INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS
DEPARTEMEN TEKNIK ELEKTRO
Program Studi Sarjana (S1) Teknik Elektro

INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
FACULTY OF INTELLIGENT ELECTRICAL & INFORMATICS TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING
Bachelor Degree Program in Electrical Engineering

1	**Nama Mata Kuliah / *Course Name***	:	Lab. Sistem Tenaga / *Power System Engineering Laboratory*
2	**Kode Mata Kuliah / *Course Code***	:	EE234611
3	**Kredit / *Credits***	:	2 SKS
4	**Semester / *Semester***	:	6

Deskripsi Mata Kuliah / *Course Description*

Mata kuliah lab sistem tenaga merupakan kuliah berbasis laboratorium dimana didalamnya terdapat praktikum: analisis sistem tenaga, mesin arus bolak-balik dan teknik tegangan tinggi. / *The Power Systems Lab course is a laboratory-based course that includes practical exercises in power system analysis, alternating current machines, and high voltage techniques.*

Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah / *Program Learning Outcomes Charged to The Course*

CPL 1 Mampu menunjukkan sikap dan karakter yang mencerminkan: ketakwaan kepada Tuhan Yang Maha Esa, etika dan integritas, berbudi pekerti luhur, peka dan peduli terhadap masalah sosial dan lingkungan, menghargai perbedaan budaya dan kemajemukan, menjunjung tinggi penegakan hukum mendahulukan kepentingan bangsa dan masyarakat luas, melalui kreatifitas dan inovasi, ekselensi, kepemimpinan yang kuat, sinergi, dan potensi lain yang dimiliki untuk mencapai hasil yang maksimal */ Being able to demonstrate attitudes and characteristics that reflect: devotion to the One Almighty God, ethics and integrity, noble virtues, sensitivity and care towards social and environmental issues, appreciation of cultural diversity and inclusivity, upholding the rule of law with a priority on the interests of the nation and the wider community, through creativity and innovation, excellence, strong leadership, synergy, and other potentials possessed to achieve maximum results.*

CPL 2	Mampu mengkaji dan memanfaatkan ilmu pengetahuan dan teknologi dalam rangka mengaplikasikannya pada bidang teknik elektro, serta mampu mengambil keputusan secara tepat dari hasil kerja sendiri maupun kerja kelompok dalam bentuk laporan tugas akhir atau bentuk kegiatan pembelajaran lain yang luarannya setara dengan tugas akhir melalui pemikiran logis, kritis, sistematis dan inovatif / *Able to examine and utilize knowledge and technology for the purpose of applying them in the field of electrical engineering, and making informed decisions based on individual work as well as group work in the form of final reports or other learning activities whose outcomes are equivalent to final projects, through logical, critical, systematic, and innovative thinking.*
CPL 3	Mampu mengelola pembelajaran diri sendiri, dan mengembangkan diri sebagai pribadi pembelajar sepanjang hayat untuk bersaing di tingkat nasional, maupun internasional, dalam rangka berkontribusi nyata untuk menyelesaikan masalah dengan mengimplementasikan teknologi informasi dan komunikasi dan memperhatikan prinsip keberlanjutan serta memahami kewirausahaan berbasis teknologi / *Able to manage one's own learning and continually self-develop as a lifelong learner to compete at the national and international levels, with the goal of making a tangible contribution to problem-solving by implementing information and communication technology and considering sustainability principles, as well as understanding technology-based entrepreneurship.*
CPL 6	Mampu mengkaji dan memanfaatkan matematika, ilmu pengetahuan alam dan teknologi serta mengidentifikasi, memformulasikan dan menyelesaikan permasalahan di bidang teknik elektro / *Able to evaluate and utilize mathematics, natural sciences, and technology, as well as identify, formulate, and solve problems in the field of electrical engineering.*

