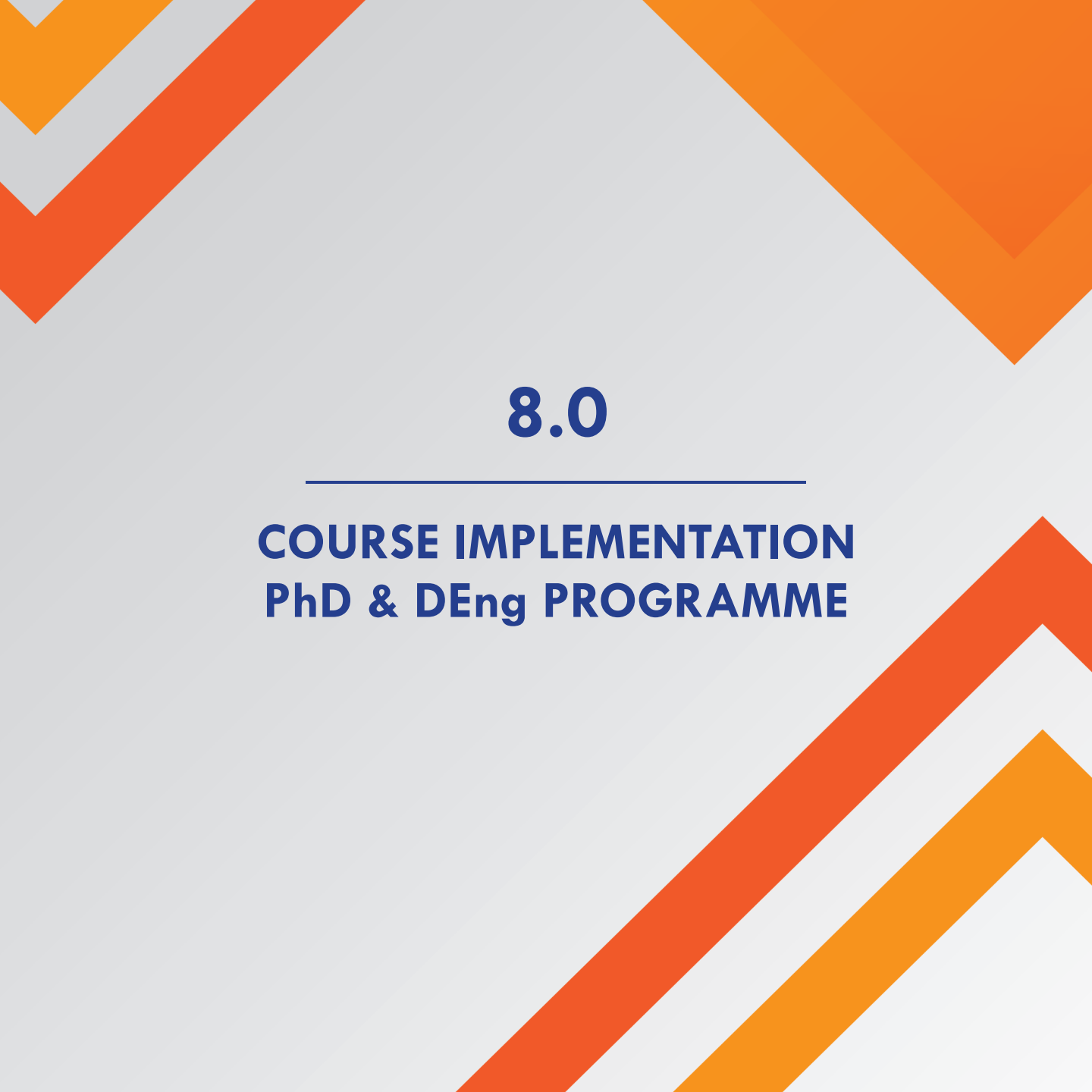
Integrate knowledge acquired for innovative and creative scientific process engineering application(s).



Practice professional leadership in respective discipline.



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



8.0

**COURSE IMPLEMENTATION
PhD & DEng PROGRAMME**

PhD & DEng

PhD & DEng Programme Structure

Course	Subjects	Credit Hours
Compulsory Course	Research Methodology	3
	Research	87
	Total Credit Hours	90

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