MODULE HANDBOOK

2019

Electrical Engineering Education
Faculty of Engineering
Yogyakarta State University

1st SEMESTER

UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING EDUCATION
Jalan Colombo Nomor 1 Yogyakarta 55281
Telephone (0274) 586168 ext 276,289,292 , (0274) 586734 , Fax (0274) 586734
Web:ft.uny.ac.id, E-mail: elektro@uny.ac.id

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Islamic Studies
Module level,if applicable:	Undergraduate
Code:	MKU6301
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Syukri Fathudin Achmad W. S.Ag., M.Pd
Lecturer(s):	Dr. Amir Syamsudin, S.Ag., M.Ag.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Lecturing
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
Course Oucomes:	CO1 Be faithful to God Almighty and be able to show a religious attitude. CO2 Uphold the value of humanity in carrying out duties based on religion, morals, and ethics. CO3 Showing someone who can be emulated and committed to develop the character of students based on Islamic values. CO4 Mastering theoretical concepts of pedagogy and concepts of knowledge in the field of Islamic Religious Education studies. CO5 Mastering educational theory, Islamic education field policy, management and educational leadership based on Islamic values.
ELO and CO mapping	(see table below)
Courses Description:	This Islamic Studies courses are mandatory for graduating for every Muslim student in all study programs in Higher Education. This course is designed with the intention to strengthen student faith and to fear Allah SWT. and have noble character (character) and broaden scientific insights and diverse lives, so that Muslim students are formed who are

	ELO1	ELO2	ELO3
CO1	✓		
CO2		✓	
CO3		✓	
CO4			✓
CO5			✓

<table>
<tr><td></td><td>virtuous, think philosophically, be rational and dynamic, and have a broad view, by paying attention to the demands to establish harmony among humans both within one religious community and with other religious communities.</td></tr>
<tr><td>Assessments</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
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<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
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<tr><td>Midterm</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>

Marzuki. 2012. Pembinaan Karakter Mahasiswa melalui Pendidikan Agama Islam di Perguruan Tinggi Umum. Yogyakarta: Penerbit Ombak.
Marzuki. 2009. Prinsip dasar Akhlak mulia: Pengantar studi kondep-konsep dasaretika dalam Islam. Yogyakarta: Debut Wahana Press-FISE UNY.
Sudrajat, Ajat et all. 2008. Din Al-Islam: Pendidikan Agama Islam di Perguruan Tinggi Umum. Yogyakarta: UNY Press.
Ali, Mohammad Daud. 2000. Pendidikan Agama Islam. Jakarta: Rajawali Press.
Azra, Azyumardi. 1999. Pendidikan Islam: Tradisi dan

</td></tr>
</table>

	Modernisasi Menuju Milenium Baru. Jakarta: Logos. 6. Al-Qur'an Al-Karim 7. Al-Abrasyi, M. Athiyah. 1987. Dasar-dasar Pokok Pendidikan Islam. Terj. H. Bustami A. Gani dan Djohar Bahry L.I.S. Jakarta: Bulan Bintang. Cet. V 8. Rahman, Fazlur. 1984. Islam. Bandung: Pustaka. 9. Nasution, Harun. 1979. Islam Ditinjau dari Berbagai Aspeknya. Jilid I & II. Jakarta: UI Press. 10. Musa, Muhammad Yusuf. 1988. Islam Suatu Kajian Komprehensif. Terj. A. Malik Madany dan Hamim Ilyas. Jakarta: Rajawali Press.
Date of revision	10 August 2019

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Catholic Studies
Module level,if applicable:	Undergraduate
Code:	MKU6302
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Petrus Sarjiman, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Lecturing.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

<table>
<tr><td>Credit points:</td><td>3</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO3 Capable to perform professional works in his/her field of expertise both individual and team works</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Understand the origin, nature, and purpose of humans so they can build a more dignified life.
CO2 Students understand the meaning of religious life and build dialogue and cooperation with other religious communities in responding to actual problems today.
CO3 Students understand the life, work, passion, death and resurrection of Jesus as written in the Bible and preached by the Church so that they can live the life of Jesus in everyday life.
CO4 Students understand the mission of the Church's mission and are actively involved in taking part in the mission of the Church in the midst of the community.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th></tr>
<tr><th>CO1</th><td>✓</td><td></td><td></td></tr>
<tr><th>CO2</th><td></td><td>✓</td><td></td></tr>
<tr><th>CO3</th><td></td><td>✓</td><td></td></tr>
<tr><th>CO4</th><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course aims to make students able to understand the origin and purpose of their lives as an image of God who believes in Jesus Christ and is united in the Catholic Church who is called to continue the work of saving God in the community.</td></tr>
</table>

<table>
<tr><td>Assessments</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
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<tr><td>Literature:</td><td>
1. Lembaga Biblika Indonesia. 2001. Alkitab Deuterokanonika. Ende
2. Paus Yohanes Paulus II. 2007. Katekismus Gereja Katolik (KGK). Ende: Penerbit Nusa Indah
3. Paus Benediktus XVI. 2009. Kompendium Katekimus Gereja Katolik. Yogyakarta: Kanisius
4. Tim Komkep KWI. 2012. YpuCat (Youth Cathecism). Yogyakarta: Kanisius.
5. DokPen KWI. Dokumen Ajaran Sosial Gereja. Yogyakarta: Kanisius
6. Konferensi Waligereja Indonesia (KWI). 1997. Imam Katolik: Buku Informasi dan Referensi. Yogyakarta: Kanisius.
7. Mgr. Ign. Suharyo. 2009. Catholic Way. Yogyakarta: Kanisius.
</td></tr>
</table>

	8. Ign. Ismartono, SJ. 1993. Pendidikan Agama katolik. Jakarta: Obor. 9. Niko Syukur Dister, OFM. 1987. Kristologi Sebuah Sketsa. Yogyakarta: Kanisiua. 10. Martasudjita. 2003. Sakramen-sakramen Gereja, Tinjauan Teologis, Liturgis dan Pastoral. Yogyakarta: Kanisius.
Date of revision	8 August 2019

Module name:	Christian Studies
Module level,if applicable:	Undergraduate
Code:	MKU6303
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Dra. Purwandari, M.Si.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Lecturing.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
Course Outcomes	CO1 Be faithful to God Almighty and be able to show a religious attitude. CO2 Uphold the value of humanity in carrying out duties based on religion, morals, and ethics. CO3 Showing someone who can be emulated and committed to develop the character of students based on Christian values. CO4 Mastering theoretical concepts of pedagogy and concepts of knowledge in the field of Christian studies CO5 Mastering educational theory, Christian education field policy, management and educational leadership based on Christian values.
ELO and CO mapping	see table below
Courses Description:	This course discusses human and human nature, human and responsibility, human and integrity of creation, religious understanding, Christian life in the work of saving God, the nature of the church, the church in Indonesia, endurance of faith, love and hope, the relationship of faith and science, people and development, the responsibility of students in

	ELO1	ELO2	ELO3
CO1	✓		
CO2		✓	
CO3		✓	
CO4			✓
CO5			✓

<table>
<tr><td></td><td>social life, nation and state, the nature of togetherness in diversity, the responsibility of students in social life, the nature of togetherness in diversity.</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

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<tr><td>Literature:</td><td>1. Alkitab. LAI. Jakarta.
2. Abdul Kholik. 2007. Dialog Kristen-Islam: Menuju Hidup Bersama. Banjarmasin: Forlog.
3. A.Yewangoe. 2002. Iman, Agama dan Masyarakat, dalam Negara Pancasila. Jakarta:Gunung Mulia.
4. Banawiratma, Kristologi dan Allah Tritunggal. 1986. Yogyakarta: Kanisius.
5. Brotosudarmo. 2008. Pendidikan Agama Kristen untuk Perguruan Tinggi. Yogyakarta: Andi.
6. Brotosudarmo. 2007. Etika Kristen untuk Perguruan Tinggi. Yogyakarta: Andi.</td></tr>
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	7. Gerrit Singgih. 2004. Mengantisipasi Masa Depan: Berteologi dalam Konteks Awal Milinium III. Jakarta: BPK Gunung Mulia. 8. Groenen. 1984. Pengantar Perjanjian Lama. Yogyakarta: Kanisius.
Date of revision	8 August 2019

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Module name:	Hinduism Studies
Module level,if applicable:	Undergraduate
Code:	MKU6305
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1^{st}
Module coordinator:	Dr. Putu Sudira, M.P.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Lecturing.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
Course Outcomes:	CO1 Faith Hyang Widhi through sraddha and devotional service and through the basic principles in Brahma Vidya, through the efforts and means of worshiping him based on yajna every day and certain days. Students Understand Hindu Human Concepts, Law, Ethics, Tri Harmony of Religious Life, Science and Art in a Hindu perspective, Concepts of Hindu Society based on Hindu religious literature, Politics in Hindu Perspective. CO2 Uphold the value of humanity in carrying out duties based on religion, morals, and ethics. CO3 Showing someone who can be emulated and committed to develop the character of students based on Hinduism values. CO4 Mastering theoretical concepts of pedagogy and concepts of knowledge in the field of Hinduism studies. CO5 Mastering educational theory, Hinduism education field policy, management and educational leadership based on Hinduism values.
ELO and CO mapping	(see table below)

	ELO1	ELO2	ELO3
CO1	✓		
CO2		✓	
CO3		✓	
CO4			✓
CO5			✓

<table>
<tr><td>Courses Description:</td><td>This course discusses human and human nature, human and responsibility, human and integrity of creation, religious understanding, Christian life in the work of saving God, the nature of the church, the church in Indonesia, endurance of faith, love and hope, the relationship of faith and science, people and development, the responsibility of students in social life, nation and state, the nature of togetherness in diversity, the responsibility of students in social life, the nature of togetherness in diversity.</td></tr>
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<tr><td>Literature:</td><td>
1. I Gusti Made Ngurah, Drs, dkk. 2012. Pendidikan Agama Hindu Untuk Perguruan Tinggi. Surabaya: Paramitha.
2. Gelgel Prof. DR. I Putu, S.H, M.Hum. Suma Imade, S.H, M.Pd. Dkk. Hukum Hindu. Jakarta: Direktorat Jendral Bimbingan Masyarakat Hindu Departemen Agama RI.
3. Pudja G, SH, MA. 2012. Bhagavad. Surabaya: Paramita.
</td></tr>
</table>

	4. Pudja G, MA, Sudharta Tjokorda Rai, MA. 2012. Manawa Dharma Sastra (Manu Dharmacastra) Atau Manu Smrti Compedium Hukum Hindu. Surabaya:Paramita. 5. Titib, DR. I Made. 2010. Teologi dan Simbul-simbul dalam Agama Hindu. Surabaya: Paramita. 6. Titib I Made, DR. 2011. Weda Sabda Suci Pedoman Praktis Kehidupan. Surabaya: Paramita.
Date of revision	8 August 2019

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Confucianism Studies
Module level,if applicable:	Undergraduate
Code:	MKU6306
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Dr. Pamuji Sukoco.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Lecturing.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

<table>
<tr><td>Credit points:</td><td>3</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO3 Capable to perform professional works in his/her field of expertise both individual and team works</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Understand the origin, nature, and purpose of humans so they can build a more dignified life.
CO2 Students will be able to understand the basic concepts of Confucianism religious education.
CO3 Students will be able to understand religions in the world and in Indonesia.
CO4 Students will be able to understand the history of the Confucianism history.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This material covers the urgency of religion in daily life with the right attitude, understanding of the sources of Confucianism, knowing the history of Confucianism, being able to explain the sacred paths carried by great teachings (Thai Rights), being able to explain about "examining the nature of each case", knowing the role Confucius in the development of science and technology.</td></tr>
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2. Keputusan Bersama Menteri Agama, Jaksa Agung dan Menteri Dalam Negeri Republik Indonesia. 2011. Jakarta: Mentri Dalam Negeri
3. ____. 1984. Tata Agama dan Tata Laksana Upacara Agama Konghucu, Penerbit MATAKIN
4. Negoro, T.K Beng Setio. 2005. Rahasia Kehidupan Jilid 1. Bandung: Karya Bengras.
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Science of Education
Module level,if applicable:	Undergraduate
Code:	MDK6201
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Arif Rohman, M.Si
Lecturer(s):	Estu miyarso, M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecture, Discussion, Practicum, Question and Answer
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks

<table>
<tr><td>Credit points:</td><td>2</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO3 Capable to perform professional works in his/her field of expertise both individual and team works</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devotion to God Almighty, devout worship and noble deeds.
CO2 Students agree to be active, responsible, and have the motivation to develop themselves,
CO3 Cooperation, caring, humble, tolerance, responsibility, honesty and integrity, patience, respect, confident, committed, rational, critical-creative, and humanist-religious.</td></tr>
<tr><td>ELO and CO mapping</td><td><table><tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th></tr><tr><td>CO1</td><td>✓</td><td></td><td></td></tr><tr><td>CO2</td><td></td><td>✓</td><td></td></tr><tr><td>CO3</td><td>✓</td><td>✓</td><td>✓</td></tr></table></td></tr>
<tr><td>Courses Description:</td><td>This course discusses the basic principles of education and the basic concepts of education and its application in educational praxis which includes: the phenomenon of education, the historical point of view of education, the nature of education and education, education as a system, and issues (issues of education in contexts) educational renewal (innovation).</td></tr>
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The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO3</td><td>Assignment</td><td>Completion of Tasks and Papers</td><td>20%</td></tr>
<tr><td>Practicum report</td><td>Small Discussion / Seminar</td><td>20%</td></tr>
<tr><td>Final Project Performance</td><td>Mid Semester Exam</td><td>20%</td></tr>
<tr><td>Final Project Report</td><td>Final exams</td><td>25%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>15%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>dialogically good individually and groups by prioritizing the use of learning techniques which educates participatively and collaboratively.</td></tr>
</table>

Literature:	1. Arif Rohman. 2009. Memahami Pendidikan dan Ilmu Pendidikan. Yogyakarta: Laksbang Mediatama. 2. Depdikbud . 1985. Pendidikan di Indonesia dari Jaman ke Jaman. Jakarta : Balai Pustaka 3. Dwi Siswoyo dkk. 2007. Ilmu Pendidikan. Yogyakarta: UNY Press. 4. Dirto Hadisusanto, Suryati Sidharto, & Dwi siswoyo. 1995. Pengantar Ilmu Pendidikan. Yogyakarta : FIP IKIP YOGYAKARTA. 5. Driyarkara . 1980. Driyarkara tentang Pendidikan. Yogyakarta : Penerbit Kanisius. 6. John I. Goodlad,. Educational Renewal. San francisco : Jossey-Bass Publishers 7. John Dewey. 1950. Democracy and Education. New York : The Macmillan Company. 8. Imam Barnadib & Sutari Imam Barnadib. 1996. Beberapa Aspek Substansial Ilmu Pendidikan. Yogyakarta : Penerbit Andi. 9. ------------------ .2002. Filsafat Pendidikan. Yogyakarta : Penerbit Adicita Karya Nusa 10. Noeng Muhadjir. 2000. Ilmu Pendidikan dan Perubahan Sosial. Yogyakarta : Rake Sarasin. 11. Sumitro, dkk. 2006. Pengantar Ilmu Pendidikan. Yogyakarta : UNY Press. 12. Tilaar, H.A.R. 2002. Pendidikan dan Perubahan Sosial : Pengantar Pedagogik Transformatif untuk Indonesia . Jakarta : Penerbit Grasindo 13. ------------------ 2005. Manifesto Pendidikan Nasional. Jakarta : Penerbit Buku Kompas. 14. Umar Tirtahardja & La Sulo. 1997. Pengantar Pendidikan. Jakarta : Ditjen Dikti, Depdikbud. 15. UU No. 20 Tahun 2003. Tentang Sistem Pendidikan Nasional. 16. Wardiman Djojonegoro .1996. Lima Puluh Tahun Perkembangan Pendidikan Indonesia. Jakarta : Depdikbud.
Date of revision	30 August 2019

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Mathematics
Module level, if applicable:	Undergraduate
Code:	KTF6205
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1st
Module coordinator:	Drs. Nur Kholis, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams ELO4 Master in basic sciences and principles of electric ELO7 Analyze and solve technical problems related to electrical engineering by applying the principles of Mathematics.
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Knowledge of the principles of Mathematics and Physics related to the principles of electricity. CO3.1 Understanding notations or symbols in mathematics, numbers, basic algebraic rules, logarithms, trigonometry, number systems. CO3.2 Understand the concept of complex numbers & numbers systems. CO3.3 Understand the concepts of matrices & systems of linear equations. CO3.4 Understand the differential concept for functions with 1 independent variable CO3.5 Understand integral concepts for functions with 1 independent variable. CO4 Analyze and solve technical problems related to electrical engineering by applying the principles of Mathematics. CO4.1 Apply notations or symbols in mathematics, numbers, basic algebraic rules, logarithms, trigonometry, number systems in understanding the next concept. CO4.2 Solve problems that require complex numbers & numbers systems. CO4.3 Solve problems that require matrices & systems of linear equations. CO4.4 Solve problems that require a differential for functions with 1 independent variable. CO4.5 Solve problems that require integrals for functions with 1 independent variable:

<table>
<tr><td>ELO and CO mapping</td><td>

	ELO1	ELO3	ELO4	ELO7
CO1	✓			
CO2		✓		
CO3				✓
CO4			✓	✓

</td></tr>
<tr><td>Courses Description:</td><td>This course gives cognitive experience to students in learning mathematics. Students are given cognitive experience through axiomatic, deductive and logical and systematic reasoning to build a model or formula. The reasoning material in mathematics is as follows: number systems, complex numbers, matrices, differentials, and integrals (indeterminate and certain) for functions with one free change.

Students after attending this lecture are expected to be able to apply these concepts in learning engineering concepts in courses in electrical engineering study programs.</td></tr>
</table>

<table>
<tr>
<td>Assessments</td>
<td>
The assessment was conducted to measure all learning outcomes, namely attainment learning achievements (CO1), general skills (CO2), knowledge (CO3), and special skills (CO4).
1. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
2. Final scores include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td>CO2</td><td>Atitude (attendance, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="4">CO3, CO4</td><td>Individual Task</td><td>Written Test</td><td>15%</td></tr>
<tr><td>Group Task</td><td>Written test</td><td>15%</td></tr>
<tr><td>Midterm</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="3"></td><td>Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>

Ayres, F,Jr. (1981) , Calculus 2/ed, SI, SNP, Singapore.
Stroud, K.A. Matematika Teknik
Mizrahi, Abe & Sullivan, Michael. Calculus and Analytic Geometry

</td>
</tr>
</table>

	4. Spiegel, Murray R. *Matrices*
Date of revision	29 August 2018

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Physics
Module level, if applicable:	Undergraduate
Code:	KTF6206
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1^{st}
Module coordinator:	Muhfizaturrahmah, S.T., M.Eng
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

<table>
<tr><td>Credit points:</td><td>2</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics.
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Devotion to God Almighty and able to show religious attitude.
CO2 Demonstrates a responsible and independent attitude towards the assigned work.
CO3 Have the ability to communicate effectively, think critically, and make decisions quickly
CO4 Mastering the physical concept and applying it to the engineering field.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>With this course, competencies are expected to be mastered in relation to: scale, units and vectors; the concepts of speed, acceleration, displacement in straight and circular motion; Newton's concepts and laws that underlie dynamics; the concepts of energy, effort and power; and concepts of applied physics specifically in the field of engineering according to each study program.</td></tr>
</table>

<table>
<tr><td>Assessments</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1–CO4</td><td>Assignment</td><td>Written</td><td>40%</td></tr>
<tr><td>Midterm</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Alvin, H., 1998, 3000 Solved Problem in Phisic, New York: Mc Graw-Hill Book Company.
2. Beiser, A., 1985, Applied Physic, New York: Mc Graw-Hill, Inc.
3. Halliday, David, dan Robert Resnick, 1987, (Penterjemah oleh Pantur Silaban dan Erwin Sucipto). Fisika Jilid I Edisi Ketika, Jakarta: Penerbit Erlangga.
4. Sears, FW, Sudaryono, PJ, 1984, (Penyadur) Mekanika, Panas dan Bunyi. Jakarta : Penerbit Binacipta.
</td></tr>
<tr><td>Date of revision</td><td>30 August 2018</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING EDUCATION
Jalan Colombo Nomor 1 Yogyakarta 55281
Telephone (0274) 586168 ext 276,289,292 , (0274) 586734 , Fax (0274) 586734
Web:ft.uny.ac.id, E-mail: elektro@uny.ac.id

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Fundamentals of Electrical
Module level, if applicable:	Undergraduate
Code:	EKO6201
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1st
Module coordinator:	Dr. Edy Supriyadi, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Student Center Learning
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO3 Can be handled according to the expertise of each team. ELO4 Master in basic sciences and principles of electric. ELO7 Capable to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology.
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Knowledge of law and the basic theory of electricity. CO3.1 Having knowledge about the basic concepts and laws of electricity. CO3.2 Having knowledge about the elements of electrical circuits. CO3.3 Having knowledge of the methods and theorems of the analysis of unidirectional electric circuit. CO3.4 Having knowledge of the phasor concept. CO3.5 Having knowledge about single-phase alternating electrical circuits. CO3.6 Having knowledge about measuring instruments and how to read them. CO4 Students have comprehensive knowledge about the phasor concept and its application in a series of alternating one-phase sources, selecting a measuring instrument and analyzing the results of measurements of electrical quantities. CO4.1 Able to analyze the basic concepts and laws of electricity. CO4.2 Being able to analyze the elements of the electrical circuit. CO4.3 Able to apply the methods and theorems of electrical circuit analysis on direct source electric circuits. CO4.4 Able to apply the concept of phasors in a single-phase alternating source electric circuit. CO4.5 Able to apply the electrical circuit analysis in a single-phase alternating electric circuit. CO4.6 Able to measure electrical quantities using a measuring instrument and analyze the measurement

<table>
<tr><td></td><td>results.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Electrical Basic Course will develop student competence on the concepts and basic laws of electricity, electrical circuit elements, methods and theorems of unidirectional source circuit analysis, phasor concepts and their application in a series of alternating single-phase sources, selecting a measuring instrument and analyzing the results of measuring electric quantities . Lectures are carried out with a variety of approaches that fit the context of the material and the potential of students, including: contextual, cooperative, and problem based learning that leads to student center learning. Continuous assessment is carried out on a competency basis and harmonized with lecture activities.</td></tr>
</table>

<table>
<tr><td>Assessments</td><td>
1. Assessment is carried out to measure all learning achievements, namely attainment learning achievements (CO1) and (CO2), knowledge (CO3), and skills (CO4).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades include the results of the assessment of attitudes, knowledge, and skills obtained from individual assignments, group assignments, presentations, Mid Semester Exams, and Final Semester Exams with the following guidelines.
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td>CO2</td><td>Self-Assessment</td><td>Observation</td><td>5%</td></tr>
<tr><td rowspan="3">CO2, CO3</td><td>Task</td><td>PBL Rubric</td><td>35%</td></tr>
<tr><td>Midterm</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Alexander Sadiku. 2007. Fundamentals of Electric Circuits. New York: McGraw-Hill International Edition.
2. Ridsdale. (1984) Elecetrical Circuits for Engineering. New York: McGrawHill.
3. Sudjana Sapi’ie. Alat Ukur dan Pengukuran Listrik. Jakarta: Pradnya Paramita.
4. Mohamad Ramdani. 2008. Rangkaian Listrik. Jakarta: Erlangga.
5. Mussama, Imam Mustholiq. Pegangan Kuliah Dasar Listrik, Listrik DC dan AC. Yogyakarta: FT UNY (tidak
</td></tr>
</table>

	dipublikasikan). 6. Mussama, Imam Mustholiq. Pengukuran Listrik, Jilid 1 dan Jilid 2. Yogyakarta: FT UNY (tidak dipublikasikan). 7 Budiono Mismail. 1995. Rangkaian Listrik, Jilid Pertama. Bandung: ITB
Date of revision	29 Agustus 2018

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electronics
Module level, if applicable:	Undergraduate
Code:	EKO6202
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1^{st}
Module coordinator:	Sardjiman Djojo Pernoto, M.Pd
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO3 Can be handled according to the expertise of each team. ELO4 Master in basic sciences and principles of electric. ELO5 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Students can develop (plan, make analog electronic circuits and analyze. CO3.1 Understand the basics and characteristics of analog electronics, and their applications. CO4 Able to present the results of series analysis. CO4.1 Plan, make analog electronic circuits and analyze. CO4.2 Able to present the results of series analysis.
ELO and CO mapping	(see table below)
Courses Description:	This course discusses and practices the basics of analog electronics, the characteristics of electronic components, rectifier circuits, transistor circuits as switches and amplifiers, operational amplifiers and wave generator circuits.

	ELO1	**ELO3**	**ELO4**	**ELO6**
CO1	✓			
CO2		✓		
CO3			✓	✓
CO4			✓	✓

Assessments	1. Assessment is carried out to measure all learning achievements, namely attainment learning achievements (CO1), general skills (CO2), knowledge (CO3), and special skills (CO4). 2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures. 3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines. The final mark will be weight as follow:
Forms of media:	Board, LCD Projector, Laptop/Computer

No	CO	Assessment Object	Assessment Technique	Weight
1	CO2	Presentation	Observation	10%
	CO3, CO4	Individual Task	a. skill set results b. Written	10%
		Group Task		10%
		Quiz		20%
		Midterm		20%
		Final Exam		30%
			Total	100%

Literature:	1. Robert Boylestad Louis Nashelsky, Electronic Devies and Circuit Theory 7 Edition (1999) Prenties Hall, Inc. 2. Hayt Neudeck, Electronic Circuit Analysis n Desaign (1978) Library of Congress Catalog Printied in USA 3. Herman Dwi Suryono, Elektronika: Teori dan Penerapan (1996) Fakultas Pendidikan Teknologi Kejuruan, Institus Keguruan dan Ilmu Pendidikan Yogyakart 4. K.F. Ibrahim, Prinsip Dasar Elektronika (1986) PT. MULTI MEDIA Jakarta
Date of revision	29 August 2018

Module name:	Digital Engineering Laboratory Work
Module level, if applicable:	Undergraduate
Code:	EKO6303
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1st
Module coordinator:	Faranita Surwi, S.T., M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	250 minutes lectures and 300 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 227 hours per semester which consists of 250 minutes lectures, 300 minutes structured activities, and 300 minutes self-study per week for 16 weeks.

