



2019



CURRICULUM **2019**

STUDY PROGRAMME
MASTER OF ELECTRICAL ENGINEERING EDUCATION

GRADUATE SCHOOL
UNIVERSITAS NEGERI YOGYAKARTA
2019

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VISION

Become a programme that superior, creative, and innovative at the Southeast Asia Region level to produce professional graduates who are pious, independent and intellectual in technical and vocational education (TVE) in 2025

MISION

- a. Organizing education and teaching that produces educators who have academic and professional competence in the TVE in electrical engineering;
- b. Mastering theory and its application of the TVE in electrical engineering;
- c. Conducting learning, research, and development of the TVE quality in electrical engineering;
- d. Educating the master graduates of Master of Electrical Engineering Education (MEEE) who can develop, manage, and apply programmes in the TVE in electrical engineering at the secondary education, higher education, training centres, and non-formal educational institutions;
- e. Building a network working with various related agencies, in the context of developing and implementing the TVE in electrical engineering.

STUDY PROGRAMME PROFILE

A summary of the specifications of the Master of Electrical Engineering Education Study Programme is presented as follows:

Degree Awarding Institution	Universitas Negeri Yogyakarta		
Program Name	Master of Electrical Engineering Education (MEEE)		
Awarded Degree	Master of Education (M.Pd.)		
Admission Requirement	Graduates of Bachelor's Degree in Electrical Engineering Education/ Mechatronics Engineering Education/ Electrical Engineering		
Mode of Study (Full-time, part-time, etc.)	Full time	Higher Education Qualification Level Framework	Level 8
Program Duration	Two Years	Minimum Credit for the Programme	40 SKS
Year Established	2015		
Faculty	Graduate School / Faculty of Engineering		

Department	Electrical Engineering Education
Accreditation	B by the National Accreditation Board for Higher Education (BAN-PT) No. 1757 / SK / BAN- PT / Akred / M / VIII / 2016 for the period 26 August 2016 to 26 August 2021
Date of Reaccreditation	August 27, 2021
Address	Colombo Street No. 1, City of Yogyakarta, Special Region of Yogyakarta, Indonesia, zip code: 55281 Telephone: + 62-274-586-168 ext. 293, + 62-274-548-161 Fax: + 62-274-5867-34 E-mail: elektro@uny.ac.id Website: http://pte.pps.uny.ac.id/

OCCUPATIONAL PROFILES OF GRADUATES

Based on the vision and mission of MEEE, there are three groups of occupation profiles of graduates in MEEE, namely: educators, researchers, and developers professionally in TVET of electrical engineering. The expected scope of occupational competences can be explained as follows:

1. Educators who are able to develop, design, and manage formal, non-formal, or informal elements of TVET in the electrical power and industrial automation professionally.
2. Researchers who are able to design, implement and decide the resolutions to TVET problems in the electrical power and industrial automation professionally.
3. Developers who are able to improve and develop the quality of TVET in the electrical power and industrial automation, as well as be adaptive to the technology changes and demands of the workforce.

PROGRAMME OBJECTIVES

1. Possess personal quality and professional ethics based on a scientific approach;
2. Implement approach of Vocational Education problems in electrical engineering based on a scientific study;
3. Develop electrical power or industrial automation knowledge in vocational education;
4. Implement vocational and technical knowledge in electrical engineering in teaching and learning.