<table>
<tr><td>Credit points:</td><td>3</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics.
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO4 Master in basic sciences and principles of electric
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Devotion to God Almighty and able to show religious attitude
CO2 Demonstrates a responsible and independent attitude towards the assigned work
CO3 Explain the concept of elementary numbers
CO3.1 Understand the basic principles, characteristics, analysis of digital circuits and their applications.
CO4 conversion of decimal, binary, octal, and hexadecimal numbers.
CO4.1 Arranging a digital circuit and can solve obstacles that occur.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course discusses and practices basic number concept materials, basic logic gates and expansion gates, boolean algebra, flip-flop circuits, counters, registers, adder-subtractors, ADC-DAC, and decoder-encoders.</td></tr>
</table>

<table>
<tr>
<td>Assessments</td>
<td>
1. Assessment is carried out to measure all learning achievements, namely attainment learning achievements (CPMK 1), general skills (CPMK 2), knowledge (CPMK 3), and special skills (CPMK 4 and CPMK 5).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="7">1</td><td>CO2</td><td>Presentation</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="6">CO3, CO4</td><td>Individual Task</td><td rowspan="6">a. Skill set results
b. Written</td><td>10%</td></tr>
<tr><td>Group Task</td><td>10%</td></tr>
<tr><td>Quiz</td><td>20%</td></tr>
<tr><td>Midterm</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>30%</td></tr>
<tr></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
</table>

Literature:	1. Ronald J. Tocci, Digital Systems Principles and Applications, Prentice-Hall 2. Herlambang, Ariadie Chandra, Lab Sheet Praktik Teknik Digital
Date of revision	30 August 2018

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Computer Programming Laboratory Work
Module level, if applicable:	Undergraduate
Code:	EKO6204
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1st
Module coordinator:	Drs. Mutaqin, M.Pd.,M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Students have the ability to identify problems, analyze needs, design, apply and test simple computer programming. CO4 Students master the basics of programming, can use C ++ in solving problems, and create projects based on C ++ programming.
ELO and CO mapping	(see table below)
Courses Description:	This course will discuss, study, and practice algorithms and computer programming. The programming language used is an intermediate programming language (C ++ programming language). The material that will be given in this course includes: programming, basic programming, being able to use

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓	✓	✓
CO4			✓	✓	✓

<table>
<tr><td></td><td>C ++ in solving problems, and making projects based on C ++ programming. Lectures are conducted using the student center. Learning strategies, theory delivery, teaching, assignments, and presentations. The evaluation system uses assignments and tests.</td></tr>
<tr><td>Assessments</td><td>
1. The assessment is carried out to measure all learning achievements, namely attainment learning achievements (CPMK 1 and CPMK 2), knowledge and skills (CPMK 3 and CPMK 4).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td>CO2</td><td>Presentation</td><td>Obseervation</td><td>10%</td></tr>
<tr><td rowspan="3">CO3
CO4
CO5</td><td>Individual Task</td><td rowspan="3">a. Skill set results
b. Written</td><td>10%</td></tr>
<tr><td>Group Task</td><td>10%</td></tr>
<tr><td>Quiz</td><td>20%</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td></td><td></td><td>Midterm</td><td rowspan="2"></td><td>20%</td></tr>
<tr><td></td><td></td><td>Final Exam</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Bambang Hariyanto,Ir.(1997). Sistem Operasi, Bandung : Informatika
2. Yogiyanto. (1995) Turbo C++l V.5. Yogyakarta: Andi Offset
3. Abdul Kadir, (1999). Bahasa C++. Yogyakarta: Andi Offset
4. Mutaqin (2007). Algoritma dan Pemrograman. Yogyakarta: FT UNY</td></tr>
<tr><td>Date of revision</td><td>30 August 2018</td></tr>
</table>

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Engineering Drawing Laboratory Work
Module level, if applicable:	Undergraduate
Code:	EKO6205
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	1st
Module coordinator:	Dr. phil Nurhening Yuniarti, S.Pd.,M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams. ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Demonstrates responsibility for work in their area of expertise independently. CO4 Mastery of drawing with pictorial techniques. CO4.1 Understanding the concepts and functions of technical drawings. CO4.2 Mastery of drawing with pictorial techniques. CO4.3 Mastery of symbols used in the field of electrical engineering. CO5 Mastery of symbols is used in the field of electrical engineering. CO5.1 Mastery of the switch image. CO5.2 Mastery of drawing lighting installations. CO5.3 Mastery of drawing power installations CO5.4 Mastery draws control circuits CO5.5 Mastery of basic commands of Autocad software. CO6 Facilitating, evaluating, implementing learning and learning outcomes in a professional manner, as well as community partnerships within the framework of vocational education in carrying out duties as a teaching profession CO6.1 Mastery of further commands of Autocad software CO6.2 Mastery of drawing PCB designs with software

<table>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Vocational Learning Strategy courses are programmed for all undergraduate study program students at FT UNY. The implementation of the Vocational Learning Strategy course is intended to provide learning experiences to students as prospective teachers / instructors of vocational / vocational education and training in order to be able to develop teaching strategies for creative, structured, measurable, and reasonable education according to vocational education and training needs. This course discusses the goals and objectives of vocational learning, vocational pedagogy and andragogy, learning theory, work-based learning, competency-based learning, student-centered contextual learning, cooperative learning, learning methods and models, learning components, theoretical learning tools, devices practical learning, learning tools in the industry, and educational process standards. In the learning process students are able to learn independently by using various learning and multimedia resources through the internet network.</td></tr>
<tr><td>Assessments</td><td>1. Assessment is carried out to measure all learning achievements, namely attainment of attitudes, general skills, knowledge, and skills

2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.</td></tr>
</table>

3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1–CO12	Assignment	Practicum report	40%
		Midterm	Practicum	20%
		Final Exam	Practicum	30%
		Attendance	Documentation	10%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Zamtinah. Diktat Gamb ar Teknik. FPTK IKIP Yogyakarta 2. http://elektro-uny.net/moodle dengan password masuk 3. _______. (2002). Persyaratan Umum Instalasi Listrik 2000. Badan Standarisasi Nasional. 4. Chandra, Handi. (2003). Dasar-dasar AutoCad 2000. PT. Elex Media Komputindo. 5. Scrhriever, Errol G. (1984). Electrical Drafting. Prentince-Hall, Inc.
Date of revision	29 August 2018

UNIVERSITAS NEGERI YOGYAKARTA
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Module name:	Mechanical Technology Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6206
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Toto Sukisno, S.Pd., M.Pd.
Lecturer(s):	1. Drs. Sunomo, M.T. 2. Drs. Mutaqin, M.Pd.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, Lecturing, Practice
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120

	minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams. ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1 Devoted to God Almighty and able to show a religious attitude and rusty with gratitude for the gifts that have been owned. CO2 Students actively participate, take responsibility, and have the motivation to develop themselves. CO3 Students are able to work in a professional manner by paying attention to and following aspects of work health, safety and security. CO3.1 Knowing about bench work theory such as; file, saw, cut and bend. CO4 Having the ability to communicate effectively, think critically and make the right decisions. CO4.1 Able to carry out work benches such as: file, sawing, cutting, and bending.
ELO and CO mapping	(see mapping table below)

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3					✓

	CO4 | | | ✓ | ✓ |
Courses Description:	Mechanical Technology Practice Lectures will equip capable and skilled students to use bench work equipment such as: file, sawing, cutting, and bending the plate carefully and considering K3 asphalt. Students are also able to apply knowledge and skills from exercises to production.
Assessments	1. Assessment is carried out to measure all learning achievements, namely attainment learning achievements (CO1), general skills (CO2), knowledge (CO3), and special skills (CO4 and CO5). 2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures. 3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines. The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO2–CO6	Presentation	Observation	10%
		Individual Task	Occuration result progam	10%
		Group Task	written test	10%
		Quiz	written test	20%
		Mid	written test	20%

	<table><tr><td></td><td></td><td>Final Exam</td><td>written test</td><td>30%</td></tr><tr><td colspan="4">Total</td><td>100%</td></tr></table>
Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Gerling, Henrich, 1974, All About Machine Tool, Willey Eastern 2. De Meyere, 1975, Work Preparation Planing, MIDC Indonesia
Date of revision	10 August 2018

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	English
Module level,if applicable:	Undergraduate
Code:	MKU6211
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	1st
Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T
Lecturer(s):	1. Muhfizaturrahmah, S.T., M.Eng
Language:	English
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, Lecturing, Practice
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO8 Capable to apply research and scientific writing methods ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course Outcomes	CO1 Devoted to God who is almighty and capable of showing religious attitude and character, CO2 Students actively participate, take responsibility, and have the motivation to develop themselves, CO3 Have conceptual knowledge about present and past tense, CO4 Mastering conceptual knowledge about progressive and perfect, CO5 Knowing conceptual knowledge about passive voice, CO6 Mastering conceptual knowledge about futures tense, CO7 Mastering procedural knowledge about spread comprehension, CO8 Knowing procedural knowledge about the objective clause, CO9 Know procedural knowledge about non-clouses, CO10 Know the procedural knowledge about the fund and infinitives, CO11 Knowing procedural knowledge about targeted and direct speeches, CO12 Show willingness to accept responsibility for the process and results of learning tasks,

<table>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO8</th><th>ELO9</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO8</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO9</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO10</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO11</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO12</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the use of English in oral and written with good and correct grammar such as the use of tense, verb, grammar, etc.</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:</td></tr>
</table>

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1–CO10	Assignment	Presentation / practicum report	40%
		Midterm	Written test	20%
		Final Exam	Written test	30%
		Attendance	Documentation	10%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Betty S. Azar. Understanding and using english Grammar. Pearson Educaation. NewYork. USA. 2002
Date of revision	10 August 2019

2nd SEMESTER

UNIVERSITAS NEGERI YOGYAKARTA
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Module name:	Pancasila
Module level,if applicable:	Undergraduate
Code:	MDU6208
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Suripno, SH., M.Pd.
Lecturer(s):	MKU Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Demonstration, Simulation, and Discussion
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester

<table>
<tr><td>Credit points:</td><td>2</td></tr>
<tr><td>Prerequisites course(s):</td><td>-</td></tr>
<tr><td>Expected learning outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, practice the values, norms, and academic ethics.
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient.
CO2 Acting as proud and loving citizens of the country, having nationalism and a sense of responsibility to the country and nation.
1. Analyzing and Becoming Pancasila Lifestyle as a Basis for the Development of Knowledge.
2. Analyzing and evaluating Pancasila as a state foundation.
CO3 Contribute to improving the quality of community, nation, and state life the progress of civilization based on Pancasila.
1. Explain and understand Pancasila in the Study of the History of the Indonesian Nation</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th></tr>
<tr><td>CO1</td><td>✓</td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td></tr>
<tr><td>CO3</td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This lecture discusses the foundation and objectives of Pancasila Education, Pancasila in the historical context of the struggle of the Indonesian, Pancasila as a philosophical system, Pancasila as political ethics and national ideology, Pancasila in the context of the R.I and Pancasila state administration as a paradigm of life in society, nation and state</td></tr>
</table>

<table>
<tr>
<td>Assessments</td>
<td>
The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1), (CO2), (CO3).
Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">CO2-CO3</td><td>Individual assignment</td><td>Article, Presentations and Papers</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Article, Presentations and Papers</td><td>15%</td></tr>
<tr><td>Midterm</td><td>Written Test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>

Rukiyati, dkk. 2013. Pendidikan Pancasila di Perguruan Tinggi. Yogyakarta: UNY Press.
Yudi Latif, 2012. Negara Paripurna: Historisitas, Rasionalitas, dan Aktualitas. Jakarta: PT Gramedia
Latif, Yudi. (2012). Mata Air Keteladanan. Pancasila dalam Perbuatan. Bandung: Mizan. Kaelan. (2004). Pendidikan Pancasila. Yogyakarta: Paradigma.
Franz Magnis-Suseno. (2003). Etika Politik. Jakarta: PT. Gramedia Pustaka Utama. Cet. Ke-7.
Bahar, Saafroedin & Hudawati, Nanie (peny). (1998). Risalah Sidang-sidang BPUPKI – PPKI 28 Mei – 22 Agustus 1945. Jakarta: Sekretariat Negara RI
Ali, As’ad Said. (2009) Negara Pancasila, Jalan Kemaslahatan Bersama. Jakarta: LP3ES
Ismail, Faisal. (1999). Ideologi Hegemoni dan Otoritas Agama, Wacana Ketegangan Kreatif Islam dan Pancasila.Yogyakarta: Tiara Wacana.
Bouchier,David. (2007). Pancasila Versi Orde Baru dan asal muasal Negara Organis. Jakarta: Gema Insani Press
A. Ubaidillah & Abdul Rozak. (2013). Pendidikan

</td>
</tr>
</table>

	Kewarganegaraan: Pancasila, Demokrasi,HAM,dan Masyarakat Madani. Jakarta: ICCE UIN Jakarta. 10. Undang-Undang Dasar RI Tahun 1945 (Setelah Amandemen I-IV).
Date of revision	18 August 2019

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Education Management
Module level,if applicable:	Undergraduate
Code:	MDK6203
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2rd
Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T
Lecturer(s):	1. Dr. Cepi Safruddin Abdul Jabar, M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, Lecturing, Practice
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology
Course Outcomes	CO1 Devoted to God who is almighty and capable of showing religious attitude and character, CO2 Students actively participate, take responsibility, and have the motivation to develop themselves CO3 Demonstrated responsibility towards work in their area of expertise independently. CO4 Able to be responsible for the achievement of group work and to supervise and evaluate the completion of work assigned to members under his responsibility CO5 Able to carry out a process of self-evaluation of work groups under its responsibility, and be able to manage learning independently CO6 Students are able to explain the basic concepts of education management CO7 Students are able to explain the concept of educational leadership CO8 Students are able to explain the components of the administration of education CO9 Students are able to explain the relationship between the school and the community CO10 Students are able to analyze the concept of educational supervision

<table>
<tr><td></td><td>CO11 Students are able to analyze the process of managing classes, curriculum, fees, study programs, education.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO5</th><th>ELO6</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO8</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO9</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO10</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO11</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>The Education Management course is a universal course and is compulsory for students of educational programs with a weight of 2 credits. This course discusses the basic concepts, roles and scope of education management, followed by an in-depth study of management in the field of educational management work, which includes: students, curriculum, education personnel, educational facilities, educational funding, management of educational institutions and the relationship of educational institutions with the community, as well as educational leadership and educational supervision. Lectures are given through face-to-face, discussion, and assignments. Evaluations include Final Exams Semester (UAS), weekly exams, Assignments, and Participation and class activities.</td></tr>
</table>

<table>
<tr><td>Assessments</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1–CO9</td><td>Assignment</td><td>Presentation / practicum report</td><td>40%</td></tr>
<tr><td>Midterm</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>

B. Suryosubroto. 2004. Manajemen Pendidikan di Sekolah. Jakarta: Rineka Cipta.
Hadari Nawawi. 1981. Administrasi Pendidikan. Jakarta: Gunung Agung.
Hartati Sukirman, et all. 1998. Adminstrasi dan Supervisi Pendidikan. Yogyakarta: UPP IKIP Yogyakarta
Oteng Sutisna. 1989. Administrasi Pendidikan: Dasar Teoritis Untuk Praktek Profesional. Bandung: Angkasa.
Made Pidarta. 1986. Pemikiran Tentang Supervisi Pendidikan. Surbaya: Sarana Press.
Soekarto Indrafachrudi. 1994. Mengatur Bagaimana Memimpin Sekolah yang Baik. Jakarta: Ghalia Indonesia.
Soewadji Lazaruth. 1988. Kepala Sekolah dan tanggungjawabnya. Yogyakarta: Kanisius.
Wayne K. Hoy & Cecil G.Miskel. 2013. Educational Administrator: Theory, Research and Practice 4th Ed. New York: McGraw Hill, Inc.

</td></tr>
</table>

	9. John Wales & Joseph Bondi. 1986. Supervision: A Guide to Practice 2nd. Colombus: Charles E. Merril Publishing Company. 10. Stephen Murgatroyd and Colin Morgan. 1993. Total Quality Management and the School. Buckingham-Philadelphia: Open University Press. 11. Thomas J. Segiovani. 1988. Supervision of Teaching. USA: ASCD.
Date of revision	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Mathematics Engineering
Module level, if applicable:	Undergraduate
Code:	EKO6307
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	2^{nd}
Module coordinator:	Drs. Nur Kholis, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecturing
Workload:	Total workload is 104 hours per semester which consists of 150 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, practice the values, norms, and ethics. ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology.
Course Outcomes	CO1 Devotion to God Almighty and able to show religious attitude. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Mastering knowledge about the principles of Mathematics and Physics related to the principles of electricity 1. Understanding function's differential and integral with two free changer or more. 2. Understanding vector analysis. 3. Understanding Order 2 and 3 Linear Differential Equations. 4. Understanding Laplace Transforms and Laplace Transform Inversions. CO4 Analyze and solve technical problems related to electrical engineering by applying the principles of Mathematics. 1. Solve differentials and integrals for polynomial, trigonometric, and exponential equations. 2. Solve ordinary differential equations and apply ordinary differential equations to the field of electrical engineering. 3. Solve linear differential equations and apply linear differential equations to the field of electrical engineering. 4. Solve Laplace transform and inverse derived from a problem in the field of electrical engineering.

<table>
<tr>
<td>ELO and CO mapping</td>
<td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td>
</tr>
<tr>
<td>Courses Description:</td>
<td>This course gives cognitive experience to students in learning mathematics. Students are given cognitive experience through axiomatic, deductive and logical and systematic reasoning to build a form of certainty. The reasoning materials in this engineering mathematics course are: differential and integral for functions with two (2) or more changes, vector analysis, ordinary differential equations and linear differential equations, and the basics of Laplace transformations, which will be applied in engineering electro. Lectures are carried out using the student centered learning approach. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.</td>
</tr>
<tr>
<td>Assessments</td>
<td>The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1) and (CO2), knowledge (CO3) and skills (CO4).

Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

1. Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines.</td>
</tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>CO</th><th>Assessment Components</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">CO3-CO4</td><td>a. Individual assignment</td><td>Homework</td><td>10%</td></tr>
<tr><td>b. Group assignment</td><td>Written Test</td><td>10%</td></tr>
<tr><td>c. Midterm</td><td>Written Test</td><td>30%</td></tr>
<tr><td>d. Final Exam</td><td>Written Test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1 Ayres, Frank, Jr. 1981 , Calculus 2nd ed, Singapore: McBraw-Hill International Book Company.
2 Stroud, K.A. & Booth, Dexter J. 2003. Matematika Teknik. Jakarta: Penerbit Erlangga.
3 Mizrahi, Abe & Sullivan, Michael. 1986.Calculus and Analytic Geometry. Belmont, California: Wadswoth Publishing Company.
4 Wardiman. 1982. Persamaan Diferensial. FMIPA – UGM: Diktat perkuliahan
5 Spiegel, Murray R. 1981. Vector. Singapore: McBraw-Hill International Book Company.
6 Spiegel, Murray R. 1999. Transformasi Laplace. Jakarta: Penerbit Erlangga.
7 Spiegel, Murray R. 1992. Matematika Lanjutan untuk Para Insinyur dan Ilmuwan. Jakarta: Penerbit Erlangga.
</td></tr>
<tr><td>Date of revision</td><td>29 July 2019</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Circuit
Module level,if applicable:	Undergraduate
Code:	EKO6308
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2rd
Module coordinator:	Dr. Edy Supriyadi
Lecturer(s):	1. Eko Prianto,S.Pd.T,M.Eng 2. Mutaqin,M.Pd,MT.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	300 minutes lectures and 360 minutes structured activities per week.
Teaching and Learning Method:	Discussion, Demonstration, and Lecturing

Workload:	Total workload is 272 hours per semester which consists of 300 minutes lectures, 360 minutes structured activities, and 360 minutes self-study per week for 16 weeks.
Credit points:	3
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, practice the values, norms, and academic ethics. ELO3 Capable to perform professional works in his/her field of expertise both individual and team works. ELO4 Master in basic sciences and principles of electric ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology.
Course Outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Knowledge of law and the basic theory of electricity. 1. Knowledge about alternating source electrical circuit analysis 2. Knowledge about natural responses and steady state responses 3. Knowledge about magnetic couplings 4. Knowledge about the analysis of three-phase electrical circuits 5. Knowledge about power factor improvement 6. Knowledge about measuring three-phase quantities CO4 Analyze and solve technical problems routinely related to electric power engineering by applying the principles of Mathematics, Physics and Chemistry. 1. Able to analyze alternating electrical circuits 2. Able to analyze natural responses and steady state responses 3. Able to analyze about magnetic couplings 4. Able to analyze three-phase electrical circuits 5. Able to apply power factor improvements to the

<table>
<tr><td></td><td>electric power system
6. Able to measure the magnitude of three phases and analyze the measurement results.</td></tr>
<tr><td>ELO and CO mapping:</td><td>

	ELO1	ELO3	ELO4	ELO7
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

</td></tr>
<tr><td>Courses Description:</td><td>This Electrical Circuit will develop student competencies in the analysis of alternating source circuits, natural responses and steady state responses, magnetic coupling circuits, three-phase circuits, power factor improvements and measurement of three-phase electric quantities, and the application of three-phase circuits in electric power systems. Lectures are carried out with various approaches that are appropriate to the context of the material and the potential of students, including: contextual, cooperative, and problem based learning that leads to student center learning. Continuous assessment is carried out on a competency basis and harmonized with lecture activities.</td></tr>
<tr><td>Study/exam achievements:</td><td>The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1) and (CO2), knowledge (CO3) and skills (CO4).

Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines.</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO2</td><td>Self Assessment</td><td>Observation</td><td>5%</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">CO3-CO4</td><td>Assignment</td><td>Rubric PBL</td><td>35%</td></tr>
<tr><td>Midterm</td><td>Written Test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Alexander Sadiku. 2007. Fundamentals of Electric Circuits. New York: McGraw-Hill International Edition.
2. Ridsdale. (1984) Electrical Circuits for Engineering. New York: McGrawHill.
3. Sudjana Sapi’ie. Alat Ukur dan Pengukuran Listrik. Jakarta: Pradnya Paramita.
4. Mohamad Ramdani. 2008. Rangkaian Listrik. Jakarta: Erlangga.
5. Mussama, Imam Mustholiq. Pegangan Kuliah Dasar Listrik, Listrik DC dan AC. Yogyakarta: FT UNY (tidak dipublikasikan).
6. Mussama, Imam Mustholiq. Pengukuran Listrik, Jilid 1 dan Jilid 2. Yogyakarta: FT UNY (tidak dipublikasikan).
7. Budiono Mismail. 1995. Rangkaian Listrik, Jilid Pertama. Bandung: ITB
</td></tr>
<tr><td>Date of revision:</td><td>31 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Electronics Practice
Module level,if applicable:	Undergraduate
Code:	EKO6209
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Drs. Sunomo, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, practice the values, norms, and ethics. ELO3 Capable to perform professional works in his/her field of expertise both individual and team works. ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology.
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient. CO2 Internalize academic values, norms and ethics. CO3 Demonstrates a responsible and independent attitude towards the assigned work. CO4 Knowledge of law and the basic theory of electricity. 1. Linking the electronic theory with the practice that will be taken. CO5 Knowledge of the preparation of scientific works including work reports in accordance with scientific procedures based on data and information analysis. 1. Make a report related to bridge diode with capacitor filter and load resistor. 2. Make a report related transistor as a switch. 3. Make a report related transistor as a comon emitter amplifier. 4. Make a report the operation amplifier as a reversing amplifier and not reverse. 5. Make a report the operation amplifier as a wave generator. 6. Make an electronic practice report. CO6 Knowledge of design, analysis and application of measurement systems related to the quantity and quality of Electric Power Engineering or Industrial

<table>
<tr><td></td><td>Automation.
1. Analyze bridge diode with capacitor filter and load resistor.
2. Analyze transistors as switches.
3. Analyze transistors as common emitter.
4. Analyze operational amplifier as a reversing amplifier and not reverse.
5. Analyze operational amplifier as wave generator.
6. Analyze electronic circuits.

CO7 Apply the theory of measurement and measuring parameters of electrical parameters.
1. Connect and read the measurement results with a voltmeter, current with a millimeterampere, and explain the functional buttons on the oscilloscope.
2. Connects and reads directional voltage waves, alternating and mixed voltage waves and wave frequencies with an oscilloscope.</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO7</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Electronic Practice lectures are to prove the count of the electronic theory that has been obtained in the Electronics course, and practice the skills to assemble electronic components and measure electrical quantities such as voltage, current and frequency as well as calculating the value of voltage reinforcement. In order to achieve the objectives of this course, the implementation is individual, meaning that each student receives a practicum module, a voltage, current,</td></tr>
</table>

<table>
<tr><td></td><td>and oscilloscope and a sine wave signal generator. In practice, each student carries out five practical titles; i.e. a bridge diode as a rectifier with a capacitor filter, a transistor as a switch, a transistor as a amplifier, an operating amplifier as a reversing and not reversing amplifier, and an operating amplifier as a wave generator. The implementation strategy is that each topic is covered in 100 minutes. With this strategy every meeting in 200 minutes, there are a maximum of 10 participants. The implementation is that every participant enters once every two weeks, taking turns or changing his friends. Participants who were not included at the time were assigned by the lecturer to calculate the amount of output requested in the worksheets to compare with the results of the practice, so participants only entered together in their study groups at meetings 1 to 3. Competency evaluation includes timeliness in completing each practicum topic , including assembling, measuring and comparing it with theoretical calculations. Perfect score is obtained if students are able to complete each worksheet from 5 worksheets in accordance with the specified time, which is 5 x 100 minutes with the results of theoritical calculations and practicum data differing by a maximum of 25%, without damaging the practicum equipment.</td></tr>
<tr><td>Assessment:</td><td>The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1), (CO2), (CO3), knowledge (CO4) and (CO5) and skills (CO6) and (CO7). Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines

<table>
<tr><th>No</th><th>CO</th><th>Assessment Components</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO4-CO7</td><td>Practice Performance of each topic</td><td>Practice</td><td>60%</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td></td><td></td><td>Midterm</td><td>Practice</td><td>20%</td></tr><tr><td></td><td></td><td>Final Exam</td><td>Practice</td><td>20%</td></tr><tr><td colspan="4">Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1 Lembar kerja Praktikum Elektronika Jurusan Pendidikan Teknik Elektro
2 Robert Boylestad & Louis Nashelsky, (1992),.Electronic Devices and Circuit Theory, Englewood Cliffs, New Jersey, Prrentice-Hall Inc.</td></tr>
<tr><td>Date of revision</td><td>30 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Fundamentals of Electricity Work
Module level,if applicable:	Undergraduate
Code:	EKO6210
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Dr. Edy Supriyadi
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, practice the values, norms, and academic ethics. ELO3 Capable to perform professional works in his/her field of expertise both individual and team works. ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology.
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Knowledge of law and the basic theory of electricity. 1. Understand the types of tools and materials used in practice. 2. Understand how to use use of electrical measuring devices. 3. Understand how to use a multimeter. 4. Understand how to use a oscilloscope/CRO. 5. Understand the principle of charging and discharging capacitors and inductors. 6. Understand the characteristics of components R, L and C. 7. Understanding the characteristics of R-L-C series and parallel circuits in an AC source. 8. Understand the effect of frequency on the R-L-C circuit. 9. Understanding the three-phase network source. 10. Understanding the characteristics of the load at the three phase source. 11. Understanding phase sequences on three phase systems. 12. Understand the three-phase power measurement system. CO4 Apply the theory of measurement and measure

<table>
<tr><td></td><td>electrical devices.
1. Capable to choose the tools and materials used for practice.
2. Capable to choose the measuring instrument used for practice.
3. Apply the use of a multimeter correctly.
4. Apply the use of a oscilloscope/CRO correctly.
5. Apply the process of charging and discharging capacitors and inductors.
6. Measuring the amount of current and power on the R-L-C load on a dc or ac power source.
7. Apply measurements to series R-L-C series and parallel to AC sources.
8. Test the effect of frequency on the R-L-C circuit.
9. Stringing and measuring three-phase network sources.
10. Arranging and measuring load characteristics at three phase sources.
11. Test the phase sequence in a three phase system.
12. Measuring power on a three phase system.</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>The Basic Electric Practice will develop student competencies regarding basic electricity concepts and law, electrical circuit elements, methods and theorems of unidirectional source circuit analysis, phasor concepts and their application in a series of alternating one-phase sources, selecting measuring tools and analyzing measurement results electric quantity. Lectures are carried out with various approaches that are appropriate to the context of the material and the potential of students, including: contextual, cooperative, and problem based learning that leads to student center learning. Continuous assessment is carried out on a competency basis and harmonized with lecture activities.</td></tr>
</table>

<table>
<tr><td>Assessment:</td><td>
The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1) and (CO2), knowledge (CO3) and skills (CO4). Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">CO3-CO4</td><td>Practice Performance of each topic</td><td>Rubric assessment of the implementation of lectures and reports</td><td>40%</td></tr>
<tr><td>Midterm</td><td>Practice Exam</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Practice Exam</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1 Alexander Sadiku. 2007. Fundamentals of Electric Circuits. New York: McGraw-Hill International Edition.
2 Ridsdale. (1984) Elecetrical Circuits for Engineering. New York: McGrawHill.
3 Sudjana Sapi’ie. Alat Ukur dan Pengukuran Listrik. Jakarta: Pradnya Paramita.
4 Mohamad Ramdani. 2008. Rangkaian Listrik. Jakarta: Erlangga.
5 Mussama, Imam Mustholiq. Pegangan Kuliah Dasar Listrik, Listrik DC dan AC. Yogyakarta: FT UNY (not
</td></tr>
</table>

	published). 6 Mussama, Imam Mustholiq. Pengukuran Listrik, Jilid 1 dan Jilid 2. Yogyakarta: FT UNY (not published). 7 Budiono Mismail. 1995. Rangkaian Listrik, Jilid Pertama. Bandung: ITB
Date of revision	13 July 2019

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Web:ft.uny.ac.id, E-mail: elektro@uny.ac.id

Module name:	Control System
Module level,if applicable:	Undergraduate
Code:	EKO6211
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Sigit Yatmono, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient. CO2 Menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya dan memiliki motivasi mengembangkan diri. CO3 Mastering knowledge about the principles of Mathematics and Physics related to the principles of electricity. 1. Understand the basic concepts of control systems which include the introduction of control system components, types of basic control actions (open and closed loop). 2. Understand the concept of control system mathematical modeling of physical system characteristics. 3. Understand the concept of system response analysis by calculating manual formulas. 4. Understand the concept of testing the stability of a control system using the Hurwitz and Routh stability concept methods. 5. Understand the concept of PID regulation in a control system. CO4 Knowledge of identifying, formulating and solving control systems in Electric Power Engineering or

Industrial Automation.

1. Formulate and describe the functions of the control system aided by MATLAB software.
2. Analyze system response tests from mathematical model equations using MATLAB software.
3. Analyze system stability tests from mathematical equation models using MATLAB software.
4. Determine the PID control coefficient and application examples using the Matlab program and the microcontroller code.

CO5 Analyze and solve technical problems related to electrical engineering by applying the principles of Mathematics.

1. Apply mathematical principles in particular, linear equations, and numerical calculations in the problem of the mathematical model of the control system.
2. Model the control system in the form of a block diagram.
3. Analyze control system response tests.
4. Analyze the control system stability test.
5. Design a PID-based control system, determine the coefficients of Kp, Ki and Kd.

ELO and CO mapping:

	ELO1	**ELO3**	**ELO4**	**ELO7**
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓
CO5				✓

Courses Description:

Control system basic discusses the understanding of control systems, process dynamics and modeling, sequential control, control with a good feedback technique, mathematical modeling of physical systems with block diagram approach with its Laplace transform and signal flow graph, orde system response analysis 1,2 and high; system stability settings, application examples and basic control actions (on / off, P, PI, PD, PID). As well as an introduction to using MATLAB as a response analysis tool, system stability and controller design.

Assessment:

The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1) dan (CO2), knowledge (CO3), and skills (CO4) and (CO5). Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1-CO2	Active in class	Observation	15%
		Assignment	Rubric	
		Discussion	Observation	
		Presentation	Rubric	
2	CO3	Quiz	Test	50%
		Assignment	Rubric	
		Midterm	Test	
		Final Exam	Test	
		Presentation	Rubric	
3	CO4-CO5	Model the control system	Assignment	35%
		Calculate control system response characteristics manually	Test	
		Analyzing the control system with Matlab software	Assignment	
		Discussion	Rubric	
		Presentation	Rubric	
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1 Ahmad Faozan Alfi, 2002, Dasar Sistem Kendali, Diktat Kuliah JPTE UNY. 2 Heru Dibyo Laksono, 2014, Sistem Kendali dengan MATLAB, Graha Ilmu. 3 Ogata, Katsuhiko, 1995, Teknik Kontrol Automatik, Erlangga. 4 Nise, S Norman, 2011, Control system Engineering, John Wolley & Sons 5 Dorf, Richard C, 2008, Modern Control Systems, Pearson Education International.
Date of revision	13 July 2019

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Module name:	Computer Network Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6212
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2nd
Module coordinator:	Deny Budi Hertanto, M.Kom.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	300 minutes lectures and 360 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 272 hours per semester which consists of 300 minutes lectures, 360 minutes structured activities, and 360 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, practice the values, norms, and academic ethics.. ELO3 Capable to perform professional works in his/her field of expertise both individual and team works. ELO4 Master in basic sciences and principles of electric ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude, honest and patient. CO2 Demonstrates a responsible and independent attitude towards the assigned work. CO3 Knowledge of law and the basic theory of electricity. 1. Understand the Basic Introduction to Computer Networks. 2. Understand LAN Cabling. 3. Understand Internet Protocol Addressing. 4. Understand Subnetting. 5. Understand Static Routing with the Packet Tracer Program. 6. Understand Computer Network Design Using Switches and Routers CO4 Identifying and solving current and future problems in Electric Power Engineering or Industrial Automation using the laws and basic theories of electricity within a broader application framework. 1. Resolve Basic Introduction to Computer Networks Problems. 2. Able to make UTP network cable to connect computers in the Local Area Network. 3. Resolve computer network addressing issues. 4. Resolve subnetting issues. 5. Resolve Static Routing Problems with the Packet Tracer Simulation Program. 6. Complete the Design of Computer Networks with Configuring the Switch and Router.

<table>
<tr><td>ELO and CO mapping:</td><td>

	ELO1	ELO3	ELO4	ELO7
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

</td></tr>
<tr><td>Courses Description:</td><td>Computer Networks are courses that are given so that students are able to explain the concept of computer networks and implement local computer networks based on the TCP / IP protocol. The material covered includes the basic concepts of networks, network topology, network layers and protocols, IP addressing and routing. Computer Network Subjects are courses that consist of Theory and Practice which in implementing learning are carried out together. Computer Networks are courses that are given so that students are able to explain the concept of computer networks and implement local computer networks based on the TCP / IP protocol. The material covered includes the basic concepts of networks, network topology, network layers and protocols, IP addressing and routing. Theory courses are held in odd semester, while Practice courses are conducted in even semester.</td></tr>
<tr><td>Assessment:</td><td>The assessment was carried out to measure all learning achievements, namely attitude attainment (CO1) dan (CO2), knowledge (CO3) and skills (CO4). Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

Final grades include the results of the assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines</td></tr>
</table>

	<table><tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr><tr><td>1</td><td>CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr><tr><td rowspan="6">2</td><td rowspan="6">CO3-CO4</td><td>Online Exam</td><td>e-learning quiz</td><td>10%</td></tr><tr><td>Competence test 1</td><td>Written Test</td><td>10%</td></tr><tr><td>Competence test 2</td><td>Practice Test</td><td>15%</td></tr><tr><td>Competence test 3</td><td>Written Test</td><td>15%</td></tr><tr><td>Competence test 4</td><td>Simulation</td><td>20%</td></tr><tr><td>Competence test 5</td><td>Written, Simulation, and Interview Test</td><td>20%</td></tr><tr><td colspan="4">Total</td><td>100%</td></tr></table>
Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1 Deny Budi Hertanto. 2014. Modul Jaringan Komputer. Bahan Pertkuliahan Teknik Elektro. Yogyakarta : FT UNY 2 Cisco Study Lab, 2008, Student Lab Manual, CCNA Networking Academy 3 Tanenbaum, Andrew, 2003, Jaringan Komputer, New York: Prenhallindo 4 Stalling, William, 2007, Jaringan Komputer, Jakarta: Salemba Teknika
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Module name:	Microprocessor System
Module level,if applicable:	Undergraduate
Code:	EKO6213
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Dr. Moh. Khairudin
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet. ELO4 Master in basic sciences and principles of electric. ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise.
Course outcomes:	CO1 Devoted to God and able to show a religious attitude and character. CO2 Students actively participate, are responsible, and have the motivation to develop themselves. CO3 Students understand the introduction to the microprocessor system and the type of microprocessor. CO4 Students understand the components of the MPF-1 Z-80 Microprocessor system. CO5 Students understand the memory map and the mode of addressing and transferring data. CO6 Students understand the MPF-1 Z-80 programming instructions. CO7 Students understand arithmetic and logic programming. CO8 Students understand the MPF-1 Z-80 MP interface and input techniques. CO9 Students understand several types of microcontroller systems. CO10 Students understand the microcontroller system architecture. CO11 Students understand the CV AVR programming and C language of the microcontroller system. CO12 Students understand the concept of input and output microcontroller systems.

<table>
<tr><td></td><td>CO13 Students understand the ADC concept.
CO14 Students understand the concepts of intrusions and timers.
CO15 Students understand the application of a microcontroller on motor control.</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO8</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO9</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO10</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO11</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO12</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO13</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO14</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO15</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the introduction of microprocessors or microcomputers, MPF-1 Z-80 Microprocessors, MPF-1 Microcontroller programming, Arithmetic and logic operations, MPF-1 functioning, parallel interface and interrupt techniques. Followed by discussing the microcontroller system which includes microcontroller system architecture, microcontroller minimum system, type of microcontroller, microcontroller programming, input and output ports, uploading programs to</td></tr>
</table>

<table>
<tr><td></td><td>the microcontroller and microcontroller applications in the electrical engineering system.</td></tr>
<tr><td>Assessment:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">CO1 - CO15</td><td>Quiz</td><td>Written test</td><td>10%</td></tr>
<tr><td>Task 1,2,3,4</td><td>Written report</td><td>10%</td></tr>
<tr><td>Midterm exams</td><td>Written test</td><td>20%</td></tr>
<tr><td>Task 5</td><td>Written report</td><td>20%</td></tr>
<tr><td>Final exams</td><td>Written test</td><td>35%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1 Gayenelly B. Grover & Francois Penichorex. (1993).The Acknowledgement of Z80, Barkeley : SYBEX Inc.
2 Andrianto, Heri. (2008). Pemrograman Mikrokontroler AVR ATMEGA 16 menggunakan Bahasa C (CodeVision AVR). Bandung: Informatika.
3 Atmel. (2008). ATMega16. Diakses pada tanggal 22 Juli 2013, dari http://www.atmel.com/images/doc2466.pdf.
4 Sigit Yatmono dkk, Z80 Simulator Media Belajar Simulasi, UNY Press, 2014.
</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Machinery
Module level,if applicable:	Undergraduate
Code:	EKO6314
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Dr. Sukir, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.

Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology
Course Outcomes:	CO1 Fear God Almighty and be able to show a religious attitude, honest and patient CO2 Demonstrates responsibility for work in their area of expertise independently CO3 Knowledge of the principles of Mathematics and Physics related to the principles of electricity. 1. Understanding the principles of Mathematics in particular trigonometry, differentials, and integrals in electrical machines. 2. Understanding the principles of Physics in particular rotating motion, torque, magnetic fields, Faraday's law, and Lorenz force in electric machines. CO4 Knowledge of law and the basic theory of electricity. 1. Understanding direct current generator. 2. Understanding direct current motor. 3. Understand 1 phase transformer. 4. Understand 3 phase transformer. 5. Understand the measuring transformer. 6. Understanding the alternating current motor is not synchronous. 7. Understand the alternating current generator synchronously (alternator). 8. Understand the alternating current motor

<table>
<tr><td></td><td>synchronously.

CO5 Analyze and solve technical problems related to electrical engineering by applying the principles of Mathematics.
1. Apply mathematical principles, especially trigonometry, differentials, and integrals in electrical machines.
2. Solve technical problems of direct current motors.
3. Solve technical problems of phase I transformers.
4. Solve 3 phase transformer technical problems.
5. Solve technical problems of measuring transformers.
6. Solve technical problems of motor alternating current not synchronously.
7. Solve the technical problems of the motor alternating current.

CO6 Apply the theory of electricity generation in general and energy efficiency in the field of generation.
1. Apply the theory of direct current generator.
2. Apply the theory of alternating current generator synchronously (alternator).</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Electric Machine are courses that consist of Theory and Practice which in the implementation of learning are carried out separately. Theory courses are held in odd semester, while Practice courses are conducted in even semester. On this occasion only the description of the subject of Electric</td></tr>
</table>

<table>
<tr>
<td></td>
<td>Machine Theory will be delivered, the Electric Machine Theory consists of 3 (three) sub materials, namely: (a). Direct Current Machine that strips about Generators and Motors. (b). Transformer that examines 1 (one) phase and 3 (three) phase power transformers, and special transformers. (c). Alternating Current Machine that peels about a synchronous machine consisting of 3 phase and 1 phase induction motors. (b). Simultaneous (synchronous) engines which strip away alternators and synchronous motors. A summary of each sub-material includes: a set of equality, working principles, characteristics and simple analysis of each sub-material.</td>
</tr>
<tr>
<td>Assessment:</td>
<td>
The assessment is carried out to measure all learning achievements, namely attainment learning achievements, namely: CLO 1 (A.1.1) and CLO 2 (A.3.2)), knowledge learning achievements, namely: CLO 3 (K.1.1) and CLO 4 (K 1.2) and the achievement of learning skills, namely: CLO 5 (S.1.6) and CLO 6 (S.2.10).
Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude than the attitude of students in general. The results of attitude assessment especially CLO 1 (A.1.1) do not become components of the student's final grade, but rather as one of the requirements for graduation, students will graduate from this course if they have a minimum of good attitude. However, for CLO 2 (A.3.2) included in the final assessment.
Final grades include the results of an assessment of knowledge, and skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines.
<table>
<tr><th>No</th><th>CO</th><th>Assessment Components</th><th>Assessment Technique</th><th>Percent</th></tr>
<tr><td>1</td><td>CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">CO3-CO4</td><td>Individual assignments</td><td>Individual task</td><td>15%</td></tr>
<tr><td>Group assignments</td><td>Group task</td><td>15%</td></tr>
<tr><td>Midterm exam</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final exam</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1 Sunyoto. 2014. Mesin Listrik Arus Searah. Bahan Pertkuliahan Teknik Elektro. Yogyakarta : FT UNY 2 Sunyoto. Dkk. Mesin arus Searah. Modul Pembelajaran I. Yogyakarta : FT UNY 3 Sunyoto. 2015. Transformator. Bahan Pertkuliahan Teknik Elektro. Yogyakarta : FT UNY 4 Sunyoto, dkk. Transformator. Modul Pembelajaran II. Yogyakarta : FT UNY 5 Sunyoto. 2015 Mesin Listrik Arus Bolak-Balikr. Bahan Pertkuliahan Teknik Elektro. Yogyakarta : FT UNY 6 Austen Styigant (1981). The J&P Transformer Book. London, Butterworths 7 Jurek,ST (1976). Electrical Macine for techniciant and technician engineers. London : Longman 8 Theraja.BL (1980). Tex Book of electrical tecnology. New Delhi : Nirja 9 Wildi.T (1981). Electrical Power Technology. New York. John willy & Son
Date of revision	13 July 2019

3rd SEMESTER

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Civic Education
Module level,if applicable:	Undergraduate
Code:	MKU6207
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Eny Kusdarini, S.H., M.Hum.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
Course Outcomes:	CO1. Devoted to God Almighty and able to show a regius attitude and character.

	CO2. Students actively participate, take responsibility, and have the motivation to develop themselves. CO3. Having knowledge about the importance of Citizenship Education for students. CO4. Have attitudes and behavior in accordance with human rights. CO5. Have awareness of rights and obligations as Indonesian citizens. CO6. Having awareness of defending the country. CO7. Having the basics of democracy. CO8. Have a picture of Indonesia's national outlook. CO9. Having motivation to participate in realizing Indonesia's resilience. CO10. Have motivation to participate in realizing Poltranas.
ELO and CO mapping:	(see mapping table below)
Courses Description:	This course contains basic concepts of insight and enthusiasm nationality, patriotism, democracy, legal awareness, respect for diversity and participation to build a nation based on Pancasila. Corresponding with its function, Citizenship Education organizes education nationality, democracy, law, multiculturalism and citizenship for students in order to support the realization of citizens who are aware of their rights and obligations, and smart, skilled and character so that they can be relied on to build nation.
Assessment:	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the

ELO and CO mapping:

	ELO1	ELO2	ELO3
CO1	✓		
CO2		✓	
CO3			✓
CO4			✓
CO5			✓
CO6			✓
CO7			✓
CO8			✓
CO9			✓
CO10			✓

<table>
<tr><td></td><td>requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO2, CO3 and CO4</td><td>Task</td><td>Presentation / written test</td><td>20%</td></tr>
<tr><td>Presence</td><td>Presentation / written test</td><td>15%</td></tr>
<tr><td>Group project</td><td>Presentation / written test</td><td>20%</td></tr>
<tr><td>Mid</td><td>Presentation / written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Presentation / written test</td><td>25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>Main Literature:
1. Sunarso, dkk. (2006). Pendidikan Kewarganegaraan. Yogyakarta: UNY Press.
2. Tim Penyusun. (2016). Pendidikan Kewarganegaraan Untuk Perguruan Tinggi. Jakarta: Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset Teknologi Pendidikan Tinggi.
3. Taniredja, T. (2010). Pendidikan Kewarganegaraan di Perguruan Tinggi Muhammadiyah. Bandung: Alfabeta.

Supporting literature
1. Branson, MS. (1998). The Role of Civic Education. Calabasas: Center of Civic Education (CCE) diakses di http://civiced.org
2. Budimansyah, D dan Suryadi. K. (2008). PKn dan Masyarakat Multikultural. Bandung: SPS UPI Bandung
3. Cogan, J dan Derricot, R. (1998). Citizenship for The 21st Century International Perspective on Education. London: Kogan Page.
4. Hardiman, BF. 2011. Hak-Hak Asasi Manusia, Polemik dengan Agama dan Kebudayaan. Jakarta: Kanisius
5. Kaelan. (2002). Filsafat Pancasila, Pandangan Hidup Bangsa Indonesia. Yogyakarta: Paradigma.
6. Kranenburg. (1975). Ilmu Negara Umum. Jakarta: Pradnya Paramita.
7. Mahfud MD, M. (2001). Dasar dan Struktur Ketatanegaraan Indonesia. Jakarta: PT Rineka Cipta.</td></tr>
</table>

	8. Mahfud MD, M. (2000). Demokrasi dan Konstitusi di Indonesia: Studi Tentang Interaksi Politik dan Kehidupan Ketatanegaraan. Jakarta: PT Rineka Cipta 9. Miriam Budiardjo. (1986). Dasar-dasar Ilmu Politik, Jakarta: PT. Gramedia, cet. X 10. Mohtar Mas'oed. (1999). Negara, Kapital dan Demokrasi, Yogyakarta: Pustaka Pelajar 11. Pranowo, MB. (2010). Multidimensi Ketahanan Nasional. Jakarta: Pustaka Alvabet 12. Riyanto, Astim, (2009). Teori Konstitusi. Bandung: Yapemdo. 13. Sanusi, A. (2006). Model Pendidikan Kewarganegaraan Menghadapi Perubahan dan Gejolak Sosial. Bandung: CICED. 14. Surbakti, Ramlan. (2010). Memahami Ilmu Politik. Jakarta. Grasindo. 15. Suroyo, D. (2002). Integrasi Nasional dalam Perspektif Sejarah Indonesia. Pidato Pengukuhan Guru Besar Ilmu Sejarah pada Fakultas Sastra, Undip Semarang 16. Tilaar, HAR. (2007). MengIndonesia Etnisitas dan Identitas Bangsa Indonesia. Jakarta: PT Rineka Cipta. 17. Torres, Carlos Alberto. (1998). Democracy, Education, and Multiculturalism: Dilemmas of Citizenship in a Global Word. Roman and Littlefield publisher. 18. Undang-Undang Republik Indonesia Nomor 12 Tahun 2006 Tentang Kewarganegaraan 19. Undang-Undang Republik Indonesia Nomor 12 Tahun 2011 Tentang Tata Urutan aturan Perundang-Undangan di Indonesia 20. Undang-Undang Republik Indonesia Nomor 24 Tahun 2009 Tentang Bendera, Bahasa, dan Lambang Negara, serta Lagu Kebangsaan. 21. Undang-Undang Republik Indonesia Nomor 48 Tahun 2009 Tentang Kekuasaan Kehakiman. 22. Undang-Undang Republik Indonesia Nomor 3 tahun 2002 tentang Pertahanan Negara. 23. Wahab, A dan Sapriya. (2011). Teori dan landasan Pendidikan Kewarganegaraan. Bandung: Alfabeta. 24. Winataputra, US. (2001). Jati Diri Pendidikan Kewarganegaraan Sebagai Wahana Sistematik Pendidikan Demokrasi. Bandung: Disertasi SPS UPI Bandung.
Date of revision	6 July 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Educational Psychology
Module level,if applicable:	Undergraduate
Code:	MDK6202
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	2^{nd}
Module coordinator:	Dr. Ketut Ima Ismara, M.Pd., M.Kes.,
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise.

<table>
<tr><td>Course Outcomes:</td><td>
CO1. Devoted to God Almighty and able to show a religious attitude and character.
CO2. Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3. Students are able to find effective and efficient ways of learning for students of the Department of Electrical Engineering Education (JPTE),
CO4. Having the ability to communicate effectively, think critically and make the right decisions.
</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO6</th></tr>
<tr><th>CO1</th><td>✓</td><td></td><td></td></tr>
<tr><th>CO2</th><td></td><td>✓</td><td></td></tr>
<tr><th>CO3</th><td></td><td></td><td>✓</td></tr>
<tr><th>CO4</th><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course contains basic concepts of develop contextual thinking (according to the characteristics of the study program) and develop elements of instructional media and learning methods as learning resources based on information technology and / or computers. The main studies include: the concept of learning perception, learning media, learning methods, as well as the functions and benefits of developing learning methods. It also examines the application of computer-based learning media will discuss the design of mind concept maps (mind mapping) with mindjet software.</td></tr>
</table>

<table>
<tr><td>Assessments:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1-CO4</td><td>Presence</td><td>Presentation / written test</td><td>10%</td></tr>
<tr><td>Task</td><td>Presentation / written test</td><td>40%</td></tr>
<tr><td>Mid</td><td>Presentation / written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Presentation / written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Elliott et. al . 2000. Educational Psychology: Effective Teaching, Effective Learning, 3/e. New York: Mc Graw Hill, inc.
2. Howard E. Gardner. 2006. Multiple Intelligences: New Horizons in Theory and Practice.
3. Howard L. Kingsley. 1948. The nature and conditions of learning. New York: Prentice-Hall, inc.
4. Sardiman A.M . 2004. Interaksi dan motivasi belajar mengajar. Indonesia: Raja grafindo Persada.
5. Sri Esti Wuryani Djiwandono. 2006. Psikologi Pendidikan revisi II. Jakarta: Grasindo.
6. Sumadi Suryabrata. 2006. Psikologi Kepribadian. Rajawali Pers.
</td></tr>
<tr><td>Date of revision</td><td>6 July 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Control Systems Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO 6215
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Ariadie Chandra Nugraha, M.T.
Lecturer(s):	Dr. Istanto Wahyu Djatmiko, M.Pd. Dr. Edy Supriyadi, M.Pd. Rustam Asnawi, Ph.D
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric

<table>
<tr><td></td><td>ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes</td><td>CO1. Assemble and explain a simple open loop (open loop) control system with one sensor and one actuator.
CO2. Arrange and explain the analysis of a first-order control system which is realized in a closed loop control system to regulate motor speed.
CO3. Assemble and explain the closed loop control system to control motor speed and position (servomechanism) and analyze the transient response and steady state of the system.
CO4. Assemble the PID control system and can explain the characteristics of each parameter P (Proportional), I (Integral), and D (Derivative).</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>The Control System Practice is a practical course that aims to have students competing in explaining and assembling several types of control systems, including a simple open loop control system and closed loop control system for controlling motor speed and position (servomechanism). Students are expected to be able to explain the response of first and second order systems, both the transient response and the steady state of the system. Furthermore, students are expected to be able to assemble the PID control system and be able to explain the characteristics of each parameter P (Proportional), I (Integral), and D (Derivative). Lectures are carried out using the Project-Based Learning (PjBL) approach, which is that at each meeting each student must complete a practice unit that has been outlined in a worksheet (jobsheet / labsheet). Competency-based assessment by observing performance per week. The final exam is carried out to check competency per student where students must complete exam questions independently. In addition, the assessment also includes active individual participation and group cooperation during lectures.</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good</td></tr>
</table>

attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO4	Performance evaluation per practice	Written test	30%
		Practice Report	Assignment	30%
		Quiz	Assignment	10%
		Performance Evaluation for Final Practice Exams	Assignment	20%
		Presence	Documentation	10%
			Total	100%

.

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. *Labsheet* (lembar kerja praktikum) Praktik Sistem Kendali. 2. Ahmad Faozan Alfi, 2002, *Dasar Sistem Kendali*, Diktat Kuliah JPTE UNY. 3. Heru Dibyo Laksono, 2014, *Sistem Kendali dengan MATLAB*, Graha Ilmu. 4. Ogata, Katsuhiko, 1995, *Teknik Kontrol Automatik*, Erlangga.
Date of revision	18 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Microprocessor Systems Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO 6216
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Muh. Khairudin, MT., Ph.D
Lecturer(s):	Rustam Asnawi, Ph.D Dr. Edy Supriyadi, M.Pd. Totok Heru TM., M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

	ELO4 Master in basic sciences and principles of microprocessor ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1. Get to know the objectives of the course Building a learning atmosphere Explain the differences and similarities between CPU characteristics 8086, 8088 and CPU Z-80 CO2. Explain the names of registers Analyst the Z-80 CPU memory map 2. Develop an expanded map of memory for a microprocessor. CO3. Explain several addressing modes Designing programming for several data transfer instructions. Explain rotation, shifting and branching instructions. CO4. Designing arithmetic operations Designing Programming logic operations. CO5. Explain the role of the stack pointer with Push and Pop instructions Describe some subroutine services and their functions. CO6. Designing Programming Showing letters and numbers (still and moving) as a result of ASCII and seven-segment conversions CO7. Designing Programming for user interface with PPI 8255 Designing Programming Programming the use of the interface with the PIO Z80 CO8. Explain the differences and similarities of microcontroller types CO9. Explain the microcontroller system architecture CO10. Designing Programming using CV AVR Designing a Minimum System Simulation with Proteus CO11. Designing microcontroller system input Programming CO12. Designing Programming the microcontroller system output CO13. Designing ADC Programming CO14. Designing Programming instructions and timers CO15. Apply a microcontroller to the motor control

ELO and CO mapping

	ELO1	ELO2	ELO3	ELO4	ELO5	ELO 6
CO1	✓	✓				
CO2	✓	✓			✓	
CO3					✓	
CO4				✓	✓	
CO5				✓		
CO6				✓		
CO7				✓		
CO8					✓	
CO9					✓	
CO10					✓	
CO11					✓	
CO12						✓
CO13					✓	✓
CO14						✓

Courses Description:

This course discusses the introduction of microprocessors or microcomputers, MPF-1 Z-80 Microprocessors, MPF-1 Microcontroller programming, Arithmetic and logic operations, MPF-1 functioning, parallel interface and interrupt techniques. Followed by discussing the microcontroller system which includes microcontroller system architecture, microcontroller minimum system, type of microcontroller, microcontroller programming, input and output ports, uploading programs to the microcontroller and microcontroller applications in the electrical engineering system.