PROGRAMME LEARNING OUTCOMES

Each graduate of the Master of Electrical Engineering Education Study Programme has the achieved at least the following learning outcomes:

Programme Learning Outcomes (PLO)	
PLO1	Demonstrate professional ethics based on religious values, patriotism, and academic norms
PLO2	Implement vocational education and engineering based on scientific approach
PLO3	Analyse vocational education and engineering through scientific research
PLO4	Develop vocational education knowledge of electrical engineering in the competency of power or industrial automation based on information technology
PLO5	Develop knowledge of electrical engineering in the competency of power or industrial automation in vocational education based on information technology
PLO6	Publish research of vocational education in electrical engineering through national and international levels
PLO7	Demonstrate critical and creative thinking skills, communication, adaptability, and leadership
PLO8	Implement strategy, model, method, media, learning material, evaluation, and learning assessment in vocational education based on information technology
PLO9	Apply electrical engineering theory in vocational teaching and learning in the competency of power or industrial automation based on information technology

The relevance of programme learning outcomes and sub-programme learning outcomes is shown in the following table:

No PLO (Code)	PLO Description	No Sub-PLO	Sub-PLO Description
PLO1	Demonstrate professional ethics based on religious values, patriotism, and academic norms	1.1	Fear God Almighty and be able to show a religious
		1.2	Uphold the value of humanity in carrying out duties based on religion, morals, and ethics
		1.3	Contribute to the improvement of the quality of a community, nation, state and civilization development based on Pancasila
		1.4	Acting as a proud and loving citizen of the country, having nationalism and a sense of responsibility to the country and nation

No PLO (Code)	PLO Description	No Sub-PLO	Sub-PLO Description
		1.5	Respecting cultural diversity, views, religion and beliefs, as well as other people's original opinions or findings
		1.6	Cooperate and have social sensitivity and care for the community and the environment
		1.7	Obey the law and discipline in community and state life
		1.8	Internalize academic values, norms, and ethics
		1.9	Demonstrate an attitude of responsibility for vocational education work in the field of electrical engineering independently
		1.10	Internalize the spirit of independence, struggle, and entrepreneurship
		1.11	Master in the concept of academic integrity in general and the concept of plagiarism specifically in terms of the type of plagiarism the consequences of violations and prevention efforts
		1.12	Able to increase the learning capacity independently
		1.13	Able to uphold academic integrity in general and prevent the practice of plagiarism
		PLO2	Implement vocational education and engineering based on scientific approach
2.2	Master in the theory and application of mathematics, logic, and computer programming for the determination and testing of vocational education research data in the field of electrical engineering		
2.3	Master in the theory and application of vocational education science to improve the quality of civil service governance, leadership, management systems, and quality assurance oriented to standard quality standards in the field of electrical engineering		

No PLO (Code)	PLO Description	No Sub-PLO	Sub-PLO Description
		2.4	Able to develop logical, critical, systematic, and creative thinking through scientific research, the creation of designs or works of art in the field of science and technology that pay attention to and apply the value of humanities following vocational education in the field of electrical engineering, compile scientific conceptions and study results based on rules, procedures and scientific ethics in the form of a thesis or other equivalent form, and uploaded on the university page, as well as papers that have been published in accredited scientific journals or accepted in international journals
		2.5	Able to make decisions in the context of solving problems in the development of science and technology that pay attention to and apply humanities based on analytical or experimental studies of information and data
PLO3	Analyse vocational education and engineering through scientific research	3.1	Master in the theory and application of various educational research approaches to the selection, application and testing of appropriate research methods in the context of vocational education research problems in the field of electrical engineering
		3.2	Able to develop, design and manage vocational education and learning programs in the field of electrical engineering following national and international quality standards of vocational education
		3.3	Able to design, implement, and recommend based on scientific studies of vocational education problems and electrical engineering expertise to stakeholders
		3.4	Able to carry out academic validation or study according to their area of expertise in solving problems in the relevant society or industry through the development of vocational knowledge and education in the field of electrical engineering
		3.5	Able to identify scientific fields that are the object of research and position them into a research map developed through an interdisciplinary or multidisciplinary approach