Assessments

Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO15	Quiz	Written test	10%
		Assigments part 1,2,3, and 4	Assignment	10%
		Middle Test	Assignment	20%

		Assigment 5	Assignment	20%
		Final Test	Assignment	35%
		Attendance	Documentation	5%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Gayenelly B. Grover & Francois Penichorex. (1993).The Acknowledgement of Z80, Barkeley : SYBEX Inc. 2. Andrianto, Heri. (2008). Pemrograman Mikrokontroler AVR ATMEGA 16 menggunakan Bahasa C (CodeVision AVR). Bandung: Informatika. 3. Atmel. (2008). ATMega16. Diakses pada tanggal 22 Juli 2013, dari http://www.atmel.com/images/doc2466.pdf. 4. Sigit Yatmono dkk, Z80 Simulator Media Belajar Simulasi, UNY Press, 2014.
Date of revision	18 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Circuit Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6217
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Faranita Surwi, S.T.,M.T.
Lecturer(s):	1. Rustam Asnawi, ST.,MT.,PhD.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 150 minutes of face-to-face activities per week per semester; (2) structured assignment activities 180 minutes per week per semester; and (3) 180 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 53 hours 20 minutes of face-to-face activities per semester.
Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric

<table>
<tr><td></td><td>ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.</td></tr>
<tr><td>Course Outcomes</td><td>CO1. Devoted to God and able to show a religious attitude and character,
CO2. Students actively participate, take responsibility, cooperate, and have the motivation to develop themselves,
CO3. Students are able to understand, arrange, measure, and analyze DC and AC electrical quantities (resistance, reactance, current, voltage, frequency, power factor, and power) for a variety of electrical circuits both DC (series, parallel, and mixed) and AC (1 phase and 3 phase) with various RLC loads in series, parallel, star, triangle, balanced and unbalanced loads with regard to work safety.
CO4. Having the ability to communicate effectively, think scientifically, critically, and make the right decisions.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course contains basic concepts of Electric Circuits develop competence intact (affective, knowl knowledge, and more on ket e rampilan practice) associated with the introduction of materials and power tools, load electricity RLC, the introduction and use of various electrical measurements of both DC and AC, various types of circuits DC and AC electricity , series, parallel and mixed circuits , charging and discharging inductors and capacitors, frequency effect on RL C series and parallel loads , resonance, star and triangle connections,phase sequence tests, measurement of 3 phase balanced and unbalanced load power, and power quality. Lectures carried out by demonstration, observation, practice, both individuals and groups. Competency-based assessment uses authentic assessments that cover : attendance, attitudes (piety, participation , tidiness, cooperation, and work safety), knowledge and skills that are reflected in (group practice assignments, individual pre-practice reports , and competency tests (practice) as a whole individual al).</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other</td></tr>
</table>

<table>
<tr><td></td><td>students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO4</td><td>Assignment</td><td>Practicum</td><td>10%</td></tr>
<tr><td>Practicum report</td><td>Written report</td><td>25%</td></tr>
<tr><td>Final Project Performance</td><td>Performance</td><td>30%</td></tr>
<tr><td>Final Project Report</td><td>Written report</td><td>30%</td></tr>
<tr><td>Attendance</td><td>Documentattion</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Kerchner & Corcoran. (1977). Alternating Current Circuit. New York: John Willey & Son. Chapter VI, VII, VIII, IX.
2. Mussama, Imam Mustholiq. Pegangan Kuliah Dasar Listrik, Listrik DC. Yogyakarta: FT UNY (tidak dipublikasikan).
3. Mussama, Imam Mustholiq. Pengukuran Listrik, Jilid 2. Yogyakarta: FT UNY (tidak dipublikasikan).
4. Ridsdale. (1984) Elecetrical Circuits for Engineering. New York: McGrawHill. Part Two. Chapter 7.
5. Wildi, Theodore. (2002). Electrical Machines, Drives, and Power Systems. Ohio: Prentice Hall. Part IV. Chapter 30.
6. ...., Buku Panduan Praktik Matakuliah Dasar Listrik. Yogyakarta: Jurusan Pendidikan Teknik Elektro FT UNY.
7. ...., (2012). Power Systems Protection, Power Quality, and Substation Automation. IDC Technologies & bookboon.com</td></tr>
<tr><td>Date of revision</td><td>18 August 2019</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Module name:	Electric Machinery Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6218
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Drs. Sukir, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	300 minutes lectures and 360 minutes structured activities per week.
Teaching and Learning Method	Lecture, Discussion, Practicum, Question and Answer
Workload:	Total workload is 272 hours per semester which consists of 300 minutes lectures, 360 minutes structured activities, and 360 minutes self-study per week for 16 weeks.
Credit points:	3
Prerequisites course(s):	-
Expected Learning Courses:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work

	implementations, and testing in electric power or industrial automation expertise.
Course Outcomes	CO1. Thanks to God Almighty and able to show a regius attitude and character, CO2. Students actively participate, take responsibility, and have the motivation to develop themselves, CO3. Students have the ability to test direct current generators to determine the characteristics of E = f (Im), and rig. Terminal V = f (Il), and efficiency for various generator connections. CO4. Students have the ability to test direct current motors to determine the characteristics of n = f (T) and efficiency for various connections CO5. Students have the ability to test a single-phase transformer with the correct steps to determine the characteristics of the transformer with activities including: planning a series of tests (experiments), arranging and carrying out tests (experiments) and implementing work safety as well as possible. Tests include: Polarity Test, Transformational Comparative Test, OCT, SCT and loading test. Tests are carried out to determine transformer efficiency and voltage regulation for various load properties. CO6. Students have the ability to test 3 phase transformers to determine the different types of 3 phase transformer connections. CO7. Students have the ability to test 3-phase electric motors to determine the characteristics n = f (s), n = f (T). CO8. Students have the ability to test 3-phase electric motors to determine motor efficiency
ELO and CO mapping	(see table below)
Courses Description:	This course contains basic concepts of Electrical Machine Practice is a practical activity that is conducting experiments (experiments), testing of machines. Practical material includes: 3 sub materials, namely: (a). Experiments (experiments), testing the Direct Current

	ELO1	ELO2	ELO3	ELO4	ELO5
CO1	✓				
CO2		✓			
CO3			✓	✓	
CO4			✓	✓	✓
CO5			✓	✓	✓
CO6			✓	✓	✓
CO7			✓	✓	✓
CO8			✓	✓	✓

<table>
<tr><td></td><td>Engine consisting of Generators and Direct Current Motors, (b). Experiments (experiments), testing the Alternating Current Machine which consists of an asynchronous motor that is a 3-phase induction motor, a girth rotor, a cage rotor and one-phase motors, as well as an synchronous engine that is an alternator and a synchronous motor. (c). Test the 1 phase Transformer.In carrying out experiments and testing carried out with the correct steps starting from starting, operating the machine to retrieve experimental data to stop the machine. The direction of experimentation and testing of the engine is to determine the characteristics of the engine both on the motor or generator. Besides that experiment and testing of electrical machines to determine engine efficiency.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">CO1-CO8</td><td>Practice Report</td><td>Presentation / written test / practicum</td><td>15%</td></tr>
<tr><td>Individual Assignment</td><td>Presentation / written test / practicum</td><td>75%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Lab Sheet practice Electric Machines: Direct Current Machines
2. Lab Sheet practice Electric Machines: Machines Not Simultaneous
3. Lab Sheet practice Electric Machines: Simultaneous Machines
4. Lab Sheet practice Electric Machine: Tramnsformator</td></tr>
<tr><td>Date of revision</td><td>31 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Power Electronics
Module level,if applicable:	Undergraduate
Code:	EKO6219
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Istanto Wahyu Djatmiko, M.Pd.
Lecturer(s):	Muhammad Ali, M.T. Drs. Sunomo, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work

<table>
<tr><td></td><td>implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes</td><td>CO1. Knowing about the component and part of the circuit power electronics
CO2. Knowing the uni directional Phase circuit and three Phase.
CO3. Understanding the series of triggers and commutations
CO4. Understanding of the converter circuits
CO5. Understanding of the ac regulator circuits
CO6. Understanding of the cycloconverter circuit
CO7. Understanding of the Chopper circuit
CO8. Understanding of the Inverter circuit
CO9. Understanding the characteristics of electric motors and their settings.
CO10. Understanding of the DC driver circuit and its application.
CO11. Understanding of the AC driver circuit and its application.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO8</td><td></td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO9</td><td></td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO10</td><td></td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO11</td><td></td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the conversion of electronic-based energy for the purposes of controlling large power electric equipment. The course material covers the concept of power electronics, power electronics components, AC / DC, DC / DC conversion circuits, AC / AC, DC / AC and drive circuits and industrial applications. Lectures are carried out using the student center learning approach with problem</td></tr>
</table>

<table>
<tr><td></td><td>based learning strategies. Competency-based assessment involves active participation in lectures, quizzes, midterm and end semester exams, and final semester exams.</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1
CO2
until
CO12</td><td>a. Individual Assignment</td><td>Presentation / written test</td><td>10%</td></tr>
<tr><td>b. Assignments</td><td>Presentation / written test</td><td>25%</td></tr>
<tr><td>c. Mid</td><td>Presentation / written test</td><td>30%</td></tr>
<tr><td>d. Final Exam</td><td>Presentation / written test</td><td>30%</td></tr>
<tr><td>e. Presence</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Breeze, Paul. (2005). Power Generation Technologies. Hongkong: Newnes.
2. Dandekar. (1991). Pembangkir Listrik Tenaga Air. Jakarta: UI- Press.
3. Djiteng Marsudi. (2005). Pembangkit Energi Listrik. Jakarta: Erlangga.
4. El Wakil. (1992). Instalasi Pembangkit Daya Jilid I. Jakarta: Erlangga.
5. Grigsby, Leonard L. (2007). Electric Power Generation, Transmission, and Distribution (Electric Power Engineering Handbook). New York: CRC.
6. Keljik,.Jeffrey J. (2008). Electricity 3: Power Generation and Delivery. Singapore: Delmar Cengage Learning.
7. Mahon, L.L.J. (1992). Diesel Generator Handbook. New York: Butterworth.
8. Pansini, Anthony J. & Smalling, K. D. (2005). Guide to Electric Power Generation. Texas: Fairmont Press.
9. PLN. (2002). Pembangkit Tenaga Listrik. Jakarta:</td></tr>
</table>

	PLN. 10. Sigalingging, K. (1994). *Pembangkit Listrik Tenaga Surya*. Bandung: Tarsito. 11. Singh, S. N. (2004). *Electric Power Generation Transmission and Distribution*. New Delhi: Prentice-Hall of India Pvt. Ltd. 12. Soelaiman. (2004). *Pembangkitan Energi Elektrik.* Bandung: Lab Konversi Energi Elektrik Jurusan Teknik Elektro ITB. 13. Willis, H. Lee. (2000). *Distributed Power Generation: Planning and Evaluation*. New York; CRC. 14. Wood, Allen J. dan Wollenberg, Bruce F. (2001). *Power Generation, Operation, and Control.* New Yersey: Wiley-Interscience.
Date of revision	18 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Commercial Electricity Installation
Module level,if applicable:	Undergraduate
Code:	EKO6220
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Djoko Laras Budiyo Taruno.
Lecturer(s):	1. Dr. Dra. Zamtinah, M.Pd. 2. Ir. Alex Sandria Jaya Wardhana, M.Eng
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works

	ELO4 Master in basic sciences and principles of electric
Course Outcomes	CO1. Devoted to God and able to show a religious attitude and character. CO2. Students agree to be active, responsible, and have the motivation to develop themselves. CO3. Students can analyze the phenomena that occur in transmission and distribution systems. CO4. Having the ability to speak, think critically and make the right decisions.
ELO and CO mapping	(see table below)
Courses Description:	This course contains basic concepts of commercial electricity installations. Coverage of materials in this course covers materials and equipment for commercial electrical installations, protection systems, installation and applicable installation requirements, wiring diagrams and one line for commercial electrical installations, lighting and power installations in commercial buildings, designation of users and users and panels, systems earth and lightning rods in Indonesia and the commissioning test.
Assessments	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude. The final mark will be weight as follow:

ELO and CO mapping:

	ELO1	ELO3	ELO4	ELO5
CO1	✓			
CO2		✓		
CO3		✓	✓	✓
CO4		✓	✓	✓

Assessments:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1-CO4	Attendance	Documentation	5%
		Assignment	Presentation / written test	30%
		Test Block I	Presentation / written test	15%
		Test Block II	Presentation / written test	15%

<table>
<tr><td></td><td><table>
<tr><td></td><td></td><td>Final Exam</td><td>Presentation / written test</td><td>35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Scheneider Electric Indonesia. (2002). Panduan Aplikasi Teknis. PT. Scheneider Indonesia.
2. Ir. Imam Sugandi, dkk. Panduan Instalasi Listrik Untuk Rumah. Yayasan Usaha Penunjang Tenaga Listrik: Jakarta.
3. John Wiley & Sons. (2000). Electrical Installation Handbook. Publicis MCD Verlag: Munich.
4. Robert L. Smith & Stephen L. Herman. (2002). Electrical Wiring Industrial 7^{th} Edition. Delmar.
5. Ray C. Mullin & Robert L. Smith. (2002). Electrical Wiring Commercial 7^{th} Edition. Delmar.</td></tr>
<tr><td>Date of revision</td><td>18 August 2019</td></tr>
</table>

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Module name:	Commercial Electricity Installation Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6221
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Djoko Laras Budiyo Taruno.
Lecturer(s):	1. Ir. Alex Sandria Jaya Wardhana, M.Eng 2. Ahmad Raditya Cahya Baswara, S.T., M.Eng.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Lecture, Discussion, Practicum, Question and Answer
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet. ELO4 Master in basic sciences and principles of electric. ELO5 Master in work standards, work methods, work implementations, and testing in electric power or

industrial automation expertise.

ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise

Course Outcomes

CO1. Devoted to God and able to show a religious attitude and character.

CO2. Students agree to be active, responsible, and have the motivation to develop themselves.

CO3. Students can analyze the phenomena that occur in transmission and distribution systems.

CO4. Having the ability to speak, think critically and make the right decisions.

ELO and CO mapping:

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓	✓	✓
CO4			✓	✓	✓

Courses Description:

This Commercial Electricity Installation Lab. Work course practices in commercial buildings. The scope of the material in this course covers the use of gauges in commercial installations, lighting installations in commercial buildings, 1-phase and 3-phase electric motor control techniques, cable connections, single switch installations, exchange switches and series switches to serve the load of lighting lamps equipped with safety, power installation, protection in commercial buildings, installation of protective equipment (MCB, ELCB, NFB, ACB, fuses) and automatic control using light sensors in commercial buildings.

Assessments:

Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1-CO4	Assignment	Practicum	35%
		Practicum report	Written report	20%
		Final Project Performance	Performance	20%
		Final Project Report	Written report	20%

<table>
<tr><td></td><td><table>
<tr><td></td><td></td><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board,</td></tr>
<tr><td>Literature:</td><td>1. Tim Instalasi. Jobsheet Praktik Instalasi Listrik Komersial.
2. Ir. Imam Sugandi, dkk. Panduan Instalasi Listrik Untuk Rumah. Yayasan Usaha Penunjang Tenaga Listrik: Jakarta.
3. John Wiley & Sons. (2000). Electrical Installation Handbook. Publicis MCD Verlag: Munich.
4. Ray C. Mullin & Robert L. Smith. (2002). Electrical Wiring Commercial 7th Edition. Delmar.
5. Ronald P. O’Riley. (1988). Electrical Grounding. Delmar Publishesrs Inc.
6. Scheneider Electric Indonesia. (2002). Panduan Aplikasi Teknis. PT. Scheneider Indonesia.</td></tr>
<tr><td>Date of revision</td><td>09 July 2019</td></tr>
</table>

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Module name:	Occupational Health And Safety
Module level,if applicable:	Undergraduate
Code:	KTF6207
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Ketut Ima Ismara, M.Pd, M.Kes
Lecturer(s):	1. Dr. phil Nurhening Yuniarti, S.Pd.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Lecture, Discussion, Question and Answer
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet. ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.

	ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise.
Course Outcomes	CO1. Devoted to God and able to show a religious attitude and character, CO2. Students actively participate, take responsibility, and have the motivation to develop themselves, CO3. Describe K3 and work productivity, CO4. Recognizing the source of danger and its mitigation, CO5. Understanding occupational diseases (PAK), CO6. Understand work accidents (KAK), CO7. Knowing the precautions for PAK and KAK, CO8. Explain the type and function of work safety equipment, CO9. K3 Management CO10. Have the ability to communicate effectively, think critically and make the right decisions.

ELO and CO mapping:

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓	✓	
CO4			✓	✓	✓
CO5			✓	✓	✓
CO6			✓	✓	✓
CO7			✓	✓	✓
CO8			✓	✓	✓
CO9			✓	✓	✓
CO10			✓		✓

Courses Description:	Occupational health and safety (K3) courses contain an understanding of the relationship between safety and work productivity, sources of hazards and their mitigation, occupational diseases, work-related accidents, prevention of occupational diseases and work-related accidents, types and functions of work safety devices, and K3 management.
Assessments:	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from

<table>
<tr><td></td><td>this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO2, CO3, CO4 and CO5</td><td>Assignment</td><td>Task</td><td>20%</td></tr>
<tr><td>Practicum report</td><td>Written report</td><td>10%</td></tr>
<tr><td>Midterm Exam</td><td>Performance</td><td>30%</td></tr>
<tr><td>final exams</td><td>Written report</td><td>30%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Anwar Prabu Mangkunegara. (2002). Manajemen Sumber Daya Manusia Perusahaan. Bandung: PT. Remaja Rosda Karya.
2. Departemen Tenaga Kerja. (2000). Dasar dasar keselamatan dan kesehatan kerja. Jakarta.
3. Mondy, R.W. (2008). Manajemen sumber daya manusia. Edisi kesepuluh jilid 1. Jakarta: Erlangga.
4. Mondy, R.W. (2008). Manajemen sumber daya manusia. Edisi kesepuluh jilid 2 . Jakarta: Erlangga.
5. Rudi Suardi. (2005). Sistem manajemen keselamatan dan kesehatan kerja. Jakarta: Lembaga Manajemen PPM
6. Undang-undang No. 1 Tahun 1970 tentang Keselamatan Kerja.</td></tr>
<tr><td>Date of revision</td><td>09 July 2019</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Web:ft.uny.ac.id, E-mail: elektro@uny.ac.id

Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Educational Socio-Antropology
Module level,if applicable:	Undergraduate
Code:	MDK6204
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	3rd
Module coordinator:	Dr. Ariefa Efianingrung, M.Si
Lecturer(s):	1. Dr. Ariefa Efianingrung, M.Si 2. Datu Jatmiko, M.A
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Inquiry and Lecturing.
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications

<table>
<tr><td></td><td>technology</td></tr>
<tr><td>Course Outcome:</td><td>CO1. Devoted to God Almighty and able to show a religious attitude and rusty with gratitude for the gifts that have been owned
CO2. Students actively participate, take responsibility, and have the motivation to develop themselves
CO3. Master the concepts and theories of educational sociology and anthropology
CO4. Understand and use socio-cultural methodology in education
CO5. Able to analyze various educational problems from a sociological and anthropological perspective</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course discusses education as a socio-cultural process. This course provides basic knowledge about the importance of climate, approaches, and socio-cultural influences, both from school and from outside the school (family, peer groups, nation-society, and mass media) in multicultural (pluralistic) societies.) and education that is most suitable for humans (anthropos) in realizing Indonesia's current and future national education goals. (ambil di RPS)</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">CO1 – CO5</td><td>Individual Assignment</td><td>Presentation / written test</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>written test</td><td>15%</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td></td><td></td><td>Mid</td><td>written test</td><td>25%</td></tr>
<tr><td></td><td></td><td>Final Exam</td><td>written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Septi ,SW., et all. 2017. Sosio dan Antropologi Pendidikan. Yogyakarta: UNY Press.
2. Ballatine, Jeanne H. 1985. School and Society: A Reader in Education and Sociology. London: Mayfield Publshing Company.
3. Farida Hanum. 2011. Sosiologi Pendidikan. Yogyakarta: Kanwa Publisher.
4. Harrison, L.E. & Huntington, S.P. (ed). 2000. Culture Matters, How Values Shape Progress. New York: Basic Books.
5. Imran Manan. 1989. Anthropologi Pendidikan, Suatu Pengantar (Terj. George F. Kneller). Jakarta: P2LPTK Dirjen Dikti.
6. Sunyoto Usman. 2015. Sosiologi: Sejarah, Teori, dan Metodologi. Yogyakarta: Pustaka Pelajar.
7. Suyata, dkk. 2000. Modul Socio-Antroplogi Pendidikan. Semi-Que.
8. Tilaar, H.A.R. 1999. Pendidikan, Kebudayaan, dan Masyarakat Madani Indonesia. Bandung: Remaja Rosdakarya.</td></tr>
<tr><td>Date of revision</td><td>10 August 2019</td></tr>
</table>

4th SEMESTER

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Technology and Vocational Education
Module level,if applicable:	Undergraduate
Code:	KTF6208
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Dr. Istanto Wahyu Djatmiko, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Quiz, Inquiry and Lecturing.
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO5 Master in work standards, work methods, work

<table>
<tr><td></td><td>implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology</td></tr>
<tr><td>Courses Outcomes:</td><td>CO1 Fear God Almighty and be able to show a religious attitude
CO2 Demonstrates a responsible and independent attitude towards the assigned work
CO3 Having the ability to communicate effectively, think critically, and make informed decisions
CO4 Understand comprehensively the concepts of planning, implementing, and evaluating curriculum and being able to apply it in the development of vocational education curriculum</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO5</th><th>ELO6</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course provides students with insight, knowledge, and learning experiences about the nature of technology and vocational / vocational education (VE) which includes: (1) VE foundation, (2) VE development, (3) VE role, (4) VE implementation model , (5) policies in VE, and (6) contemporary issues of VE. Lectures are carried out in the form of lectures and class and group discussions by assigning critical observations and analyzes to the practices of implementing vocational education in Indonesia</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:</td></tr>
</table>

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO14	Attendace	Presentation / written test	10%
		Individual Assignment/Group Assignment	written test	20%
		Mid	written test	30%
		Final Exam	written test	40%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Depdiknas. 1997. Ketrampilan menjelang 2020 Untuk Era Global. Jakarta: Depdiknas. 2. Soeharsono Sagir. 1989. Membangun Manusia Karya. Jakarta: Pustaka Sinar Harapan. 3. Thompson, J.F. 1973. Foundation of Vocational Education: Social and Philosophical Concept. New Jersey: Prentice Hall. 4. Wardiman Djojonegoro. 1990. Mengembangkan manusia melalui pendidikan kejuruan. Jakarta. 5. Fink, C.R. & Crunkilton, J.R. 1999. Curriculum Development in Vocational and Technical Education: Planning, Content, and Implementation. Boston: Allyn And Bacon. 6. Maclean, R & Wilson, D. 2010. International Handbook of Educatio fot The Changing World of Work. Bridging Academic and Vocating Learning. UNESCO-UNEVOC International Center for Technical anf Vocational Education Training. Bonn: Springer. 7. Dedi, Supriadi. 2002. Sejarah Pendidikan Teknik dan Kejuruan Indonesia: Membangun manusia Produktif. Jakarta: Direktorat Pendidikan Menengah Kejuruan, Direktorat Jendral Pendidikan Dasar dan Menengah, Departemen Pendidikan Nasional.
Date of revision:	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Power Electronics Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6222
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Dr. Istanto Wahyu Djatmiko
Lecturer(s):	1. Drs. Sunomo, MT. 2. Muhamad Ali, ST.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics

<table>
<tr><td></td><td>ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God Almighty and able to practice discipline and character,
CO2 Students are proactive, responsible, and have the motivation to develop themselves,
CO3 Students are able to practice power electronic circuits according to their characteristics,
CO4 Students are able to make practice reports based on practical results data,
CO5 Have the ability of discipline, teamwork, critical thinking and make the right decisions,</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course practices electronic energy-based energy conversion for the purpose of controlling large power electric equipment. Practice materials include the introduction of power electronics practice units, power electronic components, AC / DC, DC / DC conversion circuits, AC / AC, DC / AC, and drive circuits and their applications. Lectures are conducted using a learning approach at the student center with a project-based learning strategy. Competency-based assessment involves active participation in practicum, preparation, data collection, reporting of practicum results, and individual examinations.</td></tr>
</table>

<table>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO5</td><td>Assignment</td><td>Practicum</td><td>10%</td></tr>
<tr><td>Practicum report</td><td>Written report</td><td>25%</td></tr>
<tr><td>Final Project Performance</td><td>Performance</td><td>30%</td></tr>
<tr><td>Final Project Report</td><td>Written report</td><td>30%</td></tr>
<tr><td>Attendance</td><td></td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Tim Praktik Elektronika Daya. (2015). Labsheet Praktik Elektronika Daya. Yogyakarta: Jurusan Pendidikan Teknik Elektro FT UNY
2. Tim Praktik Elektronika Daya. (2015). Buku Laporan Praktik Elektronika Daya. Yogyakarta: Jurusan Pendidikan Teknik Elektro FT UNY.</td></tr>
<tr><td>Date of revision</td><td>18 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electricity Installation Design
Module level,if applicable:	Undergraduate
Code:	EKO6223
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Dr. Djoko Laras Budyo Taruno, M.Pd.
Lecturer(s):	Ir. Alex Sandria Jaya Wardhana, M.Eng.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week.
Teaching and Learning Method	Presentation, Discussion, Question and Answer, Problem Based Learning, Problem Solving.
Workload:	Total workload is 90 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or

<table>
<tr><td></td><td>industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Thanks to God and able to show a religious attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Students are in planning the electrical field in office buildings, hotels, industry.
CO4 Students are able to plan electricity in office buildings, hotels, industry.
CO5 Students are able to do mechanical and electrical planning calculations in office buildings, hotels, industry.
CO6 Students are able to draw mechanical and electrical planning drawings in office buildings, hotels, industries.
CO7 Students are able to make work plans and mechanical and electrical requirements in office buildings, hotels, industry.
CO8 Students are able to make an analysis of the costs of mechanical and electrical work in office buildings, hotels, industry.
CO9 Students are able to make mechanical and electrical commissioning testing plans in office buildings, hotels, industry.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO8</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO9</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Basic planning, electrical system & installation planning, lighting, power, electrical panels, lightning protection, air conditioning / air conditioning, telecommunications, sound & MATV, CCTV & building security alarms, fire alarms, technical requirements, technical analysis, job analysis, cost analysis</td></tr>
</table>

<table>
<tr><td></td><td>and budget plan, Inspections and tests.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 – CO9</td><td>Attitude</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Individual Assignment/Group Assignment</td><td>Presentation</td><td>10%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="3"></td><td>Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Gunter G Seip, (2000). Electrical Installations Handbook
2. WE Steward & J Watkins, Modern Wiring Practice
3. Muhaimin, (2001). Teknologi Pencahayaan.
4. Wlliam & Richard, (1997) Mechanical and Eelctrikal systems in Building.
5. PUIL 2000
6. Supreme, GAE, MG, Telemecanique Cataloges
7. Philips, TOA, National, Nitan, Ademco cataloges
8. Prasimax, (2002) Protocol TCP</td></tr>
<tr><td>Date of revision:</td><td>08 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electricity Installation Design Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6224
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Dr. Djoko Laras Budyo Taruno, M.Pd.
Lecturer(s):	Ir. Alex Sandria Jaya Wardhana, M.Eng.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week.
Teaching and Learning Method	Discussion, Observation, Project Based Learning, Presentation.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or

	industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes:	CO1 Thanks to God and able to show a religious attitude and character, CO2 Students actively participate, take responsibility, and have the motivation to develop themselves, CO3 Students are in planning the electrical field in office buildings, hotels, industry. CO4 Students are able to plan electricity in office buildings, hotels, industry. CO5 Students are able to do mechanical and electrical planning calculations in office buildings, hotels, industry. CO6 Students are able to draw mechanical and electrical planning drawings in office buildings, hotels, industries. CO7 Students are able to make work plans and mechanical and electrical requirements in office buildings, hotels, industry. CO8 Students are able to make an analysis of the costs of mechanical and electrical work in office buildings, hotels, industry. CO9 Students are able to make mechanical and electrical commissioning testing plans in office buildings, hotels, industry. CO10 Students can make PLC programs with the Ladder Diagram programming language for solving machine control cases and PLC-based processes.
ELO and CO mapping:	(see table below)
Courses Description:	Basic planning, electrical system & installation planning, lighting, power, electrical panels, lightning protection, air

ELO and CO mapping:

	ELO1	ELO4	ELO5	ELO6
CO1	✓			
CO2	✓			
CO3		✓		
CO4		✓		
CO5			✓	
CO6			✓	
CO7			✓	
CO8			✓	
CO9			✓	
CO10			✓	✓

<table>
<tr><td></td><td>conditioning / air conditioning, telecommunications, sound & MATV, CCTV & building security alarms, fire alarms, technical requirements, technical analysis, job analysis, cost analysis and budget plan, Inspections and tests.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 – CO10</td><td>Attitude</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Individual Assignment/Group Assignment</td><td>Observation report</td><td>20%</td></tr>
<tr><td>Mid</td><td>Practicum test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Practicum test</td><td>40%</td></tr>
<tr><td colspan="4" align="right">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Gunter G Seip, (2000). Electrical Installations Handbook
2. WE Steward & J Watkins, Modern Wiring Practice
3. Muhaimin, (2001). Teknologi Pencahayaan.
4. WIliam & Richard, (1997) Mechanical and Eelctrikal systems in Building.
5. PUIL 2000
6. Supreme, GAE, MG, Telemecanique Cataloges
7. Philips, TOA, National, Nitan, Ademco cataloges
8. Prasimax, (2002) Protocol TCP</td></tr>
<tr><td>Date of revision</td><td>15 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Statistics
Module level,if applicable:	Undergraduate
Code:	MKU6210
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Aditya Arie Nugraha, Ph.D.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet. ELO5 Master in work standards, work methods, work

	implementations, and testing in electric power or industrial automation expertise. ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology. ELO8 Capable to apply research and scientific writing methods.
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude and character that is implemented in learning and learning outcomes. CO2 Students actively participate, take responsibility, discipline, be able to work together, and have the motivation to develop themselves. CO3 Describe the basic concepts of parametric and nonparametric statistics. CO4 Compare descriptive and inferential statistics. CO5 Make a frequency distribution. CO6 Make various types of graphs. CO7 Using the binomial distribution, khai-squared, normal, t, and Fisher for hypothesis testing. CO8 Analyzing data with correlation techniques, regression analysis, and ANAVA statistics. CO9 Using the SPSS program package to analyze data CO10 Interpreting the results of data analysis. CO11 Choosing the right statistical technique for a research problem.

ELO and CO mapping:

	ELO1	**ELO2**	**ELO5**	**ELO7**	**ELO8**
CO1	✓				
CO2		✓			
CO3					✓
CO4					✓
CO5			✓	✓	✓
CO6			✓	✓	✓
CO7				✓	✓
CO8				✓	✓
CO9				✓	✓
CO10				✓	✓
CO11				✓	✓

<table>
<tr><td>Courses Description:</td><td>This subject discusses the role of statistics in the field of research, descriptive statistics: frequency distribution, steam-leaf distribution, inferential statistics: probability theory discrete change, binomial distribution, normal continuous variable distribution, chi-square, student-t and Fisher; characteristics of the sampling distribution, hypothesis testing: a difference test of two groups with the t-opportunity distribution, different tests of more than two groups with variance analysis with assumptions and further tests; correlation and regression analysis, and usage some nonparametric statistics. The discussion includes basic concepts, applications, interpretation of data analysis results using the SPSS program package.</td></tr>
<tr><td>Assessment:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1 - CO11</td><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Assignment</td><td>Precentation</td><td>15%</td></tr>
<tr><td>Project assigment</td><td>Precentation</td><td>15%</td></tr>
<tr><td>Midterm exams</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final exams</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Howerl, David C. (1987). Statistical methods for Psychology. Boston :Duxbury Press.
2. Pedhazur, E.J. (1982). Multiple Regresion Bihavioral Research. New York : Holt, Rinehart and Wiston.</td></tr>
<tr><td>Date of revision</td><td>13 July 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power Protection
Module level,if applicable:	Undergraduate
Code:	EKO6225
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4rd
Module coordinator:	Dr. Edy Supriyadi
Lecturer(s):	1. Ir.alex Sandria J. Wardhana,M.Eng 2. Totok Sukisno, S.Pd,M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method:	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

<table>
<tr><td></td><td>ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devotion to God Almighty, devout worship and noble deeds.
CO2 Students agree to be active, responsible, and have the motivation to develop themselves,
CO3 Students have competencies about Overcurrent Relays, Differential Relays, Voltage Relays, Power Relays, Temperature Relays, Power Breakers; Protection at substations, Transformer Protection, Transmission Network Protection, Distribution Network Protection, Motor Protection, and Building Protection.
CO4 Having the ability to speak, think critically and make the right decisions regarding the electric power protection system .</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This Electric Power Protection Practice Lectures will develop student competencies regarding the need for Overcurrent Relays, Differential Relays, Voltage Relays, Power Relays, Temperature Relays, Power Breakers; Protection at substations, Transformer Protection, Transmission Network Protection, Distribution Network Protection, Motor Protection, and Building Protection. Lectures are carried out with a variety of discussions that are appropriate to the material and potential of students, including: contextual, project-based learning, and problem-based learning that is directed at learning at the student center. The assessment is carried out on a competency basis and is aligned with the lecture activities.</td></tr>
<tr><td>Study/exam achievements:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the</td></tr>
</table>

assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 - CO4	Attendance	Documentation	10%
		Assignment	Precentation	20%
		Mid	written test	30%
		Final Exam	written test	40%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Bonar Pandjaitan. 2012. *Praktik-Praktik Proteksi Sistem Tenaga Listrik.* Yogyakarta: Andi Offset. 2. Christophe Prévé. 2006. *Protection of Electrical Networks*. London: ISTE,Ltd. 3. Edy Supriyadi, 2000. *Sistem Proteksi Tenaga Listrik.* Yogyakarta: Adi Cita. 4. Elmore Walter A. *Protective Relaying Theory & Application*. New York: Marcell Dekker 5. Lewis Blackburn & Thomas J. Domin. 2006. *Protective Relaying: Principles and Applications.* Taylor&Francis Group,LLC. 6. PT. PLN (Persero) P3B. 2006. *Materi Pelatihan O&M Relai Proteksi Jaringan*. Jakarta: PLN. 7. Russel Mason. *The Art & Science of Protective Relaying*. General Electric 8. Scheinder electric. Sepam range Sepam 1000+ Substation Transformer Motor Busbar
Date of revision:	31 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Programmable Logic Controller Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6327
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Totok Heru Tri Maryadi, M. Pd.
Lecturer(s):	1. Sigit Yatmono, ST.,M.T. 2. Amelia Fauziah Husna,M. Pd.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week.
Teaching and Learning Method	Presentation, Discussion, Question and Answer, Problem Based Learning, Problem Solving.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.
Credit points:	3
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work

	implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes:	CO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics CO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet CO3 Students can identify the components of the input module and output module in PLC-based control, CO4 Students can explain boolean basic logic instructions (AND, OR, and NOT) on PLC programming, CO5 Students can apply memory flag instructions (internal relay) on PLC programming, CO6 Students can apply timer instructions on PLC programming, CO7 Students can apply counter instructions (enumerators) on PLC programming, CO8 Students can apply arithmetic instructions (addition, subtraction, multiplication, division, and comparison) in PLC programming, CO9 Students can explain the scale instructions for analog input and analog output in PLC programming, CO10 Students can make PLC programs with the Ladder Diagram programming language for solving machine control cases and PLC-based processes.
ELO and CO mapping:	(see table below)

	ELO1	ELO4	ELO5	ELO6
CO1	✓			
CO2	✓			
CO3		✓		
CO4		✓		
CO5			✓	
CO6			✓	
CO7			✓	
CO8			✓	
CO9			✓	
CO10			✓	✓

<table>
<tr><td>Courses Description:</td><td>This course discusses theory and practices PLC-based process control. The discussion includes component input modules, output modules, memory flags, timers, counters, arithmetic, and analog input and analog output. Practicum is carried out using the problem based learning approach individually or in groups using practicum worksheets. Competency-based assessment at the end of the lecture individually.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 – CO10</td><td>Attitude</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Individual Assignment/Group Assignment</td><td>Presentation</td><td>20%</td></tr>
<tr><td>Mid</td><td>Practicum test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Practicum test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Bolton, W. (2015). Programmable logic controllers. Newnes.
2. Pardey, J., Amroun, A., Bolton, M., & Adamski, M. (1994). Parallel controller synthesis for programmable logic devices. Microprocessors and Microsystems, 18(8), 451-457.
3. Frank D. Petruzella, Programmable Logic Controllers, 3rd edition, McGraw-Hill Ed. US 2005</td></tr>
<tr><td>Date of revision</td><td>12 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Industrial Electricity Installation
Module level,if applicable:	Undergraduate
Code:	EKO6228
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Alex Sandria Jaya W, S.Pd
Lecturer(s):	1. Dr.Zamtinah,M.Pd 2. Dr.Ir.Djoko Laras Budiyo Taruno,M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week
Teaching and Learning Method:	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance

	to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes:	CO1 Devoted to God and able to show a religious attitude and character, CO2 Students agree to be active, responsible, and have the motivation to develop themselves, CO3 Students can manage the operation of the power generation system from the generator to the user. CO4 Having the ability to speak, think critically and make the right decisions
ELO and CO mapping:	(see table below)
Courses Description:	This course discusses the completion of industrial electrical installations. Coverage of materials in this course covers materials and equipment for industrial electrical installations, protection systems, installation and applicable installation requirements, wiring diagrams and single lines in industrial electrical installations, lighting and power installations in industry, setting conductor and distribution capacity, feeders and panels , medium voltage protection systems, power factor improvements and capacitor installation techniques, grounding systems and lightning rods in Indonesia as well as the commissioning test.
Study/exam achievements:	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

ELO and CO mapping:

	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6
CO1	✓					
CO2		✓				
CO3			✓	✓	✓	
CO4						✓

<table>
<tr><td></td><td>
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1-CO4</td><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Assignment</td><td>Presentation</td><td>20%</td></tr>
<tr><td>Mid Exam</td><td>written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Scheneider Electric Indonesia. (2002). Panduan Aplikasi Teknis. PT. Scheneider Indonesia.
2. Ir. Imam Sugandi, dkk. Panduan Instalasi Listrik Untuk Rumah. Yayasan Usaha Penunjang Tenaga Listrik: Jakarta.
3. John Wiley & Sons. (2000). Electrical Installation Handbook. Publicis MCD Verlag: Munich.
4. Robert L. Smith & Stephen L. Herman. (2002). Electrical Wiring Industrial 7th Edition. Delmar.
5. Ray C. Mullin & Robert L. Smith. (2002). Electrical Wiring Commercial 7th Edition. Delmar.
</td></tr>
<tr><td>Date of revision:</td><td>31 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Industrial Electricity Installation Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6229
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Alex Sandria Jaya W, S.Pd
Lecturer(s):	1. Dr.Zamtinah,M.Pd 2. Dr.Ir.Djoko Laras Budiyo Taruno,M.Pd
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week
Teaching and Learning Method:	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

<table>
<tr><td></td><td>ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise.</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God and able to show a religious attitude and character.
CO2 Students agree to be active, responsible, and have the motivation to develop themselves.
CO3 Students can analyze the phenomena that occur in transmission and distribution systems.
CO4 Having the ability to speak, think critically and make the right decisions.</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course practices the application of industrial electrical installations ranging from security systems to automation of electrical installations in industry. The scope of material in this course covers the complete electrical components commonly used in industry, manual and automatic 3-phase motor controllers, power factor improvements using bank capacitors with manual or automatic settings, automatic main failures as main network backup (PLN) compilation automatic and relay based shutdown, 20 kv medium voltage protection system and industrial installation based on programmable logic control (PLC).</td></tr>
<tr><td>Study/exam achievements:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.</td></tr>
</table>

<table>
<tr>
<td></td>
<td>
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1
- CO4</td><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Comptence Test 1</td><td>Performance Test</td><td>25%</td></tr>
<tr><td>Competence Test 2</td><td>Performance Test</td><td>25%</td></tr>
<tr><td>Competence Test 3</td><td>Performance Test</td><td>25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Tim Instalasi. Jobsheet Praktik Instalasi Listrik Industri
2. Ir. Imam Sugandi, dkk. Panduan Instalasi Listrik Untuk Rumah. Yayasan Usaha Penunjang Tenaga Listrik: Jakarta.
3. John Wiley & Sons. (2000). Electrical Installation Handbook. Publicis MCD Verlag: Munich.
4. Robert L. Smith & Stephen L. Herman. (2002). Electrical Wiring Industrial 7th Edition. Delmar.
5. Ronald P. O'Riley. (1988). Electrical Grounding. Delmar Publishesrs Inc.
6. Scheneider Electric Indonesia. (2002). Panduan Aplikasi Teknis. PT. Scheneider Indonesia.
</td></tr>
<tr><td>Date of revision:</td><td>31 August 2019</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Industrial Management
Module level,if applicable:	Undergraduate
Code:	EKO6230
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Muhamad Ali, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week.
Teaching and Learning Method	Presentation, Discussion, Question and Answer, Problem Based Learning, Problem Solving.
Workload:	Total workload is 90 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO5 Master in work standards, work methods, work

	implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1 Thanks to God and able to show a religious attitude and character, CO2 Students actively participate, take responsibility, and have the motivation to develop themselves, CO3 Students have knowledge about management and organization and how to achieve the vision of the organization effectively and efficiently by optimizing available resources. CO4 Students are able to master the science of industrial management. CO5 Students are able to present and teach industrial management knowledge well. CO6 Students are able to express opinions in discussions relating to the field of industrial management. CO7 Students have the ability to communicate effectively, think critically and make the right decisions.
ELO and CO mapping:	

	ELO1	ELO3	ELO5	ELO6
CO1	✓			
CO2	✓			
CO3		✓		
CO4		✓	✓	
CO5			✓	✓
CO6		✓		
CO7		✓		✓

Courses Description:	Industrial Management is a subject supporting the competence of technicians and electrical engineering teachers to understand the conditions of the workforce and industry in general. The material covered includes management and organization, the development of management theory, decision making, management styles, industrial production processes, work procedures, work culture, quality management, human resource management and information systems management. After completing this lecture, students are expected to have insight, knowledge, skills and attitudes that can increase work effectiveness and efficiency in order to

	achieve organizational goals by optimizing available resources. Lectures are carried out using the student center learning approach. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.
Assessments:	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude. The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO7	Attendance	Documentation	10%
		Individual Assignment/Group Assignment	Presentation	20%
		Mid Exam	Written test	30%
		Final Exam	Written test	40%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Hani Handoko (1995), Management, BPFE Yogyakarta 2. Koontz, H, Weinrich H (1998). Management, McGraw Hill 3. Muhamad Ali. (2011). Modul Kuliah Manajemen Industri 4. Z. Sutalaksana, dkk (1997). Teknik Tata Kerja, Ganexa Exact Bandung
Date of revision	06 July 2019

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Counseling Guidance
Module level,if applicable:	Undergraduate
Code:	MDK6205
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Dr. Ketut Ima Ismara, M.Pd.,M.Kes.
Lecturer(s):	1. Mutaqin, M.Pd., M.T. 2. Dr. Edy Supriyadi
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

<table>
<tr><td></td><td>ELO3 Capable to perform professional works in his/her field of expertise both individual and team works
ELO9 Capable to develop a vocational education innovation and publish scientific paper</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God who is almighty and capable of showing religious attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Mastery of the concept of the nature and urgency of guidance and counseling in schools,
CO4 Mastery of the concept of purpose and function of guidance and counseling in schools,
CO5 Mastery of the principles and principles of guidance and counseling,
CO6 Mastery of the concept of understanding of individual students,
CO7 Mastery of the concepts and praxis of counseling services in schools and case transfer,</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO9</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO6</td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO7</td><td></td><td>✓</td><td>✓</td><td></td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Guidance and Counseling, is a science and skills course. This course develops student understanding (prospective subject teachers / fields of study) about guidance and counseling in schools and the role of subject teachers / fields of study in guidance and counseling services in schools.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.</td></tr>
</table>

<table>
<tr><td></td><td>The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 – CO7</td><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Assignment</td><td>Presentation</td><td>20%</td></tr>
<tr><td>Mid Exam</td><td>written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Sukardi, dewa Ketut. 2010. Pengantar Pelaksanaan Program Bimbingan dan Konseling di Sekolah. Jakarta: Penerbit Rineka Cipta
2. Crain, W. 2007. Teori Perkembangan: Konsep dan Aplikasi. Yogyakarta: Pustaka Pelajar
3. Yusuf, S dan Nurihsan, J. 2010. Landasan Bimbingan dan Konseling. Bandung: PT. Remaja Rosdakarya
4. Sutirna. 2013. Bimbingan dan Konseling, Pendidikan Formal, Non Formal dan Informal. Yogyakarta: Penerbit Andi Offset
5. Wardati & Jauhar, M. 2011. Implementasi Bimbingan dan Konseling di Sekolah. Jakarta: Penerbit Prestasi Pustakaraya
6. Sukmadinata,N.S. 2007. Bimbingan dan Konseling dalam Praktek. Bandung: Maestro
7. Winkel, W.S.,& Sri Hastuti. 2004. Bimbingan dan Konseling di Institusi Pendidikan. Yogyakarta: Media Abadi.
8. Prayitno & Erman Amti. 2010. Dasar-Dasar Bimbingan dan Konseling. Jakarta: Penerbit Rineka Cipta</td></tr>
<tr><td>Date of revision</td><td>10 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power System Analysis
Module level,if applicable:	Undergraduate
Code:	EKO6231
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4th
Module coordinator:	Dr. Giri Wiyono, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week.
Teaching and Learning Method	Presentation, Discussion, Question and Answer, Problem Based Learning, Problem Solving.
Workload:	Total workload is 90 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric

<table>
<tr><td></td><td>ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Thanks to God and able to show a religious attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Students have knowledge of the concept of electric power systems,
CO4 Students are able to mention and explain the components of the electric power system, the types of disturbances in the electric power system,
CO5 Students are able to calculate the amount of electric current that occurs if the electric power system is interrupted,
CO6 Students are able to identify power losses that occur in the electric power system,
CO7 Students are able to optimize by minimizing power losses in a simple electric power system,
CO8 Students are able to present and teach the electric power system,
CO9 Students have the ability to communicate effectively, think critically and make the right decisions,</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO7</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO8</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO9</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Electric Power System Analysis is a theoretical course given to students to equip capabilities in the field of electric power systems and analysis to obtain a stable and optimal system.</td></tr>
</table>

<table>
<tr><td></td><td>The material covered includes the basic concepts of electric power systems, electric power system components, electric power system disturbances, types of power system disturbances, short circuit fault analysis, sudden cause analysis on electric power systems, studies of electricity load flow, electric power system stability and electric power system optimization. Lectures are carried out using the student center learning approach through lecture lectures in class combined with group discussions and case studies. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 – CO9</td><td>Attitude</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Individual Assignment/Group Assignment</td><td>Presentation</td><td>20%</td></tr>
<tr><td>Mid Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Stevenson, William D, 1984. Analisis Sistem Tenaga Listrik, Jakarta. Penerbit Erlangga
2. Lazaar, Irwin, 1980. Electrical System Analysis and Design for Industrial Plants. New York. McGraw - Hill Book Company.
3. Grainger John J. and Stevenson, William D 1994, Power System Analysis. Singapore. McGraw – Hill
4. Turan Gonnen, 1999, Electrical McGraw – Hill</td></tr>
<tr><td>Date of revision</td><td>08 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Intelligent Control System
Module level,if applicable:	Undergraduate
Code:	EKO6235
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	4^{th}
Module coordinator:	Dr. Haryanto, M.Pd., M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet.

<table>
<tr><td></td><td>ELO4 Master in basic sciences and principles of electric.
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise.</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Devoted to God Almighty and able to show a regius attitude and character that is implemented in learning and learning outcomes.
CO2 Students actively participate, take responsibility, discipline, be able to work together, and have the motivation to develop themselves.
CO3 Students are able to develop (plan, make, and present) a variety of intelligent control programs for process operations to be effective and efficient and to optimize results / products.
CO4 Having the ability to work effectively, think critically and make the right decisions quickly in making intelligent control system programs.</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>Intelligent Control System lectures to develop the ability of students to be able to develop control systems for control machines and or electronic / electrical equipment and be able to implement them for various control processes by prioritizing the principles of improving the performance of intelligent control systems based on fuzzy logic (LF), networks artificial nerves (ANN) and genetic algorithms (AG), both software and hardware-software. Lectures are carried out using the student center learning approach, with problem based and case based learning models. Competency-based assessment involves active participation, individual and group assignments, midterms and final semester exams.</td></tr>
<tr><td>Assessment:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component</td></tr>
</table>

<table>
<tr><td></td><td>of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 - CO4</td><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td>Assignment</td><td>Written test</td><td>20%</td></tr>
<tr><td>Midterm exams</td><td>Written test</td><td>30%</td></tr>
<tr><td>Final exams</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Ghalnaraghi, F., and Kuo, B. 2010. Automatic control systems, USA: John Wesley Addison.
2. Houpis, C.H., & Lamont, G.B. (1992). Digital control systems theory, hardware, software. (2nd Ed.). New York: McGraw Hill, Inc.
3. Luger. 2005. Artificial intelligence. USA: John Wesley Addison.
4. Nie, J. & Linkens, D. (1995). Fuzzy-neural control: principles, algorithms and applications. New Jersey: Prentice Hall Inc.
5. Ogata (2006). Automation control systems. USA: Mc. Graw Hill.
6. Sukla, R.C. (2001). Control Systems. Delhi: Dhanpat Rai & Co. (Pvt.) Ltd.</td></tr>
<tr><td>Date of revision</td><td>13 July 2019</td></tr>
</table>

5th SEMESTER

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Instructional Media
Module level,if applicable:	Undergraduate
Code:	KTF6203
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. Sunaryo Soenarto, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demostration, and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. ELO2 Knowledge of the concepts of developing learning strategies, and learning media for technology and vocational education in the field of Electrical Engineering. ELO3 Able to plan, train, and study the fields of electrical or automation engineering used. ELO4 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology
Course Outcomes:	CO1 Students who are dedicated to Allah SWT and are able to show attitudes and character regius. CO1.1 Students agree to be active, responsible, and have motivation to develop themselves, CO2. Explain the relationship between communication theory, and also learning theory understanding, functions, benefits, advantages and disadvantages of learning media CO2.1 Check the taxonomies of various vocational learning media CO2.2 Analyzing the strengths and weaknesses of various learning media CO2.3 Apply the concept of developing printed teaching materials CO2.4 Applying the basic principles of photography in learning media CO2.5 Implement a learning video production program CO3 Students are able to communicate effective messages, think critically and make the right decisions,

	CO3.1 Students are able to compile a script of a video learning program CO4 Students are trained in managing electronic media and conventional media CO4.1 Students are able to work in groups in synergy in producing instructional video media,
ELO and CO mapping:	(see mapping table below)
Courses Description:	This course discusses the development of contextual thinking (in accordance with study programs in the studio) and elements of learning media. The main study discusses: concept communication, learning communication, information technology, functions and benefits of instructional media, as well as conventional instructional economic media, model development, instructional design. Examining printed and electronic learning media applications such as posters, photos, videos, audio visual and multimedia. Learn the rules, structure and methods of media development (4D and ADDIE). Lectures are carried out by agreeing to student learning centers and production media independently. Competency-based assessment and sponsored performance and active communication.

ELO and CO mapping:

	ELO1	ELO2	ELO3	ELO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

<table>
<tr>
<td>Assessments:</td>
<td>
1. Assessment is carried out to measure all learning achievements, namely attainment learning achievements (CPMK 1), general skills (CPMK 2), knowledge (CPMK 3), and special skills (CPMK 4 and CPMK 5).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using considerations on each student having a good attitude. Read more about like, good, and very good attitude. Assessment results are not a component of a student's final grade, approved as one of the graduation requirements. Students who will graduate from this course have a minimum of good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades complete the results of knowledge, general skills, and special skills obtained from individual assignments, group assignments, Midterm Exams, presentations and final products with the following guidelines.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO3
CO4
CO5</td><td>Presentation</td><td>Observation</td><td>30%</td></tr>
<tr><td>Individual task</td><td>Accuracy of results with task criteria</td><td>25%</td></tr>
<tr><td>Group task</td><td>Accuracy of results with task criteria</td><td>25%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>
1. Arif Sardiman. (2001). Media Pendidikan. Jakarta: Pustekkom Diknas.
2. Azhar Arsyad. (2003). Media Pembelajaran.Jakarta PT. Raja Grafindo Persada.
3. Chapman, Nigel and Jenny Chapman.(2004). Digital
</td>
</tr>
</table>

	Multimedia. England: John Wiley & Sons Ltd. 4. Heinrich,R., Molenda,M. and Russel. (1982). Instructional Media. New York: John Willey & Sons. 5. Nana Sudjana dan Ahmad Rivai. (1997). Media Pengajaran, Bandung: Sinar Baru 6. Smaldino, E. Sharon et.al (2012). Instructional Technology and Media For Learning, New Jersey: Merril Prentice Hall 7. Sunaryo Soenarto dkk. (2012). Media Pembelajaran Teknologi dan Kejuruan, Yogyakarta: FT UNY. 8. Yunardi. (2002). Belajar Sendiri Adobe Photoshop 6,0. Surabaya: Indah.
Date of revision	30 August 2018

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Curriculum and Instructional of Vocational
Module level,if applicable:	Undergraduate
Code:	KTF6201
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Dr. Sunaryo Soenarto, M.Pd.
Lecturer(s):	1. Dr. Istanto Wahyu Djatmiko 2. Dr. Edy Supriyadi, M.Pd.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion, Observation, and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course Outcomes:	CO1 Devotion to God Almighty and able to show religious attitude CO2 Demonstrates a responsible and independent attitude towards the assigned work CO3 Having the ability to communicate effectively, think critically, and make informed decisions CO4 Understand comprehensively the concepts of planning, implementing, and evaluating curriculum and being able to apply it in the development of vocational education curriculum.
ELO and CO mapping	(see table below)
Courses Description:	This course equips students with the ability to comprehensively comprehend the concepts of curriculum

ELO and CO mapping:

	ELO1	ELO2	ELO6	ELO7	ELO9
CO1	✓				
CO2			✓		
CO3			✓	✓	
CO4			✓	✓	✓

<table>
<tr><td></td><td>planning, implementation, and evaluation and be able to apply them in the development of vocational education curriculum. The course generally contains material about the understanding, dimensions, functions, and role of the curriculum; curriculum development components; principles of curriculum development; curriculum development model and organization; vocational learning approaches, strategies and models. Lectures are carried out both with lectures, class and group discussions which are complemented by the assignment of observations and critical analysis of vocational education development practices.</td></tr>
<tr><td>Assessment:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 - CO4</td><td>Assignment</td><td>Presentation</td><td>60%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>15%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>20%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Finch, C.R & Crunkilton, J.R. (1999). Curiculum Development in Vocational and Technical education (fifth edition). Massachusetts: Allyn and Bacon
2. Olive, P.F. (1992). Developing the Curiculum (third edition). New York: Harper Collins Publishers.
3. Bean, J.A., Toefr, C.F., & Alessi, S.J. (1986). Curicullum Planning and Development. Massachusetts: Allyn and</td></tr>
</table>

	Bacon 4. Thompson, J.F. (1993). Foundation of Vocational Education. New Jersey: Prentice Hall 5. Sukamto. (1988). Perencanaan & Pengembangan Kurikulum Pendidikan Teknologi dan Kejuruan. Jakarta: dikti 6. Sukamto. (2001). Perubahan Karakteristik Dunia Kerja dan Revitalisasi Pembeljaran dalam Kurikulum Pendidikan Kejuruan. Pidato Pengukuhan Guru Besar. Yogyakarta: UNY 7. Ella Yulaelawati. (2004). Kurikulum dan Pembeljaran. Jakarta: Pakar Raya 8. Pardjono, Wardan Suyanto, dan Satunggalno. (2003). Pendidikan Kejuruan dengan Kurikulum Berbasis Kompetensi Berorientasi Kecakapan Hidup. Makalah. Disampaikan dalam Lokakarya Pembelajaran dengan KBK Berorientasi Kecakapan Hidup tanggal 29 dan 30 April 2003 di Fakultas Tekik Universitas Negeri Yogyakarta 9. CD Bahan Sosialisasi Kurikulum Berbasis Kompetensi 10. CD Sosialisasi Kurikulum Tingkat Satuan Pendidikan 11. CD Sosialisasi Kurikulum 2013
Date of revision	19 July 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power Protection Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6226
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. Edy Supriyadi
Lecturer(s):	1. Toto Sukisno, M.Pd.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected Learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course outcomes:	CO1 Devoted to God Almighty and able to show a regius attitude and character, CO2 Students actively participate, take responsibility, and have the motivation to develop themselves, CO3 Students have a comprehensive competency regarding the operation of Overcurrent Relays, Differential Relays, Voltage Relays, Power Relays, Temperature Relays, Power Breakers; Protection at Main Station, Transformer Protection, Transmission Network Protection, Distribution Network Protection, Motor Protection, and Building Protection. CO4 Having the ability to communicate effectively, think critically and make the right decisions regarding electrical protection systems.
ELO and CO mapping	(see table below)
Courses Description:	Electric Power Protection Practice Lectures will develop student competencies regarding the operation of Overcurrent Relays, Differential Relays, Voltage Relays, Power Relays, Temperature Relays, Power Breakers; Protection at Main Station, Transformer Protection, Transmission Network

	ELO1	ELO2	ELO4	ELO9
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

<table>
<tr><td></td><td>Protection, Distribution Network Protection, Motor Protection, and Building Protection. Lectures are carried out with various approaches that are appropriate to the context of the material and the potential of students, including: contextual, project base learning, and problem base learning that lead to student center learning. Continuous assessment is carried out on a competency basis and harmonized with lecture activities.</td></tr>
<tr><td>Assessments:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1 - CO4</td><td>Individual Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>

Bonar Pandjaitan. 2012. Praktik-Praktik Proteksi Sistem Tenaga Listrik. Yogyakarta: Andi Offset.
Christophe Prévé. 2006. Protection of Electrical Networks. London: ISTE,Ltd.
Edy Supriyadi, 2000. Sistem Proteksi Tenaga Listrik. Yogyakarta: Adi Cita.
Elmore Walter A. Protective Relaying Theory & Application. New York: Marcell Dekker