No PLO (Code)	PLO Description	No Sub-PLO	Sub-PLO Description
		3.6	Able to document, store, secure, and rediscover research data to ensure validity and prevent plagiarism
PLO4	Develop vocational education knowledge of electrical engineering in the competency of power or industrial automation based on information technology	4.1	Master in the concepts and application of vocational education science for the development, design, and management and innovation of quality learning in the field of electrical engineering
		4.2	Developing, designing, implementing, analyzing, testing, and make decisions through scientific research on vocational education and learning problems in electrical engineering, manifested in the form of scientific research results
PLO5	Develop knowledge of electrical engineering in the competency of power or industrial automation in vocational education based on information technology	5.1	Master in the theory and application of electrical engineering expertise for the development, design, and management and innovation of educational quality to meet the demands of vocational education workforce qualifications in the field of electrical engineering following the current development of technology and labor market demands
		5.2	Able to process big data as material for decision making on educational, learning, research, and technical issues related to electrical engineering expertise
PLO6	Publish research of vocational education in electrical engineering through national and international levels	6.1	Able to arrange ideas, results of thought, and scientific arguments responsibly and based on academic ethics, and communicate them through the media to the academic community and the wider community
		6.2	Able to publish academic work in accredited national scientific journals or reputable international journals
PLO7	Demonstrate critical and creative thinking skills, communication, adaptability, and leadership	7.1	Able to manage, develop and maintain a network of colleagues, colleagues within a wider research institution and community
		7.2	Able to adapt, work together, create, contribute, and innovate in applying science to social life and acting as a global citizen with a global vision
		7.3	Able to use at least one international language for oral and written communication

No PLO (Code)	PLO Description	No Sub-PLO	Sub-PLO Description
PLO8	Implement strategy, model, method, media, learning material, evaluation, and learning assessment in vocational education based on information technology	8.1	Able to develop, design, and apply vocational education and electrical engineering expertise to innovate instructional material and assessments based on computer and internet technology
		8.2	Able to use information technology in the context of scientific development and implementation in vocational education in the field of electrical engineering
PLO9	Apply electrical engineering theory in vocational teaching and learning in the competency of power or industrial automation based on information technology	9.1	Able to formulate supporting components for the needs of electricity and industrial automation as a consideration in the development, design, and application of instructional programs and instructional media in vocational education
		9.2	Able to manage computer programming as a processing aid and decision making for educational, learning, research, and technical problems related to electrical engineering expertise

REVIEW MATERIAL

1. Scientific foundation of education founded on ethics and moral, rational and scientific, as well as creative, systematic, and innovative thinking that is oriented toward student-centered learning, activities-based learning, and lifelong learning;
2. Scientific foundation of education that is oriented toward education for work and work-based learning according to the philosophy of vocational education;
3. Rational and scientific thinking with the mastery of mathematics and logics to make decisions on the problems of vocational education research;
4. The essence of vocational education founded on the master of learning theories, student characteristics, learning with global insights, education management, education resources, education funding, and vocational education quality assurance;
5. The scope of the electrical engineering expertise founded on the mastery of engineering mathematics, logics, numerical computation, computer programming, electrical components, sensors and transducers, microprocessors and microcontrollers, and SCADA for the application of vocational learning that is oriented toward e-education;
6. Creative and innovative thinking found on the knowledge on energy management, energy conversion, electrical power generator system, transmission and distribution system, electrical protection, telemetry, renewable energy technology, energy storing technology for electrical energy management based on green technology;

7. Creative and innovative thinking founded on the knowledge on big data, user behavior theory, mechanical technology, smart algorithm, database programming, visual programming, interface programming and ergonomics for the integrated automation system management that is oriented toward Industry 4.0 and future technology.