</td></tr>
</table>

	5. Lewis Blackburn & Thomas J. Domin. 2006. *Protective Relaying: Principles and Applications.* Taylor&Francis Group,LLC. 6. PT. PLN (Persero) P3B. 2006. *Materi Pelatihan O&M Relai Proteksi Jaringan*. Jakarta: PLN. 7. Russel Mason. *The Art & Science of Protective Relaying*. General Electric 8. Scheinder electric. Sepam range Sepam 1000+ Substation Transformer Motor Busbar.
Date of revision	19 July 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Vocational Instruction Strategic
Module level,if applicable:	Undergraduate
Code:	TKF6202
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. Haryanto, M.Pd., M.T
Lecturer(s):	1. Dr. phil. Nurhening Yuniarti, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning	After taking this course the students have ability to:

outcomes:	ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO3 Can do work in accordance with professional expertise, both individually and in teams ELO5 Mastering work standards, work methods, carrying out work, and testing in the field of electric power engineering or industrial automation. ELO6 Able to plan, implement, and evaluate learning in the field of electric power or automation techniques used ELO9 Able to develop innovations in the field of education, and publish the results of his work
Course Outcomes	CO1 Demonstrate polite, honest, good faith in lectures. CO2 Demonstrates responsibility for work in their area of expertise independently. CO3 Knowledge of the preparation of scientific papers including work reports in accordance with scientific procedures based on data and information analysis. CO3.1 Understand the scope of the Learning Strategy Course CO3.2 Belief in the Objectives, Targets, and Learning Process of Vocational Education CO3.3 Understanding Student-centered learning CO3.4 Understand the basic concepts of work-based learning CO3.5 Understanding Competency-based Learning CO3.6 Understanding Learning Theory CO3.7 Understanding Pedagogy - Vocational Andragogy CO3.8 Understanding Process Standards CO3.9 Learning approaches, methods and models CO4 Apply education management to schools, education and training institutions in the field of Electrical Engineering CO4.1 Using Learning Approaches, Methods, and Models CO5 Apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and / or technology in accordance with their area of expertise. CO5.1 Developing Theory Learning Tools, Practices, and Field Practices
ELO and CO mapping	(see table below)

	ELO1	ELO3	ELO5	ELO6	ELO9
CO1	✓				
CO2		✓			
CO3			✓		✓
CO4			✓		

<table>
<tr><td></td><td>

CO5			✓		

</td></tr>
<tr><td>Courses Description:</td><td>Vocational Learning Strategy courses are programmed for all undergraduate study program students at FT UNY. The implementation of the Vocational Learning Strategy course is intended to provide learning experiences to students as prospective teachers / instructors of vocational / vocational education and training in order to be able to develop teaching strategies for creative, structured, measurable, and reasonable education according to vocational education and training needs. This course discusses the goals and objectives of vocational learning, vocational pedagogy and andragogy, learning theory, work-based learning, competency-based learning, student-centered contextual learning, cooperative learning, learning methods and models, learning components, theoretical learning tools, devices practical learning, learning tools in the industry, and educational process standards. In the learning process students are able to learn independently by using various learning and multimedia resources through the internet network.</td></tr>
<tr><td>Assessments:</td><td>

1. Assessment is carried out to measure all learning outcomes, namely attainment learning attitudes, general skills, knowledge, and special skills.
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, Insertion Exams, and Final Semester Exams with the following guidelines.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO2 CO3 CO4 CO5	Presentation	Presentation	10%
		Individual Assignment	Accuracy of program results	10%
		Group Assignment	Written test	10%
		Quiz	Written test	20%

</td></tr>
</table>

		MID	Written test	20%
		Final Exam	Written test	30%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Billet, S. (2011). Vocational Education Purposes, Traditions and Prospects. New York: Springer Science+Business Media B.V. 2. Blank, W.E. (1982). *Handbook for Developing Competency-Based Training Programs*. London : Prentice-Hall,Inc. 3. Cuningham, I., Dawe, G., Bennett, B. (2004) *The Handbook of Work Based Learning.* Burlington: Gower Publishing Company. 4. Hill, W.F. (2011). *Teori-teori Pembelajaran: Konsepsi, komparasi, dan Signifikasni*. Bandung: Nusamedia 5. Jonassen D.H. (2004). *Learning to Solve Problems an Instructional Desig Guide*. San Francisco: Pfeiffer. 6. Jonassen D.H. (2004). *Learning to Solve Problems a Handbook for Desinging Problem-Solving Learning Environments*. San Francisco: Pfeiffer. 7. Koper, R. & Tatterasal, C. (2005). *Learning Design A Handbooks on Modelling and Delivering Networked Education Training*. New York: Springer. 8. Leighbody, G.B. (1966). *Methods of teaching shops and technocal subjects*. New York: Delmar Publisher. 9. Lucas.B., Spencer.,E., Claxton.G. 2012. *How To Teach Vocational Education, A Theory Of Vocational Pedagogy.*

	London: Centre for Skills Development 10. Maclean, R. (2007). *Learning and Teaching for the Twenty-First Century.* New York: Springer 11. Tan, O.S. (2003) *Problem-Based Learning, Innovation Using Problems to Power Learning in the 21st Century*: Singapore: Cengage Learning 12. Anderson, Lorin W. (1989). *The effective teacher: Studi guide and readings*. New York: McGraw-Hill Publishing Co. 13. Atwi Suparman (2001). *Disain instructional*. Jakarta: PAU Depdiknas. 14. Harris, R., Guthrie, H., Hobart, B. (1995). *Competency based education and training.* MacMillan Education Australia Ltd. 15. Millls, H.R. (1977). *Teaching and training: A handbook for instructors*. London: The MacMillan Press, Ltd. 16. Klein, Stephen B. (2002). *Learning: Principles and application*. New York: McGraww-Hill Publishing Company. 17. Cheng, Y.C. (2005). *New Paradigm For Re-Engineering Education, Globalization, Localization and Individualization*. Dordrecht: Springer 18. Pavlova, M. (2009). *Technology and Vocational Education for Sustainable Development Empowering Individuals for the Future.* Queensland: Springer Science Business Media B.V. 19. Piirto, J. (2011). *Creativity for 21st Century Skills How To Embed Creativity Into The Curriculum.* Rotterdam: Sense Publishers 20. Staron, M. 2011. *Life-Based Learning Model – A Model For Strengt-Based Approaches To Capability Development and Implications for Personal Development Planning.* Australian Government Department for Education Science and Training and TAFE NSW Available on-line at:http://learningtobeprofessional.pbworks.com/w/page/32893040/Life-based-learning Accessed 21/12/2014 21. Staron, M., Jasinski, M and Weatherley, R. 2006. *Life-Based Learning: A Strength-Based Approach For Capability Development In Vocational And Technical Education.* Australian Government Department for Education Science and Training and TAFE NSW Available on-line at:http://learningtobeprofessional.pbworks.com/w/page/32893040/Life-based-learning Accessed 21/12/2014 22. Wardiman Djojonegoro. (1998). *Pengembangan Sumberdaya Manusia melalui SMK.* Jakarta : PT. Jayakarta Agung Offset.
Date of revision	30 August 2018

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Vocational Learning Assessment
Module level,if applicable:	Undergraduate
Code:	KFT6204
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Dr. Edy Supriyadi, M.Pd.
Lecturer(s):	1. Dr. Haryanto, M.Pd. M.T. 2. Prof. Dr. Samsul Hadi, M.Pd., M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing.
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.

Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Contribute to improving the quality of community, nation, and state life the progress of civilization based on Pancasila. ELO3 Demonstrates responsibility for work in their area of expertise independently. ELO5 Knowledge of the preparation of scientific works including work reports in accordance with scientific procedures based on data analysis and information related to learning assessment. ELO6 Apply information and communication technology in carrying out the duties of educators and education personnel. ELO8 Implement strategies, media, teaching materials, and evaluation of learning in technology and vocational education in the field of Electrical Engineering. ELO9 Assessing the implications of the development or implementation of science, technology or art in accordance with their expertise based on the rules, procedures and scientific ethics to produce solutions, ideas, designs, or art criticism and compile scientific descriptions of the results of their studies in the form of thesis or final project report.
Course Outcomes:	CO1 Devoted to God YME and able to show a religious attitude and character CO2 Uphold the confidentiality of his work, honest and fair in carrying out duties based on religion, morals, and ethics. CO3 Show a professional attitude in carrying out their duties with full responsibility and high dedication. CO4 Knowledge of the preparation of scientific works including work reports in accordance with scientific procedures based on data and information analysis. CO5 Preparation of work reports qualitatively and quantitatively in accordance with scientific procedures

based on data analysis and information related to learning assessment.

CO6 Use information and communication technology to compile, process / analyze data and information on measurement results and in making reports related to learning evaluation and assessment tasks.

CO6.1 Solve the problem of evaluation and assessment of learning by developing test and non-test instruments and analyzing data and information on measurement results, then interpreting the results as outlined in the report of learning outcomes.

CO7 Implement strategies, media, teaching materials, and evaluation of learning in technology and vocational education in the field of Electrical Engineering.

CO8 Applying assessment skills to learning technology and vocational education in the field of Electrical Engineering both theory and practice through the use of IT and various measurement techniques using test and non-test instruments that have been developed.

CO9 Provide assessment technique skills for learning technology and vocational education in the field of Electrical Engineering both theory and practice through the use of IT to produce ideas for evaluation and assessment that are solutive, effective and efficient.

ELO and CO mapping

	ELO1	**ELO2**	**ELO3**	**ELO5**	**ELO6**	**ELO8**	**ELO9**
CO1	✓						
CO2		✓					
CO3			✓				
CO4				✓			
CO5				✓			
CO6					✓		
CO7						✓	
CO8						✓	
CO9							✓

Courses Description:

This course develops student competencies in order to be able to apply evaluation and assessment of learning outcomes, develop test and non-test instruments, analyze test and non-test items, describe the results of analysis of test items and non-tests, and make evaluation and assessment reports of student learning outcomes.

Assessments:

1. Assessment is carried out to measure all learning achievements, namely attitudes learning achievements (CPMK 1, 2, 3), knowledge (CPMK 5), and special skills (CPMK 6), general skills (CPMK 8, 9).

2. Attitude assessment is carried out at each meeting using observation techniques and / or peer assessment by using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude compared to the attitude of students in general. The results of attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements (10%). Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.

3. Final grades include the results of the assessment of knowledge, special skills and general skills, obtained from individual assignments, group assignments, presentations, quizzes, Midterm Exams, and Final Semester Exams with the following guidelines.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 CO2 CO3 CO5 CO6 CO8 CO9	Presentation	Observation	10%
		individual Assignment	Presentation	20%
		Group Assignment	Presentation	20%
		quiz	Written test	20%
		MID	Written test	20%

<table>
<tr><td></td><td><table><tr><td></td><td></td><td>Final Exam</td><td>Written test</td><td>30</td></tr><tr><td></td><td></td><td colspan="2">Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Cohen−Swerdlik (2009). Psychological Testing and Assessment: An Introduction to Tests and Measurement 7th Edition. USA: Mc. Graw Hill Company.
2. Groth, G. & Marnat. (2003). Handbook of psychological assessment fourth edition. Canada: John Wiley & Sons, Inc.
3. Higher Education Commission. (2012). Classroom Assessment. USA: Columbia University Press
4. Lester, P.E., Inman, D., & Bishop, L. 2014. Handbook of tests and measurement in education and the social sciences third edition. USA: The Rowman & Littlefield Publishing Group, Inc.
5. Phye, G.D. (1997). Handbook of classroom</td></tr>
</table>

	assessment learning, achievement, and adjustment. USA: Academic Press. 6. Scheerens, J., Glas, C., & Thomas, S.M., 2003. *Educational evaluation, assessment, and monitoring*. Netherland: Swets & Zeitlinger B.V., Lisse, The Netherlands. 7. Timothy R. Vansickle, T.R. & Vansickle, K.J. (1988). Vocational assessment handbook. Texas: Texas University Press. 8. van den Akker, J., Gravemeijer, K., Susan McKenney, S., & Nienke Nieveen, N. (2006). Educational Design Research The Design, Development and Evaluation of Programs, Processes and Products. Canada: Taylor & Francis.
Date of revision	28 August 2018

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Industrial Internship
Module level,if applicable:	Undergraduate
Code:	KTF6309
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Moh. Khairudin, M.T.,Ph.D.
Lecturer(s):	1. Bambang sulistyo,S.Pd.,M.Eng. 2. Mohamad Ali,MT 3. Muslikhin,M.Pd. 4. Yosep efendi, M.Pd. 5. Arif Marwanto,M.Pd. 6. Didik Purwantoro,M.Eng. 7. Moh. Adem Yerusalem, Ph.D. 8. Dewi Eka Murniati, S.E.,M.M. 9. Dra. Yuswati,M.P.d. 10. Dra. Sari Puspita 11. Joko Santosa
Language:	Bahasa Indonesia
Classification within the	Compulsory/~~Elective~~ Course

curriculum:	
Teaching format / class hours per week during the semester:	300 minutes lectures and 360 minutes structured activities per week.
Teaching and Learning Method:	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 272 hours per semester which consists of 300 minutes lectures, 360 minutes structured activities, and 360 minutes self-study per week for 16 weeks.
Credit points:	3
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology ELO8 Capable to apply research and scientific writing methods ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course outcomes:	CO1 Devotion to God Almighty, devout worship and noble deeds. CO2 Students agree to be active, responsible, and have the motivation to develop themselves, CO3 So students can add insight into knowledge and technology Through Activities Direct experience in the industry / company / workshop occupied. In addition, students can learn aspects of entrepreneurship related to

	the industry occupied, so that it can bring experience practice industry into his duties after graduation. CO4 Explain industrial management and required labor competencies industry, according to the industry / company / workshop occupied. CO5 Help carry out the tasks and activities of the production process and / or process services in the industry / company / workshop occupied. CO6 Find a case when implementing Industry Practices and analyze it in depth as outlined in the Industry Practice report. If possible, the case can be appointed as a Final Project and or Thesis. CO7 Having entrepreneurial competence as indicated by making proposals establishing a business (specifically for PI entrepreneur participants). Even if allows, a study of proposals to establish a business can be raised become the Final Project and or Thesis.
ELO and CO mapping:	(see table below)
Courses Description:	The Industrial Practice Program is a hallmark of FT UNY which it continues to run perfected. With a credit weight of 3 SKS, this activity is a curricular program which must be taken by FT UNY students. Implementation of at least 256 hours or for 2 (two) months with a block system in odd semester, even semester special semester. Industrial Practice Program that is involved with industries that are Meet the requirements and relevant to existing

ELO and CO mapping:

	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8	ELO9
CO1	✓								
CO2		✓							
CO3			✓	✓	✓	✓	✓	✓	✓
CO4			✓	✓	✓	✓	✓	✓	✓
CO5			✓	✓	✓	✓	✓	✓	✓
CO6			✓	✓	✓	✓	✓	✓	✓
CO7			✓	✓	✓	✓	✓	✓	✓

<table>
<tr><td></td><td>study programs at FT UNY. Therefore in searching, selecting and selecting students for Industrial Practices well organized through planning, coordination, implementation, control and careful evaluation, so as to achieve effective and efficient goals. In order to support the smooth running of the Industrial Practice program, governance is needed Administrative arrangements and administration are regulated in the industry practice manual.</td></tr>
<tr><td>Study/exam achievements:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">CO1
-CO7</td><td>Industrial Valuation
a. Work discipline
b. Work attitude
c. Creativity
d. Work quality</td><td>Observation/ Documentation</td><td>15%
15%
15%
15%</td></tr>
<tr><td>Faculty assessment</td><td>Written test</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>Industrial Practice Guidelines Faculty of Engineering Yogyakarta State University - Industrial Practice Team</td></tr>
<tr><td>Date of revision</td><td>31 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Education Multimedia Design Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6336
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr, Sunaryo Soenarto, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to:

<table>
<tr><td></td><td>ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Explain the concepts and characteristics of interactive learning multimedia
CO2 Assessing the multimedia elements of learning.
CO3 Apply the principles and format of multimedia design learning in the field of expertise Electro
CO4 Analyzing development models of learning multimedia
CO5 Developing the structure of multimedia-based electronic teaching materials.
CO6. Develop storyboards (scripts) Interactive Learning Multimedia.
CO7 Operate application programs to edit video sources.
CO8 Operate an application program to design animations
CO9 Producing Interactive MP courses / subjects taught</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
</table></td></tr>
</table>

CO7					✓	
CO8					✓	
CO9				✓		✓

Courses Description:	The Design Multimedia Learning lecture will discuss the design of font shapes and sizes, the psychology of foreground colors and background display layouts, as well as the learning multimedia display screen format. It will also discuss the format of learning multimedia script writing (storyboard). To develop the ability of operate multimedia computer applications, it will also simulate video editing programs, still image editing, and the development of interactive media. Lectures are carried out using the student center learning approach. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.

Assessments

Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 - CO9	Assignments	Presentation	30%
		Midle Exam	Written test	20%
		Final Exam	Written test	40%
		Attandance	Documentation	10%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Chapman, Nigel and Jenny Chapman. Digital Multimedia. England: John Wiley & Sons Ltd., 2004.

	2. Philip, Rob*. The Developer"s Handbook to Interactive Multimedia : a Practical Guide for Educational Applictions*. London: Kogan Page Limited, 1997. 3. Vaugh, Tay. *Multimedia: Making It Work*. New York: McGraw – Hill, 2001. 4. Hannafin, Michael J. The Design, Development, and Evalution of Instruction Software. New York: Mac Millan Publishing Company,1988. 5. Soulier, J. Steven. The Design and Development of Computer Based Instruction. Boston: Allyn and Bacon, Inc., 1988. 6. Yunardi, Eppy. Belajar Sendiri Adobe Photoshop 6,0. Surabaya: Indah, 2002. 7. --------------. Pembuatan CD Interaktif dengan Macromedia Flash Profesional 2000. Semarang: Salemba Infotek, 2004.
Date of revision	18 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Transmission and Distribution
Module level,if applicable:	Undergraduate
Code:	EKO6237
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. Giri Wiyono, M.T
Lecturer(s):	1. Dr. Zamtinah 2. Faranita Surwi, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-

Expected Learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course outcomes:	CO1 Devoted to God Almighty and able to show a religious attitude and character. CO2 Students actively participate, take responsibility, and have the motivation to develop themselves. CO3 Students can analyze the phenomena that occur in transmission and distribution systems. CO4 Having the ability to communicate effectively, think critically and make the right decisions.
ELO and CO mapping	(see table below)
Courses Description:	This course discusses the technique of transmitting and distributing electric power from generators to users. The scope of this course material includes: an introduction to the technique of transmission and distribution of electric power, electrical characteristics of the transmission line, representation of the transmission line and the relationship of current to voltage, general constants of the transmission line, pie charts and flow of power on the transmission line, current carrying capacity and corona, compensation on the transmission line, as well as high voltage air duct planning

ELO and CO mapping

	ELO1	ELO2	ELO4	ELO9
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

<table>
<tr><td>Assesments:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1 - CO4</td><td>Individual Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Hutauruk. (1993). Transmisi Daya Listrik. Jakarta: Penerbit Erlangga
2. Gupta, JR. (1981). A Course In Electrical Power. India: Katson Publishing House.
3. Pansini, Anthony J. (2006). Electrical Distribution Engineering. USA: Taylor & Francis Ltd.
4. Sadaat, Hadi. (1999). Power System Analysis.Singapore: Mc Graw Hill.
</td></tr>
<tr><td>Date of revision</td><td>11 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Maintenance and Services Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6238
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Toto Sukisno, S.Pd.,M.Eng
Lecturer(s):	1. Totok Heru Tri Maryadi,M. Pd. 2. Eko Swi Darmawan, M. Pd.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week.
Teaching and Learning Method	Discussion, Observation,
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-

<table>
<tr><td>Expected Learning Outcomes:</td><td>After taking this course the students have ability to:
ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God and able to show a religious attitude and character.
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves.
CO3 Students can evaluate the operating conditions in the generating subsystem to the user through inspection and testing.
CO4 Having the ability to communicate effectively, think critically and make the right decisions.</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the management of maintenance and repair of electrical systems ranging from existing components in the generating sub-system to the utilization sub-system. The scope of this course material includes: examinations and tests on power plants, checks and tests on power transformers, checks and tests on lighting installations, checks and tests on power installations, checks and tests on lightning distribution systems, rewinding 1 phase electric motors, rewinding 3 phase electric motors, and preparing reports and recommendations on the results of inspection and testing activities.</td></tr>
</table>

<table>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO2 - CO4</td><td>Individual Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Tim. (2015). Panduan Praktik Pemeliharaan dan Perbaikan Kelistrikan. Tidak Diterbitkan.
2. Theraja, B. L., & Theraja, A. K. (2017). Textbook of Electrical Technology Volume I IN SI System of Units. S. Chand.
3. Sumanto, M. A. (1993). Motor Listrik Arus Bolak-Balik. Edisi Pertama, Penerbit Andi Offset, Yogyakarta.</td></tr>
<tr><td>Date of revision</td><td>16 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Professional Ethics
Module level,if applicable:	Undergraduate
Code:	EKO6254
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T.
Lecturer(s):	Dr. Istanto Wahyu Djatmiko, M.Pd. Dr. Edy Supriyadi, M.Pd. Dr. Drs. Haryanto, M.Pd.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Demonstration, Simulation, and Discussion
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics

<table>
<tr><td></td><td>ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams.
ELO4 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation.
ELO6 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Showing polite, disciplined, and honest attitude during lectures.
CO2 Can carry out the tasks of the Professional Ethics course both independently and in groups.
CO3 Mastering the concept of professional ethics and professional code of ethics of the teacher.
CO4 Able to apply the concept of professional ethics and code of ethics in carrying out duties as a professional teacher in the field of electrical engineering education.
CO5 Being able to analyze anti-corruption as part of professional ethics.
CO6 Being able to analyze the importance of Intellectual Property Rights (IPR) for the teaching profession.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>Providing knowledge about ethics, ethical awareness and ethical behavior in carrying out the vocational teacher profession in the field of electrical engineering which covers various spectrums of thought in ethics, description of ethics and the teaching profession, ethical issues in the profession, and its implementation and development in the practice of the technical vocational teacher profession. Lectures are carried out using the student center learning approach with problem based learning strategies. Competency-based assessment involves active participation in lectures, quizzes, midterm and end semester exams, and final semester exams.</td></tr>
</table>

<table>
<tr>
<td>Assessments</td>
<td>
1. Assessment is carried out to measure all learning achievements, namely attitudes of learning achievement (CPMK 1 & 2), knowledge (CPMK 3 & 4), and special skills (CPMK 5 & 6).
2. Attitude assessment is done through direct observation of each student in each lecture meeting, including: attendance, discipline, personal and interpersonal interaction. This attitude assessment category, namely: "Very Good", "Good", and "Less Good". The minimum attitude value is included in the "Good" category. By using observation and / or self-assessment techniques using the assumption that basically every student has a good attitude. The results of this attitude assessment are used as consideration to determine the final assessment of this course.
3. The final grades include the results of the knowledge assessment, and the specific skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations are determined as follows.The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="7">1</td><td rowspan="7">CO1
CO3
CO4
CO5
CO6</td><td>Attendance</td><td>documentation</td><td>5%</td></tr>
<tr><td>Individual assigment</td><td>observation</td><td>10&</td></tr>
<tr><td>Group assigment</td><td>Written test</td><td>5%</td></tr>
<tr><td>quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>MID</td><td>Written test</td><td>20%</td></tr>
<tr><td>MID 2</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>
1. Naagarazan, R.S. (2006). A Texbook on Professional Ethics and Human Values. New Delhi: New Age International (P) Limited, Publishers
2. Kultgen, J.H. (1988). Ethics and Professionalism. Philadelphia: University of Pennsylvania Press
3. Soetjipto dan Raflis Kosasi. 1999.Profesi Keguruan. Jakarta: Rineka Cipta
5. Dit.PSMK. (2017). Konseptual Model Pengembangan Kompetensi Guru Produktif SMK Berbasis Industri. Jakarta: Direktorat Jenderal Pendidikan Dasar dan Menengah, Kementerian Pendidikan dan Kebudayaan.
6. Nanang T. Puspito, NT, dkk, (Ed). (2011). Pendidikan Anti-Korupsi Untuk Perguruan Tinggi. Jakarta: Direktorat Jenderal Pendidikan Tinggi, Kementerian Pendidikan dan
</td>
</tr>
</table>

	Kebudayaan. 7. Banindro, B.S. (2015). Implementasi Hak Kekayaan Intelektual (Hak Cipta, Merek, Paten, Desain Industri), Bidang: Seni Rupa, Kriya, Desain Grafis, Desain Produk. Yogyakarta: Badan Penerbit ISI Yogyakarta, Institut Seni Indonesia 1. 7. Oey-Gardiner, M., dkk. (2017). Era Disrupsi : Peluang dan Tantangan Pendidikan Tinggi Indonesia. Jakarta: Akademi Ilmu Pengetahuan Indonesia
Date of revision	18 August 2018

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Energy Management
Module level,if applicable:	Undergraduate
Code:	EKO6239
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Dr. Giri Wiyono, M.T
Lecturer(s):	Team

Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation,
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expexted Learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course outcomes:	CO1 Students devoted to God Almighty and able to show attitudes and behavior that have a noble character, CO2 Students have personal skills in the form of: honesty, communication, responsibility, creative, and independent), CO3 Students have social skills in the form of collaboration, and synergy, CO4 Students are able to develop themselves as creative

<table>
<tr><td></td><td>human learners.