CURRICULUM & COURSE DISTRIBUTION PER SEMESTER

NO.	SUBJECT CODES	SUBJECTS	NUMBER OF CREDIT SYSTEMS			SEMESTER AND NUMBER OF CREDIT SYSTEM				TOTAL OF CREDIT SEMESTER	
			(UMBERS	THEORY	PRACTICE	1	2	3	4		
I. FOUNDATION SUBJECTS OF SCIENCE											
1	PPS 8201	Philosophy of Science	2	2		2				7	
2	PPS 8202	Statistics	2	2			2				
3	PPS 8304	Methodology of Educational Research	3	3		3					
Number of Credit			7	7		5	2				
II. EXPERTISE SUBJECTS [COMPULSORY]											
1	EKO 8201	Vocational Education	2	2		2				26	
2	EKO 8202	E-Instructional of Vocational Education	2	2		2					
3	EKO 8203	E-assessment of Vocational Education	2	2			2				
4	EKO 8304	Electrical Learning Project of Vocational Education and Training	3	2	1			3			
5	EKO 8205	Internet of Things	2	2		2					
6	EKO 8206	Optimization Techniques	2	2		2					
7	EKO 8207	Artificial Intelligence	2	2			2				
8	EKO 8208	Thesis Proposal	3	2	1		3				
9	EKO 8309	Academic Writing	2	2				2			
10	EKO 8616	Thesis	6		6				6		
Number of Credit			26	18	8	8	7	5	6		
III. SPECIALIZATION SUBJECTS [ELECTIVE]											
1. Electrical Power Engineering											
11	EKO 8210	Electrical Power System	2	2			2			7	
12	EKO 8211	Electrical Power System Automation	2	2			2				
13	EKO 8312	Renewable Energy	3	2	1			3			
2. Industrial Automation Engineering											
14	EKO 8213	Human Machine Interface	2	2			2				
15	EKO 8214	Machine Learning	2	2			2				
16	EKO 8315	Industrial robotics	3	2	1			3			
Number of Credit			6	4	2		4	2			
NUMBER OF CREDIT SYSTEM TO BE TAKEN			40	31	9	13	13	8	6	40	

COURSE DESCRIPTION

- 1. PPS 8201 PHILOSOPHY OF SCIENCE** **THEORY 2 CREDITS**

This course contains the basics of philosophy (ontology, epistemology, and axiology), assumptions and implications of science; truth of thinking (logic); behave (ethically), as well as seek for nature or authenticity (metaphysics); science & technology; application of a philosophical approach to vocational education.
- 2. PPS 8202 STATISTICS** **THEORY 2 CREDITS**

This course discusses various applied and popular statistical techniques for case studies with data obtained from vocational education in the electrical engineering field; case studies are discussed based on the statistical concepts and methodology; independent and assisted data analysis for each case study; and making written report on the application of statistics on vocational education in the electrical engineering field.
- 3. PPS 8304 METHODOLOGY OF EDUCATIONAL RESEARCH** **THEORY 3 CREDITS**

This course includes the concept of education research, the comparison between quantitative and qualitative research characteristics, quantitative research type, qualitative research type, mixed method research type, literature review and hypothesis, population and samples, research subjects and objects, research instrument development, and data analysis techniques.
- 4. EKO 8201 VOCATIONAL EDUCATION** **THEORY 2 CREDITS**

This course discusses the foundations of education for work, competency-based education, work-based learning, professionalism development, learning facility management, budget management, electrical work safety and health, and vocational education policies.
- 5. EKO 8202 E-INSTRUCTIONAL OF VOCATIONAL EDUCATION** **THEORY 2 CREDITS**

This course consists of the message design, augmented reality and virtual oriented software development models, internet-based learning, distance learning, and media as computer-based learning resource for vocational education.
- 6. EKO 8203 E-ASSESSMENT OF VOCATIONAL EDUCATION** **THEORY 2 CREDITS**

This course discusses the design and development of test and non-test instruments for measuring competency in theoretical learning, laboratories, and workshops; qualitative and quantitative descriptive analysis techniques for the validity and reliability of the instrument; classical and modern grain analysis techniques for dichotomous and politomous data; e-assessment (computer based test and computer adaptive test), and e-report.
- 7. EKO 8304 ELECTRICAL LEARNING PROJECT OF VOCATIONAL EDUCATION AND TRAINING** **THEORY 2 CREDITS; PRACTICE 1 CREDIT**

This course discusses needs analysis, curriculum development, learning media; infrastructure and facilities analysis, educational staff and personnel analysis, budgeting analysis, feasibility test, education and training implementation design, and marketing technique in vocational education in the electrical engineering field. The product of this course is an education and training design in the field of electrical engineering.