CO5 Students are able to conduct electrical energy audits on various types of industrial loads according to procedures and standard requirements that apply</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th><th>ELO9</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td></td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This Energy Management Lecture will develop contextual thinking about managing electrical energy on the load side and provide knowledge and skills in conducting electrical energy audits on various types of industrial loads according to procedures and standard requirements that apply and be able to utilize technology as a learning resource. The main studies include: Basic principles of electrical energy management, electrical energy management planning, saving electricity on various types of industrial loads, and calculating efficiency in the use of electrical energy. It also examines the application of electrical energy audits practically in the industry in accordance with applicable procedures and standard requirements. This lecture is carried out using student centered learning strategies (student center learning). Assessment of lectures uses three elements, namely: active participation in the classroom, communication of interactions in presentations, and competency tests individually and in groups</td></tr>
</table>

Assesments:

Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO5	Individual Assignment	Presentation	15%
		Group Assignment	Presentation	15%
		Quiz	Written test	15%
		Mid	Written test	25%
		Final Exam	Written test	30%
			Total	100%

Forms of media:

Board, LCD Projector, Laptop/Computer

Literature:

1. DM. Tagare.(2002). *Electri*cal Power Capacitors, Design and Manufacture. New Delhi: Tata McGraw-Hill Publishing .
2. Giri Wiyono. (2014). *Modul Perkuliahan Manajemen Energi Listrik*, Yogyakarta; Jurusan Pendidikan Teknik Elektro FT UNY
3. Giri Wiyono. (2015). *Jobsheet Praktik Manajemen Energi Listrik*, Yogyakarta: Jurusan Pendidikan Teknik Elektro FT UNY
4. Howard E. Jordan,. (1994). Energy-Efficient Electric Motors and Their Applications Second Edition. New York: Plenum Press.
8. Joseph B. Murdoch. (1985). Illumination Engineering. New York: Macmillan Publishing Company
9. Roger C.Dugan., Mark F. McGranaghan, and H. Wayne Beaty, Rob. (1996). *Electrical Power Systems Quality. New York*: McGraw-Hill.
10. Smith, Craigh B. (1981). *Energy Management Principles*. New York: Pergamon Press.
11. Steve Doty and Wayne C. Turner. (2009). Energy Management Handbook, Seventh Edition. New York: The

	Fairmont Press
Date of revision	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power System Simulation Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6240
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{rth}
Module coordinator:	Dr. Giri Wiyono, M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning	After taking this course the students have ability to:

<table>
<tr><td>outcomes:</td><td>ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO4 Master in basic sciences and principles of electric
ELO9 Capable to develop a vocational education innovation and publish scientific paper</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Students devoted to God Almighty and able to show attitudes and behavior that have a noble character,
CO2 Students have personal skills in the form of: honesty, communication, responsibility, creative, and independent),
CO3 Students have social skills in the form of collaboration, and synergy,
CO4 Students are able to develop themselves as creative human learners.
CO5 Students are able to perform electric power system simulation skills, both under normal conditions and fault conditions using the ETAP Power Station computer program.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO9</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This Electric Power System Simulation lecture will provide knowledge and skills in conducting electric power system simulation, both under normal conditions and fault conditions using the ETAP Power Station computer program. The main studies include: electric power system modeling, electric power system analysis, electric power system simulation principles, introduction of ETAP Power Station, short circuit analysis (load flow analysis), load flow analysis, contingency study), motor starting studies, harmonic studies. It also examines the application of electric power system simulations in real terms for various conditions, both normal conditions and disturbance conditions with a case study of electric power</td></tr>
</table>

<table>
<tr><td></td><td>systems area III Ungaran Central Java This lecture is carried out using student-centered learning strategies (student center learning). Assessment of lectures uses three elements, namely: active participation in class, individual assignments, and individual competency tests</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1 - CO5</td><td>Individual Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Giri Wiyono. (2014). Modul Simulasi Sistem Tenaga Listrik menggunakan ETAP Power Station. Yogyakarta; Jurusan Pendidikan Teknik Elektro FT UNY
2. Giri Wiyono. (2015). Jobsheet Praktik Simulasi Sistem Tenaga Listrik dengan ETAP Power Station, Yogyakarta: Jurusan Pendidikan Teknik Elektro FT UNY
3. Glenn W. Stagg and Ahmed H. El-Abiad. (1988). Computer Methods in Power Systems Analysis. Singapore: McGraw-Hill Inc.
4. Hadi Saadat. (1999). Power System Analysis. Singapore: McGraw-Hill Book Co.
5. MA Pai. (1979). Computer Techniques in Power System Analysis. New Delhi: Tata McGraw-Hill Publishing Company Limited.
6. Ramasamy Natarajan.. (2002). Computer-Aided Power</td></tr>
</table>

	System Abnalysis. New York: Marcel Dekker Inc. 7. R.N. Dhar. (1982). *Computer Aided Power System Operation and Analysis*. New Delhi: Tata McGraw-Hill Publishing Company Limited.
Date of revision	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Laboratorium Management
Module level,if applicable:	Undergraduate
Code:	EKO6241
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Mutaqin, M.Pd., M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method:	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field

<table>
<tr><td></td><td>of expertise both individual and team works
ELO9 Capable to develop a vocational education innovation and publish scientific paper</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Students devoted to God Almighty, obedient to worship and show a special attitude, tawadlu, and istiqomah,

CO2 Students actively participate, take responsibility, and have the motivation to develop themselves, and have character in every learning that is done,

CO3 Students have the ability to understand the concepts and scope of management of educational laboratories, the preparation of SOPs, laboratory services in learning, the application of OHS and 5S in the laboratory, standard laboratory school facilities and infrastructure, organizational structure and job descriptions, equipment inventory, material management and practicum results,

CO4 Students can plan, implement and develop an education laboratory management system at school,</td></tr>
<tr><td>ELO and CO mapping:</td><td><table><tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO9</th></tr><tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>CO4</td><td></td><td></td><td></td><td>✓</td></tr></table></td></tr>
<tr><td>Courses Description:</td><td>This course will study, understand and practice the management of educational laboratories, starting from understanding concepts, developing and implementing educational laboratory management systems in schools. The scope of material includes, among others: the scope of laboratory management, preparation of SOPs, laboratory services in practicum learning, the application of OSH and 5S in the laboratory, standard systems for school lab facilities and infrastructure, development of organizational structures and job descriptions of laboratory organization personnel, inventory of equipment, management of materials management and the results of practicum, school lab development planning and the development of school laboratory management information systems. The learning strategy uses the student center approach with methods including: lectures, discussions, assignments, simulations, and field practice. Evaluation of evaluation uses the assignment model, presentation and written test.</td></tr>
</table>

<table>
<tr>
<td>Assesments:</td>
<td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1 – CO4</td><td>Individual Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Group Assignment</td><td>Presentation</td><td>15%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>15%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>

George Storm. (1995). Managing the Occupational Education Laboratory. Second edition Revised and Updated. Michigan : Prakken Publitions.Inc.
Heraldy, Eddy. (2003). Sistem Manajemen Mutu Laboratorium. Surakarta :FMIPA UNS
Jerry C. Olson, et all. (1982). Modern School Shop Planning. Ann Arbor, Michigen: Prakken Publication, Inc.
Christine Paszko , Elisabeth Turner. (2002). Laboratory Information Management Systems: Development. New York; Marcel Dekker, Inc
Drs. Riandi, M.Si. (2002). Pengelolaan laboratorium. Bandung : UPI.
Permendiknas No. 40 Tahun 2008, Tentang Standar Sarana dan Prasarana SMK.

</td>
</tr>
<tr>
<td>Date of revision</td>
<td>10 August 2019</td>
</tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Interfacing Laboratory Work
Module level,if applicable:	Undergraduate
Code:	EKO6242
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Ariadie Chandra Nugraha, M.T
Lecturer(s):	1. Didik Hariyanto, M.T. 2. Rustam Asnawi, ST., MT., PhD.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 161 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-

Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes:	CO1 Devoted to God and able to show a religious attitude and character. CO2 Students actively participate, take responsibility, and have the motivation to develop themselves. CO3 Students are able to explain the basic concepts of interfaces and their types, and generally explain interface standards that are widely used. CO4 Students are able to explain and use the IEEE 1284 standard to read input data and send output data from / to simple devices. CO5 Students are able to explain and use the RS-232 standard to read input data and send output data from / to simple devices. CO6 Students are able to explain and use the USB standard to read input data and send output data from / to simple devices. CO7 Students are able to explain and use the I2C standard to read input data and send output data from / to simple devices. CO8 Students are able to explain and use RFID standards to read input data. CO9 Students are able to explain and use the Bluetooth standard to read input data and send output data from / to simple devices.

ELO and CO mapping	(see mapping table below)
Courses Description:	Interfacing Laboratory Work is a practical course that aims for students who take this course to have competence to implement commonly used interface protocols, namely IEEE 1284 (Parallel), RS232 (Serial), USB, I2C, Bluetooth and RFID to read input data from the sensor and write data or output commands to the actuator. Lectures are carried out using the Project-Based Learning (PBL) approach, which is that at each meeting each student must complete a practice unit that has been outlined in the labsheet. Competency-based assessment by observing performance per week. The final exam is carried out to check competency per student where students must complete exam questions independently. In addition, the assessment also includes active individual participation and group cooperation during lectures.

ELO and CO mapping:

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓	✓	✓
CO4			✓	✓	✓
CO5			✓	✓	✓
CO6			✓	✓	✓
CO7			✓	✓	✓
CO8			✓	✓	✓
CO9			✓	✓	✓

<table>
<tr><td>Assessments:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO2 - CO9</td><td>Assignment</td><td>Practicum</td><td>30%</td></tr>
<tr><td>Practicum report</td><td>Written report</td><td>30%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>10%</td></tr>
<tr><td>Final Exam</td><td>Practicum</td><td>20%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. Labsheet (lembar kerja praktikum) Praktik Teknik Antarmuka
2. Serial Port Complete: COM Ports, USB Virtual COM Ports, and Ports for Embedded Systems; 2nd Edition; Jan Axelson; Lakeview Research; 2007; ISBN 978-1-931-44806-2.
3. USB Complete: The Developer’s Guide, Fourth Edition; Jan Axelson; Lakeview Research; 2009; ISBN 978-1-931448-08-6
</td></tr>
<tr><td>Date of revision</td><td>20 August 2019</td></tr>
</table>

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MODULE HANDBOOK

Module name:	Sensor and Transducer lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6243
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5^{th}
Module coordinator:	Amelia Fauziah Husna, M.Pd.
Lecturer(s):	1. Herlambang Sigit Pramono, S.T., M.Cs.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and Lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO4 Master in basic sciences and principles of electric

<table>
<tr><td></td><td>ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God Almighty and able to show a regius attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Students can carry out work according to the professional field of expertise both individually and in teams
CO4 Students are able to master basic science and basic electricity
CO5 Students are able to master work standards, work methods, work implementation, and testing in the field of electric power engineering or automation</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This Sensor and Transducer Practice Lecture discusses the introduction and application of sensors in the field of mechatronics. This course examines a variety of sensors, such as light, inductive, capacitive, echo, radar, power, pressure and speed sensors, and how to apply and use them in a series. Lectures are carried out using the student center learning approach. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.</td></tr>
</table>

<table>
<tr><td>Assessments:</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO2 - CO5</td><td>Assignment</td><td>Practicum</td><td>25%</td></tr>
<tr><td>Practicum report</td><td>Written report
Performance</td><td>30%</td></tr>
<tr><td>Final Project Performance</td><td>Practicum</td><td>25%</td></tr>
<tr><td>Final Project Report</td><td>Written report</td><td>15%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>
1. -. -. Modul Praktikum Sensor dan Tranduser Bab 1. Instrumentasi Suhu. Yogyakarta: UNY
2. -. -. Modul Praktikum Sensor dan Tranduser Bab 2. Instrumentasi WIEN Bridge. Yogyakarta: UNY
3. -. -. Modul Praktikum Sensor dan Tranduser Bab 3. Cahaya. Yogyakarta: UNY
4. -. -. Modul Praktikum Sensor dan Tranduser Bab 4. Kelembaban. Yogyakarta: UNY
</td></tr>
<tr><td>Date of revision</td><td>28 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Digital Control
Module level,if applicable:	Undergraduate
Code:	EKO6244
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	5th
Module coordinator:	Dr. Moh. Khairudin
Lecturer(s):	1. Sigit Yatmono, ST.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Simulation, and lecturing
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning	After taking this course the students have ability to:

<table>
<tr><td>outcomes:</td><td>ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics
ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet
ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Devoted to God Almighty and able to show the attitude and character regius
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Mastering the basics of control theory, both classical and modern, and their application in the analysis and design of control systems,
CO4 Able to use computer software packages for modeling and simulation of Electrical Engineering issues in particular and engineering problems in general,</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course covers general configurations of digital control systems, other terms, brief history of digital control system development, hardware configuration, various digital controllers, analog / digital conversion, snapshots, continuous and discrete time signals, retention order-zero (ZOH), Transformational Z principles, Ratio-based modeling, digital PID controllers, space-state modeling, signal flow charts, state equation solutions, stability analysis, digital filters.</td></tr>
</table>

<table>
<tr>
<td>Assessments:</td>
<td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">CO1 - CO4</td><td>Assignment 1,2,3, and 4</td><td>Presentation</td><td>10%</td></tr>
<tr><td>Assignment 5</td><td>Project Performance</td><td>20%</td></tr>
<tr><td>Quiz</td><td>Written test</td><td>10%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>20%</td></tr>
<tr><td>Final Exam</td><td>Written test</td><td>35%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>

Astrom, Karl J. and Bjorn Wittenmark, “Computer-controlled Systems”, Prentice Hall, Inc, Englewood Cliffs, NJ
Kuo, Benjamin C., “Digital Control Systems”, Holt, Rinehart and Winston, Inc., NY.
Franklin, Gene F., et.al., “Digital Control of Dynamic Systems”, Addison Wesley Publishing Company, Reading, MA.
Phillips, Charles L.. and H. Troy Nagle, “Digital Control Systems: Analysis and Design”, Prentice Hall, Inc, Englewood Cliffs, NJ

</td>
</tr>
<tr>
<td>Date of revision</td>
<td>28 August 2019</td>
</tr>
</table>

6^{th} SEMESTER

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Sociocultural Education
Module level,if applicable:	Undergraduate
Code:	MKU6214
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Prof. Dr. Siti Irene Astuti D, M.Si.
Lecturer(s):	1. Drs. Nurhadi, M.Si.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrates devotion to YME God, the practice of values, norms, and academic ethics. ELO2 Demonstrate an attitude of nationalism, responsibility, and tolerance towards society and the environment. ELO3 Can carry out work in accordance with the professional

<table>
<tr><td></td><td>field of expertise both individually and in teams.</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Fear God Almighty and be able to show a religious attitude, honest and patient.
CO2 Respect the diversity of cultures, views, religions, and beliefs, as well as other people's original opinions or findings.
CO2.1 Describe the relevance between education and society and culture.
CO2.2 Understand humans as cultured, ethical, and aesthetic creatures.
CO3 Work together and have social sensitivity and care for the community, and the environment.
CO3.1 Understand human nature and civilization.
CO3.2 Understand the nature of humans as individual beings and social beings.
CO4 Develop and maintain a network of supervisors, colleagues, colleagues both inside and outside the institution.
CO4.1 Identify social capital and cultural capital that determine the success and failure of education.</td></tr>
<tr><td>ELO and CO mapping</td><td><table><tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th></tr><tr><td>CO1</td><td>✓</td><td></td><td></td></tr><tr><td>CO2</td><td></td><td>✓</td><td></td></tr><tr><td>CO3</td><td></td><td>✓</td><td></td></tr><tr><td>CO4</td><td></td><td></td><td>✓</td></tr></table></td></tr>
<tr><td>Courses Description:</td><td>At the end of the lecture helps students grow the importance of education in encouraging: critical power, creative power, appreciation, and sensitivity of students to social and cultural values in order to establish their personality as a provision for community life as individuals and social beings who: (a) are democratic, civilized, and uphold human values, dignity and care for the preservation of natural resources and the environment, (b) have the ability to master the basics of science, technology and art, (c) have the ability to master basic knowledge about human concepts , culture, values, morals and law, science, technology and art and the environment, and (d) play a role in finding solutions for socio-cultural and environmental solutions wisely and wisely.</td></tr>
</table>

<table>
<tr><td>Assessments:</td><td>

1. The assessment is carried out to measure all learning outcomes, namely attainment learning achievements (CPMK 1), (CPMK 2), and (CPMK 3) (CPMK 4).
2. Final grades include the results of general knowledge assessment obtained from individual assignments, group assignments, presentations, quizzes, Insert Tests, and Final Examinations with the following guidelines.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td>2</td><td>CO3 dan CO4</td><td>a. Individual assignments
b. Group assignments
c. Midterm exam
d. Final exams</td><td>a. Article
b. Presentations and Papers
c. Written test
d. Written test</td><td>15%
15%
20%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>

1. Siti Irene Astuti D. 2016. *Pendidikan Sosial Budaya*. Yogyakarta: UNY Press.
2. Koentjaraningrat. 1993. *Kebudayaan, Mentalitas, dan pembangunan*. Jakarta: Gramedia Pustaka Utama.
3. Soejono Soekanto. 2000*. Sosiologi Suatu Pengantar*. Jakarta: Raja Grafindo Persada.
4. Sudjarwo. 2015*. Proses Sosial dan Interaksi Sosial dalam Pendidikan*. Bandung: Mandar Maju.
</td></tr>
<tr><td>Date of revision</td><td>19 August 2018</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Educational Research Method
Module level,if applicable:	Undergraduate
Code:	MKP6301
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Dr. Ketut Ima Ismara, M.Pd.,M.Kes.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	150 minutes lectures and 180 minutes structured activities per week.
Teaching and Learning Method	Discussion, Brain Storming, Student Centered Learning, and Lecturing, Computer Based Learning.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes self-study per week for 16 weeks.
Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrates devotion to YME God, the practice of values, norms, and academic ethics ELO2 Demonstrate an attitude of nationalism, responsibility, and tolerance towards society and the environment. ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams

	ELO4 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation. ELO5 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering and industrial automation. ELO6 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology ELO9 Able to develop innovations in education, and publish the results of his work
Course Outcome:	CO1 Demonstrate polite, honest, good faith in lectures. CO2 Contribute to improving the quality of life in a society, nation, state, and advancement of civilization based on Pancasila CO3 Knowledge of the preparation of scientific papers including work reports in accordance with scientific procedures based on data and information analysis. CO4 Apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and / or technology in accordance with their area of expertise. CO5 Assessing the implications of the development or implementation of science, technology or art in accordance with their expertise based on the rules, procedures and scientific ethics to produce solutions, ideas, designs, or art criticism and compile scientific descriptions of the results of their studies in the form of thesis or final project report. CO6 Make decisions appropriately in the context of problem solving in their area of expertise, based on the results of an analysis of information and data. CO7 Compile reports of Scientific Works in accordance with scientific procedures based on analysis, information and data and be able to interpret and communicate accurately and accountably in order to solve problems and phenomena that occur related to the profession.

<table>
<tr><td>ELO and CO mapping</td><td>

	ELO1	ELO2	ELO5	ELO9
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓
CO5				✓
CO6				✓
CO7				✓

</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the knowledge, understanding and application of various research methods in the context of preparing the final project. In lectures discussed various types of research, steps of scientific research ranging from determining the topic, identifying problems, reviewing the literature, determining the focus of the problem, determining the variables, design and design, data collection techniques, analysis and conclusion drawing. Learning activities include lectures with various approaches and methods that involve students, such as discussions, field observations to learn to identify problems and practice making research proposals.</td></tr>
<tr><td>Assessments</td><td>1. The assessment was conducted to measure all learning achievements, namely attainment learning achievements (CPMK 1), general skills (CPMK 2), knowledge (CPMK 3), and special skills (CPMK 4 and CPMK 5).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude than the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, presentations, quizzes, insert tests, and final semester examinations with the following guidelines.</td></tr>
</table>

<table>
<tr><td></td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO2</td><td>Presentation</td><td>Observation</td><td>10%</td></tr>
<tr><td>2</td><td>CO3 dan CO5</td><td>a. Individual assignments
b. Group assignments
c. Quiz
d. Final exams</td><td>a. Accuracy of program results
b. Writen</td><td>20%
20%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Arikunto, S. 2006. Penelitian Tindakan Kelas. Jakarta : Rineka Cipta.
2. Sugiyono. 2006. Metode Penelitian Kuantitatif Kualitatif dan R&D. Bandung: Alfabeta.
3. Sachari, Agus (2003). Pengantar Metode Penelitian. Bandung: Erlangga.
4. Arikunto, S. (2016). Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Rineka Cipta.
5. Emzir. (2010). Metodologi Penelitian Pendidikan:Kuantitatif dan Kualitatif. Jakarta: Rajawali Pers.
6. Tim Tugas Akhir Skripsi(2013). Pedoman Penyusunan Tugas Akhir Skripsi. Yogyakarta.</td></tr>
<tr><td>Date of revision</td><td>30 August 2018</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Entrepreneurship
Module level,if applicable:	Undergraduate
Code:	MKU6212
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{rd}
Module coordinator:	Mutaqin, M.Pd.,M.T.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method:	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field

	of expertise both individual and team works ELO8 Capable to apply research and scientific writing methods ELO9 Capable to develop a vocational education innovation and publish scientific paper
Course outcomes:	CO1 Students devoted to God Almighty, obedient to worship and show a special attitude, tawadlu, and istiqomah, CO2 Students value active, responsible, and have the motivation to develop themselves, and character in every learning undertaken, CO3 Students have a soul / spirit & amp; entrepreneurial character, considering the nature of entrepreneurship, business ethics and social responsibility, having entrepreneurial skills,
ELO and CO mapping:	see table below
Courses Description:	This course will equip students to be able to build soul / character and entrepreneurship, understand the concept of entrepreneurship, and practice skills. The scope of this course material includes: developing the spirit / character and character of entrepreneurship, motivation achievement, the nature of entrepreneurship, business ethics and social responsibility, production management, finance, marketing and human resources, opportunities businesses, business plans, and entrepreneurial practices / learning projects. Learning strategies using student center learning with methods including: lectures, discussions, games, assignments, simulations, and Field practice and presentation. Evaluation uses the assignment model, presentation and written test.

	ELO1	ELO2	ELO3	ELO7	ELO8	ELO9
CO1	✓					
CO2		✓				
CO3			✓	✓	✓	✓

<table>
<tr>
<td>Assessment:</td>
<td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1 - CO3</td><td>Assignment</td><td>Paper and Presentation</td><td>25%</td></tr>
<tr><td>Mid Term</td><td>Written Test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>35%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>
1. Abdullah Gymnastiar. (2006). Melipatgandakan Kekayaan dengan Kecerdasan Spiritual. Bandung. Solusi Qalbu.
2. Alain Fayolle. (2007).Handbook of Research in Entrepreneurship Education, Volume 2. Belgium: Edward Elgar Publishing Limited
3. Buchari Alma. (2006). Kewirausahaan. Edisi kesepuluh. Bandung: Alfabeta
4. Gerben Blaauw, Peter van der Sijde ,Christoph Diensberg (2008). Teaching Entrepreneurship, Cases for Education and Training. Netherlands: A Springer Company
5. Geoffrey G. Meredith dkk. (1996) Kewirausahaan, Teori dan Praktek. Edisi kelima. Jakarta: PT Pustaka Binaman Pressindo.
6. Justin G. Longenecker dkk.(2001). Kewirausahaan Manajemen Usaha Kecil. Jakarta: PT. Salemba Empat Patria.
7. Lynn M. Pearce. (2010). Business Plans Handbook, Volume 16. New York: Farmington Hills,
8. Rusman Hakim. (1998). Kiat Sukses Berwiraswasta. Edisi Kedua. Jakarta: PT Elex Media Media Komputindo.
</td>
</tr>
</table>

Date of revision:	31 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Indonesian Language
Module level,if applicable:	Undergraduate
Code:	MKU6209
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6rd
Module coordinator:	Zamtinah, M.Pd.
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method:	Discussion and Lecturing
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works

<table>
<tr><td></td><td>ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology
ELO8 Capable to apply research and scientific writing methods
ELO9 Capable to develop a vocational education innovation and publish scientific paper</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Thanks to God Almighty and able to show a regius attitude and character,
CO2 Students uphold academic ethics and avoid plagiarism,
CO3 Students uphold nationalism through the use of Indonesian,
CO4 Students agree to be active, responsible, and have the motivation to develop themselves,
CO5 Students are able to use Indonesian properly and correctly orally in various types of scientific work, both formal, semi-formal,
also popular
CO6 Having the ability to communicate, think critically and produce scientific papers</td></tr>
<tr><td>ELO and CO mapping:</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO5</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>Indonesian language skills are an absolute requirement for Indonesian students to be able to express their thoughts to other parties effectively. Courses Indonesian is expected to make students have high communication skills in the scientific realm. Based on the mastery of functions language and variety and barrel, reading spelling skills, sentences, paragraphs, and types of discourse, as well as reproducing texts from various sources, students expected to be able to write and speak well in Indonesian scientific barrel. Students are expected to understand aspects of scientific papers including definitions and types of scientific papers, and able to compile scientific papers both popular, semi-formal and formal. Students are able to implement ethics authorship and</td></tr>
</table>

<table>
<tr><td></td><td>refraining from actions including plagiarism.</td></tr>
<tr><td>Assessment:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1-CO6</td><td>Assignment</td><td>Paper and Presentation</td><td>25%</td></tr>
<tr><td>Mid Term</td><td>Written Test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>35%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Amien, M. (1995) Pedoman penulisa karya ilmiah. Yogyakarta: Program Pasca Sarjana UNY
2. Andi Baso Mappatoto (1993) Teknik penulisan feature (Karangan Khas). Jakarta: Gramedia
3. Brotowijoyo, Mukayat D. (2002). Penulisan Karangan Ilmiah. Jakarta: Akademika Pressindo
4. Dirjen Dikti Kemdikbud RI (2013) Materi Kuliah Bahasa Indonesia
5. ______ (1990) Bahan Penataran Penelitian Dasar dan Penulisan Karya Ilmiah bagi Dosen Muda FPTK IKIP Yogyakarta.
6. Daniel Samad (1997) Dasar-dasar meresensi buku. Jakarta: PT Gramedia Widiasarana Indonesia
7. Edy Zaqeus (2005) Resep cespleng menulis buku best seller: Jurus jitu menulis buku laris untuk orang sibuk seperti anda. Yogyakarta: Gradien Books
8. Haryanto, AG. (1993) Seluk beluk penyusunan karya ilmiah. Jakarta: Hipokrates.
9. Isnani, AS. Suryono. (2008) Plagiarisme. Pengembangan Wwaasan Redaksi. Media Aesculapius Departemen Farmakologi FKUI.
10. Kamus Besar Bahasa Indonesia (2001). Pusat Bahasa Depdiknas. Jakarta: Balai Pustaka
11. Keraf, Gorys. 1997. Komposisi, sebuah</td></tr>
</table>

	PengantarKamahiran Bahasa. Ende: Penerbit Nusa Indah. 12. Kuncoro, Mudrajat. (2009) Mahir menulis. Kiat jitu menulis artikel opini, kolom, dan resensi buku. Jakarta: Penerbit Erlangga 13. Permendiknas No. 17 Tahun 2010 tentang Pencegahan dan Penanggulangan Plagiat di Perguruan Tinggi. 14. Ramlan, M. dkk. (1994) Bahasa Indonesia yang salah dan yang benar. Yogyakarta: Andi Offset. 15. Soekamto, dkk (1995) Pedoman penelitian. Lembaga Penelitian IKIP Yogyakarta 16. Sriyana, Jaka (2012) Kode etik penulis dan etika kepenulisan karya ilmiah. 17. Sugiyono (2005) Metode penelitian administrasi. Bandumg : Alfabeta 18. ______ (2006) Statistika untuk penelitian. Bandung : Alfabeta 19. ________(2013) Cara mudah menyusun: skripsi, tesis, dan disertasi. Bandung: Alfabeta 20. Suharsimi Arikunto (1989) Prosedur penelitian suatu pendekatan praktik. Bandung : Bina Aksara 21. Wahyu Wibowo (2002) 6 langkah jitu agar tulisan anda makin hidup dan enak dibaca. Jakarta : Gramedia Pustaka Utama 22. Undang-Undang No. 12 Tahun 2010 tentang Pendidikan Tinggi
Date of revision:	31 August 2019

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Transmission and Distribution lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6245
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Dr. Giri Wiyono, M.T
Lecturer(s):	1. Dr. Zamtinah 2. Faranita Surwi, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

<table>
<tr><td></td><td>ELO4 Master in basic sciences and principles of electric
ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Devoted to God Almighty and able to show a religious attitude and character.
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves.
CO3 Students can analyze the phenomena that occur in transmission and distribution systems.
CO4 Having the ability to communicate effectively, think critically and make the right decisions.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This course practices the phenomena that occur in the process of transmitting and distributing electric power from generators to users. The scope of this course material includes: load characteristics of R, L and C at DC and AC sources, phase sequence checking, voltage regulation and power flow on a simple transmission line, simulation of voltage drop and phase angle on the transmission line, parameters that affect the flow real and reactive power, use of transformers to increase power transfer capacity, alternators, synchronous motors, long lines and synchronous capacitors, synchronous motor operations at low loads, and the stability of power system switching</td></tr>
<tr><td>Assesments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:</td></tr>
</table>

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1-CO4	Individual Assignment	Practicum report	10%
		Group Assignment	Practicum	20%
		Mid	Written test	25%
		Final Exam	competence test	40%
		Attendance	Documentation	5%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Hutauruk. (1993). Transmisi Daya Listrik. Jakarta: Penerbit Erlangga 2. Gupta, JR. (1981). A Course In Electrical Power. India: Katson Publishing House. 3. Pansini, Anthony J. (2006). Electrical Distribution Engineering. USA: Taylor & Francis Ltd. 4. Sadaat, Hadi. (1999). Power System Analysis.Singapore: Mc Graw Hill
Date of revision	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Micro teaching
Module level,if applicable:	Undergraduate
Code:	EKO 6246
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T.
Lecturer(s):	Dr. Istanto Wahyu Djatmiko, M.Pd. Dr. Edy Supriyadi, M.Pd. Dr. Drs. Haryanto, M.Pd.,M.T. Dr. Sunaryo Soenarto,MPd.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of: (1) 150 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 40 hours of face-to-face activities per semester
Credit points:	3
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrates devotion to YME God, the practice of

	values, norms, and academic ethics ELO2 Uphold the value of humanity in carrying out duties based on religion, morals, and ethics. ELO5 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation. ELO6 Able to plan, implement, and evaluate learning in the field of electric power or automation. ELO8 Able to apply research methods and preparation of scientific works
Course Outcomes	CO1 Students fear God and be able to show a religious attitude and character, CO2 Uphold the confidentiality of his work, honest and fair in carrying out duties based on religion, morals, and ethics. CO3 Knowledge of the preparation of scientific works including work reports in accordance with scientific procedures based on data and information analysis. CO3.1 Understand the basics of Vocational Learning Management. CO3.2 Develop a Micro Teaching Learning Plan (RPP). CO3.3 Understand 8 basic learning skills CO4 Implement innovative learning models that are relevant to the characteristics of students. CO4.1 Practicing basic teaching skills is limited. CO4.2 Practice the basic skills of integrated teaching in learning theory. CO4.3 Practice basic integrated teaching skills in practical learning in the laboratory. CO4.4 Practice the basic skills of integrated teaching in practical learning in the workshop. CO5 Facilitating, evaluating, implementing learning and learning outcomes professionally, as well as community partnerships within the framework of vocational education in carrying out their duties as a teaching profession. CO5.1 Skillfully simulates 8 basic teaching skills.