8. EKO 8205 INTERNET OF THINGS**THEORY 2 CREDITS**

This subject discusses the concept of the internet of things; explanation of the IoT architecture; application of IoT in various fields, especially in electricity, renewable energy, industrial machinery; and conceptual design of an IoT-based system in the field of vocational education for electricity and industrial automation.

9. EKO 8206 OPTIMIZATION TECHNIQUES**THEORY 2 CREDITS**

This course contains conceptual and design insights in an optimization problem in the field of electrical engineering for electricity and industrial automation and to solve it using the appropriate method or algorithm to get the best results. Solving linear and nonlinear optimization problems using several classical methods and solving complex optimizations using genetic algorithm methods.

10. EKO 8207 ARTIFICIAL INTELLIGENCE**THEORY 2 CREDITS**

This course discusses the concept of searching, matching and intelligent system design which includes expert systems, fuzzy logic, artificial neural networks, genetic algorithms and evolutionary computational models, system optimization applications in electrical engineering, and applications in vocational education in electrical engineering through intelligent visual system programming using the intelligence method.

11. EKO 8308 THESIS PROPOSAL**THEORY 2 CREDITS; PRACTICE 1 CREDIT**

This course discusses the principles of scientific or academic writing, the writing standards with the American Psychological Association (APA) format, trends in educational concepts and policies, strategies in developing Chapter I, II, and III, research instrument development, as well as academic presentation techniques and ethics. The product of this course is a thesis proposal and seminar of the thesis proposal.

12. EKO 8209 ACADEMIC WRITING**THEORY 2 CREDITS**

This course discusses strategies for writing scientific or academic papers in the form of journal articles with national and international standards, which include: types and forms of academic papers, stimulating ideas, truth and scientific methods, structure of scientific articles, styles, language for academic writing, ethics and code of ethics writing, literature review search techniques, how to upload articles to the Open Access Journal System (OJS), and strategies to be published in accredited national journals and international journals, strategies to prepare academic presentations at international forums, and strategies for conducting the presentations. The product of this course is a scientific paper published in a national accredited journal or a Scopus-indexed proceeding.

13. EKO 8210 ELECTRICAL POWER SYSTEM**THEORY 2 CREDITS**

This course discusses basic concepts of electric power systems, components of electrical power systems, electrical power system analysis, management of electrical energy on the aspects of generator and load, electric power protection systems, basic principles of electrical power management, electrical power management planning, saving electrical power on the aspect of generator, application of electrical power audits on the load according to the applicable standard procedures and requirements,

and calculation of efficiency of the electrical power use on the load, and the application in vocational education learning in the field of electrical engineering.

- 14. EKO 8211 ELECTRICAL POWER SYSTEM AUTOMATION** **THEORY 2 CREDITS**
This course discusses the identification of plant system, the modelling of plant system, automation system design, automation system based on SCADA and real time system. Further, this course also studies remote terminal unit (RTU), master terminal unit (MTU), integrated instrumentation system, SCADA pipeline, SCADA at transmission system, and power generator.
- 15. EKO 8212 RENEWABLE ENERGY**
THEORY 2 CREDITS; PRACTICE 1 CREDIT
This course discusses energy conversion, renewable energy involving power generator based on solar energy, wind, ocean wave, geothermal energy, nuclear, fossil fuel, micro-hydro, battery technology, and studies on the needs analysis and designs of various renewable energy, ranging from the generator system, transmission system, distribution system, to installation for consumers that are relevant with the generator type. The product of the course is the design of one of the renewable energy types, and its application in vocational learning in the field of electrical engineering.
- 16. EKO 8213 HUMAN MACHINE INTERFACE** **THEORY 2 CREDITS**
This course discusses the concept of human-machine interaction, principles in interface design, user profiles, interface design processes, visual, audio, motion, and bio-potential based natural interface techniques; use of electrooculography (EOG), electroencephalography (EEG), bio-impedance, and electromyographic (EMG) as interfaces on machines.
- 17. EKO 8214 MACHINE LEARNING** **THEORY 2 CREDITS**
This course consists of machine learning and introduction to statistical patterns with studies involving assisted learning (generative and discriminative learning, parametric and non-parametric learning, neural network, supporting vector machine); unmonitored learning (groups, limiting dimensions, kernel method), learning theories (sacrifice bias/variance, practical suggestions); strengthening and adaptive control learning, as well as learning applications for the latest machinery such as robotic control, data mining, autonomous navigation, bio-informatics, speech introduction, and text and web data processing.
- 18. EKO 8315 INDUSTRIAL ROBOTICS**
THEORY 2 CREDITS; PRACTICE 1 CREDIT
This course discusses the (conceptual) design on automation or robotic control system through direct field observation (industry) in the field of robotics or industrial automation. The product of this course is the design of one of the examples of industrial automation and its application in vocational learning in the field of electrical engineering.
- 19. EKO 8616 THESIS** **PRACTICE 6 CREDITS**
This course is the accumulation of attitudes, knowledge, and skills obtained from the courses taken during the period of study and manifested in the form of a report of scientific research using the appropriate research method.

LEARNING PROCESS

1. The implementation of the Master's program is done through classes and research.
2. There are 16 (sixteen) face-to-face classes or meetings per semester, not including the final examination.
3. Classes may be done by blended learning or the full e-learning model.
4. Each lecturer is required to hold 16 (sixteen) classes or meetings, not including the final examination.
5. Each lecturer is required to complete an online class attendance, and those who have not met the required number of classes or meetings must schedule a make-up class and/or its equivalent activity. Make-up class schedule must be included in the online class attendance.
6. Students are required to attend the classroom activities of each course in a semester at least 75% (seventy-five percent) of the total number of meetings. Absence due to illness or academic duties with a valid letter of explanation from relevant parties may be tolerated and counted as attendance.
7. Students who do not meet the 75% (seventy-five percent) minimum attendance may not be allowed to take the final examination and shall receive E as the final grade.
8. Final examinations are held at the same period according to the academic calendar.
9. Students are required to complete evaluation forms of the courses they take through the following link <https://emonev.lppmp.uny.ac.id/>

ASSESSMENT

1. Evaluation of the learning progress aims to identify various challenges in the learning process in order to plan a more planned, structured, and systemic learning process.
2. Evaluation results are delivered to students, academic advisors, and parents.
3. Learning progress evaluation is conducted in the first 3 (three) semesters.
4. By the third semester, Master's students must have passed the proposal seminar with a minimum GPA of 3.00 (three point zero).
5. If students are deemed unable to complete study, they shall be declared as resigning and provided with a Letter of Statement on the Confirmation of Studies.
6. Learning result assessment uses various approaches based on the competency that must be mastered by students.
7. The final grade of a course uses a scale of 0 (zero) to 100 (one hundred) with a passing grade of 56 (fifty-six).
8. Students who have not completed or submitted assignments on the course, will not receive any grade and instead receive a K on the transcript. This may change into a proper grade when the students have completed and submitted their assignments in a maximum period of one semester. If in one semester students fail to complete and submit their assignments, they will receive grades from the course lecturer accordingly.
9. The course grade is the cumulative result of the components of class participation, assignment or report, and examination scores which reflect students' competency mastery.
10. The assessment system for determining the final grade is based on the Benchmark Reference Assessment (PAP).
11. The grade accepted for a repeated course is the grade on the latest academic transcript. Repeated courses are those with B- as the highest grade.

12. The calculation of the semester grade point average (GPA) is based on the total letter score grades converted into numeric scores multiplied by the number of credits and divided by the total credits taken by the student in a semester.



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