<table>
<tr><td>ELO and CO mapping</td><td>

	ELO1	ELO2	ELO5	ELO6	ELO8
CO1	✓				
CO2		✓			
CO3			✓		
CO4					✓
CO5				✓	

</td></tr>
<tr><td>Courses Description:</td><td>Micro Learning Courses form and provide provisions for students to have pegagogical competencies, professional competencies, personality competencies, and social competencies through: understanding basic teaching skills, preparation of lesson plans, practice of basic teaching skills limited, practice of basic teaching skills integrated, both in learning theory, practice in the laboratory, as well as in the workshop.</td></tr>
<tr><td>Assessments</td><td>

1. The assessment was conducted to measure all learning achievements, namely attainment learning achievements (CPMK 1), general skills (CPMK 2), knowledge (CPMK 3), and special skills (CPMK 4 and CPMK 5).
2. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given the attitude rating: not good, good enough, good, and very good. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
3. The final grade includes the accumulation of assessments for each meeting as referred to by the weight of the assessment.

The final mark will be weight as follow:

No	CO	Assessment Object	Assessment Technique	Weight
1	CO1 – CO7	Understand the fundamentals of Micro Teaching.	Written test	10%
		Field observation	Assignment	10%
		Compose of syllabus	Assignment	10%
		Compose of learning implementation plan	Assignment	15%
		Practicing the limited of basic teaching skills	Performing	10%

</td></tr>
</table>

			Test	
		Practicing the basic skills of integrated teaching in learning theory.	Performing Test	10%
		Practice basic integrated teaching skills in practical learning in the laboratory.	Performing Test	15%
		Practice the basic skills of integrated teaching in practical learning in the workshop.	Performing Test	20%
			Total	100%

Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Barnawi & M. Arifin (2012). Teori & praktik pengajaran yg efektif & Kreatif. Bandung: Ar- Ruzz Media 2. Dewa Ayu Eka Agustini, Luh Putu Artini, Ni Nyoman Padmadewi. (2010) Pengantar Micro Teaching. Jakarta: Balai Pustaka 3. Arif Sardiman. (2001). Media Pendidikan. Jakarta: Pustekkom Diknas.
Date of revision	30 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP) **MODULE HANDBOOK**

Module name:	Electrical Power Plant
Module level,if applicable:	Undergraduate
Code:	EKO6247
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}

Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T
Lecturer(s):	1. Muhfizaturrahmah, S.T., M.Eng 2. Eko Swi Darmawan, M.Pd. 3. Eko Prianto, M.Eng.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to ELO1 Demonstrates devotion to YME God, the practice of values, norms, and academic ethics. ELO3 Can carry out work in accordance with the professional field of expertise both individually and in teams. ELO4 Mastering basic science and basic electricity. ELO5 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation. ELO7 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology.
Course Outcomes:	CO1 Fear God Almighty and be able to show a religious attitude, honest and patient. CO2 Demonstrates responsibility for work in their area of expertise independently. CO3 Knowledge of law and the basic theory of electricity. CO4 Knowledge of the preparation of scientific papers including work reports in accordance with scientific procedures based on data and information analysis. CO5 Knowledge of the generation, distribution, use, installation and engineering of electric power automation in the business world and industry in accordance with the standards and principles that are generally accepted and relevant in the field of

	electricity and renewable energy. CO6 Analyzing the application of materials related to Electric Power Engineering or Industrial Automation for the development of renewable energy development. CO7 Apply the theory of electricity generation in general and energy efficiency in the field of generation.
ELO and CO mapping	(see table below)
Courses Description:	This course studies the working principles of Steam Power Plants (PLTU), PLTG, PLTA, PLTN and other alternative power plants such as micro hydro, solar, wind, and wave power plants. In addition, studies are also related to initial movers and electrical equipment in power plants; cable or grid lines from the generator to the transformer and substation; plant operation; parallel generator; control system at the plant; and interconnection systems in generation. Students are taught to carry out disturbance analysis and generator recovery processes; power change analysis and power plant optimization; and cost analysis and generation management.

	ELO1	**ELO3**	**ELO4**	**ELO5**	**ELO7**
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓
CO6					✓
CO7					✓

<table>
<tr>
<td>Assessments:</td>
<td>
The assessment was conducted to measure all learning outcomes, namely attainment learning achievements (CPMK 1 (A.1.1) and (CPMK 2 (A.3.2)); knowledge (CPMK 3 (K.1.2) and CPMK 4 (K.2.1)); and skills (CPMK 5 (S.2.2), CPMK 6 (S.2.9), and (CPMK 7 (S.2.10)).

Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude than the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, Inserts Exams, and Final Semester Exams with the following guidelines.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1 dan CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td>2</td><td>CO3, CO4, CO5, CO6, dan CO7</td><td>a. Individual assignments
b. Group assignments
c. Midterm exam
d. Final exams</td><td>Written test</td><td>15%
15%
20%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer</td>
</tr>
<tr>
<td>Literature:</td>
<td>

Breeze, Paul. (2005). Power Generation Technologies. Hongkong: Newnes.
Dandekar. (1991). Pembangkir Listrik Tenaga Air. Jakarta: UI- Press.
Djiteng Marsudi. (2005). Pembangkit Energi Listrik. Jakarta: Erlangga.
El Wakil. (1992). Instalasi Pembangkit Daya Jilid I. Jakarta: Erlangga.
Grigsby, Leonard L. (2007). Electric Power Generation, Transmission, and Distribution (Electric Power Engineering Handbook). New York: CRC.

</td>
</tr>
</table>

	6. Keljik,.Jeffrey J. (2008). *Electricity 3: Power Generation and Delivery.* Singapore: Delmar Cengage Learning. 7. Mahon, L.L.J. (1992). *Diesel Generator Handbook*. New York: Butterworth. 8. Pansini, Anthony J. & Smalling, K. D. (2005). *Guide to Electric Power Generation*. Texas: Fairmont Press. 9. PLN. (2002). *Pembangkit Tenaga Listrik*. Jakarta: PLN. 10. Sigalingging, K. (1994). *Pembangkit Listrik Tenaga Surya*. Bandung: Tarsito. 11. Singh, S. N. (2004). *Electric Power Generation Transmission and Distribution*. New Delhi: Prentice-Hall of India Pvt. Ltd. 12. Soelaiman. (2004). *Pembangkitan Energi Elektrik.* Bandung: Lab Konversi Energi Elektrik Jurusan Teknik Elektro ITB. 13. Willis, H. Lee. (2000). *Distributed Power Generation: Planning and Evaluation*. New York; CRC. 14. Wood, Allen J. dan Wollenberg, Bruce F. (2001). *Power Generation, Operation, and Control.* New Yersey: Wiley-Interscience.
Date of revision	30 August 2018

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power Plant Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6247
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Dr. phil. Nurhening Yuniarti, M.T
Lecturer(s):	1. Muhfizaturrahmah, S.T., M.Eng 2. Eko Swi Darmawan, M.Pd. 3. Eko Prianto, M.Eng.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Demonstration, Simulation.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrates devotion to YME God, the practice of values, norms, and academic ethics. ELO3 Can carry out work in accordance with the professional

<table>
<tr><td></td><td>field of expertise both individually and in teams.
ELO4 Mastering basic science and basic electricity.
ELO5 Mastering work standards, work methods, work implementation, and testing in the field of electric power engineering or industrial automation.
ELO7 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology.</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Fear God Almighty and be able to show a religious attitude, honest and patient.
CO2 Demonstrates responsibility for work in their area of expertise independently.
CO3 Knowledge of law and the basic theory of electricity.
CO4 Knowledge of the preparation of scientific papers including work reports in accordance with scientific procedures based on data and information analysis.
CO5 Knowledge of the generation, distribution, use, installation and engineering of electric power automation in the business world and industry in accordance with the standards and principles that are generally accepted and relevant in the field of electricity and renewable energy.
CO6 Analyzing the application of materials related to Electric Power Engineering or Industrial Automation for the development of renewable energy development.
CO7 Apply the theory of electricity generation in general and energy efficiency in the field of generation.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO3</th><th>ELO4</th><th>ELO5</th><th>ELO7</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>CO7</td><td></td><td></td><td></td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>This subject studies and practices the working principle of PLTU, PLTA, PLTG and PLTN simulation. Students are taught to learn the characteristics of alternators; paralleling generato; PLTS installation and operation; installation and operation of wind power plants; microhydro installation and operation;</td></tr>
</table>

<table>
<tr><td></td><td>operation, maintenance and repair of generators; Diesel power generation equipment (PLTD); operation, maintenance and repair of PLTD. In addition, this course also studies the simulation of Load frequency control of power stations using LQR and Robbust methods, and conducts field studies on power plants.</td></tr>
<tr><td>Assessments</td><td>The assessment was conducted to measure all learning outcomes, namely attainment learning achievements (CPMK 1 (A.1.1) and (CPMK 2 (A.3.2)); knowledge (CPMK 3 (K.1.2) and CPMK 4 (K.2.1)); and skills (CPMK 5 (S.2.2), CPMK 6 (S.2.9), and (CPMK 7 (S.2.10)).
1. Attitude assessment is carried out at each meeting using observation techniques and / or self-assessment using the assumption that basically every student has a good attitude. The student is given a value of a very good attitude or not good if it shows significantly better or less good attitude than the attitude of students in general. The results of the attitude assessment are not a component of the student's final grade, but rather as one of the graduation requirements. Students will graduate from this course if at least have a good attitude. Attitude assessment also considers the activeness of students following lectures.
2. Final grades include the results of an assessment of knowledge, general skills, and special skills obtained from individual assignments, group assignments, Inserts Exams, and Final Semester Exams with the following guidelines.

The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1 dan CO2</td><td>Attitude (presence, activity, discipline, honesty)</td><td>Observation</td><td>10%</td></tr>
<tr><td>2</td><td>CO3, CO4, CO5, CO6, dan CO7</td><td>a. Individual assignments
b. Group assignments
c. Midterm exam
d. Final exams</td><td>Written test</td><td>15%
15%
20%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Breeze, Paul. (2005). Power Generation Technologies. Hongkong: Newnes.
2. Dandekar. (1991). Pembangkir Listrik Tenaga Air. Jakarta: UI- Press.</td></tr>
</table>

	3. Djiteng Marsudi. (2005). *Pembangkit Energi Listrik*. Jakarta: Erlangga. 4. El Wakil. (1992). *Instalasi Pembangkit Daya Jilid I*. Jakarta: Erlangga. 5. Grigsby, Leonard L. (2007). *Electric Power Generation, Transmission, and Distribution (Electric Power Engineering Handbook)*. New York: CRC. 6. Keljik,.Jeffrey J. (2008). *Electricity 3: Power Generation and Delivery.* Singapore: Delmar Cengage Learning. 7. Mahon, L.L.J. (1992). *Diesel Generator Handbook*. New York: Butterworth. 8. Pansini, Anthony J. & Smalling, K. D. (2005). *Guide to Electric Power Generation*. Texas: Fairmont Press. 9. PLN. (2002). *Pembangkit Tenaga Listrik*. Jakarta: PLN. 10. Sigalingging, K. (1994). *Pembangkit Listrik Tenaga Surya*. Bandung: Tarsito. 11. Singh, S. N. (2004). *Electric Power Generation Transmission and Distribution*. New Delhi: Prentice-Hall of India Pvt. Ltd. 12. Soelaiman. (2004). *Pembangkitan Energi Elektrik.* Bandung: Lab Konversi Energi Elektrik Jurusan Teknik Elektro ITB. 13. Willis, H. Lee. (2000). *Distributed Power Generation: Planning and Evaluation*. New York; CRC. 14. Wood, Allen J. dan Wollenberg, Bruce F. (2001). *Power Generation, Operation, and Control.* New Yersey: Wiley-Interscience.
Date of revision	30 August 2018

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Vocational Guidance
Module level,if applicable:	Undergraduate
Code:	KTF6210
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Mutaqin, M.Pd.,M.T.
Lecturer(s):	Dr. Nurhening Yuniarti, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	Compulsory/~~Elective~~ Course
Teaching format / class hours per week during the semester:	The form of learning is in the form of lectures, which consist of 100 minutes of face-to-face activities per week per semester; (2) structured assignment activities 120 minutes per week per semester; and (3) 120 minutes of independent activities per week per semester.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 26 hours 40 minutes of face-to-face activities per semester
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet

<table>
<tr><td></td><td>ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
ELO7 Capable to manage vocational education and training of electrical engineering expertise by utilizing information and communications technology</td></tr>
<tr><td>Course Outcomes</td><td>CO1 Get to know potential of self (interests, talents, self-expertise, character or personality, and intelligence: intellectual, emotional, spiritual, adversity).
CO2 Get to know the needs of the workforce, Job evaluation (performance, vocational competence and technology).
CO3 Self Career Projection (SWOT self analysis).
CO4 Develop self competence.
CO5 Looking for a job, applying for a job.
CO6 Success Job Test.
CO7 Success Career Works.
CO8 Presenting observations of self potential, self career projection.</td></tr>
<tr><td>ELO and CO mapping</td><td><table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO5</th><th>ELO6</th><th>ELO 7</th></tr>
<tr><td>CO1</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO7</td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>CO8</td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Courses Description:</td><td>Vocational Career Guidance and Technology lectures will reveal the individual's basic potential, personal interests and trends, attitudes and behavioral habits. Students can know the direction of personal career development, especially understanding their basic potential and are able to plan a career better and in accordance with their potential. The main studies include: recognizing self potential, recognizing the needs of the world of work (job evaluation), developing self competence, career projection, finding a job, successful job</td></tr>
</table>

<table>
<tr><td></td><td>tests, and successful career work. Lectures are carried out using the student center learning approach. Competency-based assessment involves active participation, and communication of interactions between individuals and groups.</td></tr>
<tr><td>Assessments</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">CO1-CO8</td><td>Assignment</td><td>Paper and Presentation</td><td>25%</td></tr>
<tr><td>Mid Term</td><td>Written Test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>35%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Paul C. Green. 1999. Building Robust Competencies: Linking Human Resources System to Organizational Strategis. San-Fransisco: Jossey-Bass Publisher.
2. Frans Poeles. 2003. Job Evaluation and Remuneration Strategies. Jakarta: Gramedia.
3. Nick boulter, Murray Dalziel, Jackie. 2003. People and Competencies. Jakarta: Gramedia.
4. Peter Sheal. 2003. The Staff Development Handbook. Jakarta: Gramedia.
5. Margaret Dale. 2003. Succesful Recruitment and Selection. Jakarta: Gramedia.
6. David Clutterbuck & Susan Kernaghan. 2003. The Power of Empowerment. Jakarta: Gramedia.</td></tr>
<tr><td>Date of revision</td><td>18 August 2019</td></tr>
</table>

UNIVERSITAS NEGERI YOGYAKARTA
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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Flexible Manufacturing System Lab. Work
Module level,if applicable:	Undergraduate
Code:	EKO6255
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Totok Heru Tri Maryadi, M. Pd.
Lecturer(s):	1. Amelia Fauziah Husna, M. Pd. 2. -
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week.
Teaching and Learning Method	Eksperimen, Discussion.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work

	implementations, and testing in electric power or industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes:	CO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. CO2 Demonstrate nationalism, responsibility, and tolerance to both society and environment. CO3 Students have the ability to identify components of a flexible manufacturing system. CO4 Students can program flexible manufacturing systems. CO5 Students can commisioning flexible manufacturing systems. CO6 Students can troubleshooting flexible manufacturing systems. CO7 Students can design flexible manufacturing systems.
ELO and CO mapping:	(see table below)
Courses Description:	Flexible Manufacturing System Practices are practical activities of identifying equipment, analyzing system processes, programming systems and designing flexible manufacturing systems.

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5				✓	
CO6				✓	
CO7				✓	✓

<table>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO7</td><td>Individual Assignment</td><td>Practicum report</td><td>10%</td></tr>
<tr><td>Group Assignment</td><td>Practicum</td><td>20%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>competence test</td><td>40%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer.</td></tr>
<tr><td>Literature:</td><td>1. Crosser, P. 1994. Pneumatic. Indonesia: Didactic Festo
2. Bolton, William. 2003. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. London: Pearson Education Limited.
3. Festo Didactic. Learning System for Automation: Fundamentals of Mechatronics.
4. Totok Heru TM. 2013. Labsheet Manufacturing Practice Flexible System. Yogyakarta: Faculty of Engineering UNY</td></tr>
<tr><td>Date of revision</td><td>15 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Refrigerant and Air Conditioning Lab Work
Module level,if applicable:	Undergraduate
Code:	EKO6250
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6th
Module coordinator:	Dr. Djoko Laras BT
Lecturer(s):	Team
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures and 240 minutes structured activities per week.
Teaching and Learning Method	Discussion, Demonstration, and *Lecturing*
Workload:	Total workload is 161 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field

	of expertise both individual and team works ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or industrial automation expertise. ELO6 Able to plan, implement, and evaluate learning in the field of electric power or automation ELO7 Able to manage vocational education and training in the field of Electrical Engineering by utilizing information and communication technology ELO8 Able to apply research methods and preparation of Scientific work
Course Outcomes	CO1 The ability to understand symbols, refrigeration and AC (Air Conditioner) engine systems, CO2 Calculate and analyze cooling loads, CO3 Mechanical and electrical practice of engine coolant, air distribution, CO4 The supply of electrical power to the cooler engine load. CO5 Maintenance and repair of engine coolants. CO6 Inspection and test commissioning on the engine coolant.
ELO and CO mapping	(see table below)
Courses Description:	The Refrigerant and Air Conditioning course is a practical course that studies the symbols of refrigeration and ac systems, the basis of refrigeration engines, refrigeration systems and ac. Understanding and practice of work systems or operation of cooling machines, mechanical & electrical systems of cooling machines. Calculation and selection of engine coolant components, cooling loads, air distribution, electricity, maintenance repairs, inspections, and test commissioning of coolant engines.

ELO and CO mapping

	ELO3	ELO4	ELO5	ELO6	ELO7	ELO8
CO1	✓					
CO2		✓				
CO3			✓	✓		
CO4			✓	✓	✓	✓
CO5			✓		✓	✓
CO6			✓	✓		✓

<table>
<tr><td>Assessments</td><td>
Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO6</td><td>Individual Assignment</td><td>Practicum report</td><td>10%</td></tr>
<tr><td>Group Assignment</td><td>Practicum</td><td>20%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>competence test</td><td>40%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>

Althouse, AD (1975). Modern Refrigeration and Air Conditioning. Holland: The Goodheart-Willcox Company Inc.
BSN. (2000). PUIL 2000, Badan Standar National.
Carrier AC company (1965). Handbook of Air Conditioning system Design. New York: McGraw-Hill Book Company.
Daikin (1989). Service Manual “ Air Conditioning and Refrigeration Equipment. Japan: Daikin.
McQuay. (1999). High Static Direct Expansion Fan Coil Units, McQuay Air Conditioning.
Schneider, (2010). Katalog Produk, Jakarta. Schneider Electric
Smacna. (2013). HVAC Sysytems Duct Design. Virginia: Smacna Inc.
Stoecker, WF and Jones, JW (1982). Refrigeration and Air Conditioning. Singapore: McGraw-Hill Book Company.
Sucaco, PT. (2011). Low Voltge PVC Insulated Cable Jakarta: Supreme Cable Manufactoring Corp. Tbk..
Traister, JE. (2009). Electrical Applications Guidebook. Virginia: Reston Publishing Campany.

</td></tr>
</table>

Date of revision	18 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Electrical Power System Operation
Module level,if applicable:	Undergraduate
Code:	EKO6251
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Toto Sukisno, M.Pd.
Lecturer(s):	1. Ir. Muhamad Ali, M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	100 minutes lectures and 120 minutes structured activities per week.
Teaching and Learning Method	Discussion
Workload:	Total workload is 91 hours per semester which consists of 100 minutes lectures, 120 minutes structured activities, and 120 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO2 Demonstrate nationalism, responsibility, and tolerance to both society and environmet ELO3 Capable to perform professional works in his/her field of expertise both individual and team works

<table>
<tr><td></td><td>ELO4 Master in basic sciences and principles of electric
ELO9 Capable to develop a vocational education innovation and publish scientific paper</td></tr>
<tr><td>Course outcomes:</td><td>CO1 Devoted to God Almighty and able to show religious attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Students can evaluate the operation of the electric power system from the generator to the user.
CO4 Having the ability to communicate effectively, think critically and make the right decisions.</td></tr>
<tr><td>ELO and CO mapping</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO2</th><th>ELO3</th><th>ELO4</th><th>ELO9</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>CO4</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>This course discusses the operation of the electric power system, starting from the generating sub-system to the utilizing sub-system. The scope of this course material includes: introduction to the electric power system, the imposition of generating units, frequency regulation, economic operations in thermal plants, constraints and disturbances in the operation of the electric power system, implementation and control of electric power system operations, voltage regulation and reactive power allocation, analysis and evaluating the operation of the electric power system</td></tr>
<tr><td>Assesments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">CO1-CO4</td><td>Assignment</td><td>Paper and Presentation</td><td>25%</td></tr>
<tr><td>Mid Term</td><td>Written Test</td><td>30%</td></tr>
<tr><td>Final Exam</td><td>Written Test</td><td>35%</td></tr>
</table>
</td></tr>
</table>

	Attendance | Documentation | 10% Total | 100%
Forms of media:	Board, LCD Projector, Laptop/Computer
Literature:	1. Sukisno, Toto. (2012). Handout Operasi Sistem Tenaga Listrik 2. Stevenson, William D. (1984). *Analisis Sistem Tenaga Listrik*. Jakarta. Penerbit Erlangga 3. Marsudi, Djiteng. (2006). *Operasi Sistem Tenaga Listrik*. Yogyakarta: Penerbit Graha Ilmu 4. J.Wood (1984). *Power Generation, Operation,and Control*. John Wiley and Sons. 5. Sadat, Hadi. (1999). *Power System Analysis*. Singapore: McGraw-Hill.
Date of revision	10 August 2019

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Industrial Automation System Design Lab Work
Module level,if applicable:	Undergraduate
Code:	EKO6252
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6^{th}
Module coordinator:	Sunomo, M. T.
Lecturer(s):	1. Ariadie Chandra Nugraha, M.T. 2. Dr. Haryanto, M.Pd.,M.T.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week.
Teaching and Learning Method	Tutoial, Task, Demonstration.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work

<table>
<tr><td></td><td>implementations, and testing in electric power or industrial automation expertise.
ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise</td></tr>
<tr><td>Course Outcomes:</td><td>CO1 Devoted to God Almighty and able to show a regius attitude and character,
CO2 Students actively participate, take responsibility, and have the motivation to develop themselves,
CO3 Students are able to plan a system based electronic hardware,
CO4 Students are able to build a system based electronic hardware,
CO5 Students are able to present a system based electronic hardware,</td></tr>
<tr><td>ELO and CO mapping:</td><td>
<table>
<tr><th></th><th>ELO1</th><th>ELO4</th><th>ELO5</th><th>ELO6</th></tr>
<tr><td>CO1</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>CO5</td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Courses Description:</td><td>The material in this course is a combination of applications from various basic sciences, such as electricity, analog and digital electronics, power electronics, control systems, mechanical technology, programming, information technology, microcontrollers and robotics. In this course, students are required to make hardware technology work. In the early weeks, students are assigned by the instructor to search for works that have been made by students in the same field of study, and analyzed to find out whether the work can be developed, modified, or improved so that the performance can be used as the title of the device hard to be made as an assignment in this course. By making hardware that is demanded, it is expected that students will truly have competence in soldering techniques, techniques of assembling electronic devices, techniques of making printed strand boards (circuits), and repair techniques (trouble shooting) if the equipment fails to work.</td></tr>
<tr><td>Assessments:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in</td></tr>
</table>

<table>
<tr><td></td><td>general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.

The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO5</td><td>Individual Assignment</td><td>Practicum report</td><td>10%</td></tr>
<tr><td>Group Assignment</td><td>Practicum</td><td>20%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>competence test</td><td>40%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Ogata, Katsuhiko, 1995, Teknik Kontrol Automatik, Erlangga.
2. Andrianto, Heri. (2008). Pemrograman Mikrokontroler AVR ATMEGA 16 menggunakan Bahasa C (CodeVision AVR). Bandung: Informatika.
3. Lingga Wardana, 2006, Belajar Sendiri Mikrokontroler AVR Seri ATMega 8535. Yogyakarta: Andi.
4. Rachmad Setiawan, 2006, Mikrokontroler MCS51, Graha Ilmu.
5. Houpis, C.H., & Lamont, G.B. (1992). Digital control systems theory, hardware, software. (2nd Ed.). New York: McGraw Hill, Inc.</td></tr>
<tr><td>Date of revision</td><td>17 August 2019</td></tr>
</table>

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Bachelor of Education in Electrical Engineering Study Program (B.Ed.Electrical SP)

MODULE HANDBOOK

Module name:	Pneumatics Lab Work
Module level,if applicable:	Undergraduate
Code:	EKO6253
Sub-heading,if applicable:	-
Classes,if applicable:	-
Semester:	6th
Module coordinator:	Totok Heru Trimaryadi, M. Pd.
Lecturer(s):	1. Amelia Fauziah Husna, M.Pd.
Language:	Bahasa Indonesia
Classification within the curriculum:	~~Compulsory~~/Elective Course
Teaching format / class hours per week during the semester:	200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week.
Teaching and Learning Method	Discussion, Task, Practice.
Workload:	Total workload is 181 hours per semester which consists of 200 minutes lectures, 240 minutes structured activities, and 240 minutes self-study per week for 16 weeks.
Credit points:	2
Prerequisites course(s):	-
Expected Learning Outcomes:	After taking this course the students have ability to: ELO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics ELO4 Master in basic sciences and principles of electric ELO5 Master in work standards, work methods, work implementations, and testing in electric power or

	industrial automation expertise. ELO6 Capable to make plans, implement, and evaluate learning in electric power or industrial automation expertise
Course Outcomes	CO1 Demonstrate piousness to God, high loyalty to academic values, norms, and ethics. CO2 Demonstrate nationalism, responsibility, and tolerance to both society and environment. CO3 Understanding pneumatic and electro-pneatic components. CO4 Understand the pneumatic and electro-pneumatic component symbols according to International Standards. CO5 Arranging the basic series of single acting cylinder and double acting cylinder. CO6 Designing pneumatic and electro-pneumatic control systems.
ELO and CO mapping	(see table below)
Courses Description:	The Pneumatic Practice Course is a course that discusses and practices about: pneumatic and electro-pneumatic components, pneumatic and electro-pneumatic components, how pneumatic and electro-pneumatic components work, compressive strength calculations for pistons, pneumatic and electro-pneumatic circuits, pneumatic and electro-pneumatic series of single and double acting cylinder, variations of various pneumatic and electro-pneumatic series for two double acting cylinder.
Assessments:	Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a

	ELO1	ELO2	ELO4	ELO5	ELO6
CO1	✓				
CO2		✓			
CO3			✓	✓	
CO4			✓	✓	
CO5				✓	
CO6				✓	✓

<table>
<tr><td></td><td>good attitude.
The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">CO1-CO6</td><td>Individual Assignment</td><td>Practicum report</td><td>10%</td></tr>
<tr><td>Group Assignment</td><td>Practicum</td><td>20%</td></tr>
<tr><td>Mid</td><td>Written test</td><td>25%</td></tr>
<tr><td>Final Exam</td><td>competence test</td><td>40%</td></tr>
<tr><td>Attendance</td><td>Documentation</td><td>5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Croser, P., 1989. Pneumatics : Basic Level TP 101 . Festo Didactic KG, D-7300 Esslingen 1.
2. Croser, P., 1994. Pneumatik. Festo Didactic. Penyunting: Budi Hartanto.
3. Patient, P., Pickup, R., dan Powell, N., 1985, Pengantar Ilmu Teknik Pneumatika., Alih bahasa: Widodo, A.T.K., Jakarta: PT.Gramedia
4. Sugihartono, 1985, Dasar-dasar Kontrol Pnematik, Tarsito, Bandung.
5. Suyanto, 2000, Pengantar Sistem Pneumatik, Jurusan Pendidikan Teknik Mesin dan Teknik Mesin, Universitas Negeri Yogyakarta.
6. Werner, H., 1993. Pneumatics: Book of Exercises with Solutions. Festo Didactic KG, D73734 Esslingen.</td></tr>
<tr><td>Date of revision</td><td>15 August 2019</td></tr>
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This book, which entitled The Module Handbook, contains the compilation of Course Specifications in Bachelor of Education in Electrical Engineering Study, Faculty of Engineering, Yogyakarta State University.