Capaian Pembelajaran Mata Kuliah / *Course Learning Outcomes*

1. Mengusai analisa sistem tenaga listrik, mesin arus bolak-balik beserta aplikasinya dan mengetahui teknik pembangkitan tegangan tinggi / *Proficient in the analysis of electric power systems, alternating current machines, and their* applications, and knowledgeable about high-voltage generation techniques.
2. Mampu menganalisa sistem tenaga listrik, mesin arus bolak-balik beserta aplikasinya dan mengetahui teknik pembangkitan tegangan tinggi. / *Capable of analyzing electric power systems, alternating current machines, and their applications, and knowledgeable about high-voltage generation*

Pokok Bahasan / *Contents*

1. Performa Pada Saluran Transmisi / *Performance in Transmission Lines*
2. Sistem Momitoring Micro Scada / *Micro SCADA Monitoring System*
3. Over Voltage and Under Voltage Time Lag Relay / *Overvoltage and Undervoltage Time Lag Relay*
4. ETAP / *ETAP (Electrical Transient and Analysis Program)*
5. Generator Sinkron 3 Phasa / *3-Phase Synchronous Generator*

6. Motor Sinkron 3 Phasa / *3-Phase Synchronous Motor*
7. Motor Induksi 3 Phasa Rotor Sangkar / *3-Phase Induction Motor (Squirrel Cage Rotor)*
8. Motor Induksi 3 Rotor Gelung / *3-Phase Induction Motor (Wound Rotor)*
9. Transformator 3 Phasa / *3-Phase Transformer*
10. Pembangkitan Tegangan Tinggi / *High-Voltage Generation*
11. Pengujian Bahan Isolasi Gas / *Gas Insulation Material Testing*
12. Pengujian Bahan Isolasi Padat / *Solid Insulation Material Testing*
13. Pengujian Bahan Isolasi Cair / *Liquid Insulation Material Testing*
14. Pengujian Isolator dengan Tegangan AC / *Insulator Testing with AC Voltage*

Prasyarat / *Pre-requisite*

Analisis Sistem Tenaga / Power System Analysis

Mesin Listrik / Electric Machines

Teknik Tegangan Tinggi / *High Voltage Engineering*

Pustaka / *Reference*

1. Modul praktikum Analisis Sistem Tenaga
2. Modul Praktikum Mesin Arus Bolak-Balik
3. Modul Praktikum Tegangan Tinggi

COURSE	Name	: Power System Laboratory
	Code	: EE184711
	Credits	: 3
	Semester	: VII

Description of Course

Power system laboratory is a course based on experiment on laboratories as well as based on software package simulation. This course is comprehensive course which consist of three experiment modules from three laboratories of power system simulation, energy conversion, and high voltage laboratories. Three main experiments will be conducted are electric machines include transformer, dielectric material testing, and power system related to transmission system, protection system, and ETAP software.

Learning Outcomes

KNOWLEDGE

(P02) Mastering the concepts and principles of science and engineering mathematics, and implementing them in the form of procedures for analysis and design in power systems, control systems, multimedia telecommunications, or electronics.

SPECIFIC SKILL

(KK01) Able to formulate engineering problems in power systems, control systems, multimedia telecommunications, or electronics.

GENERAL SKILL

(KU11) Able to implement sustainability principles and develop knowledge

(KU12) Able to implement information and communication technology (ICT) in the context of implementation of his/her work

ATTITUDE

(S06) Working together, having social sensitivity and caring for community and environment

(S09)Demonstrating attitude of responsibility on work in his/her field of expertise independently

(S12)Working together to be able to make the most of his/her potential

Course Learning Outcomes

KNOWLEDGE

Mastering on implementation of power system analysis on laboratory scale plant, operation and control of electric machines include transformer, and mastering on high voltage generation for dielectric strength testing.

SPECIFIC SKILL

Mastering on data analysis obtained from all laboratory experiment modules and comparing the data analysis results with theoretical knowledge they have learned on related subjects.

GENERAL SKILL

Able to conduct laboratory scale experiment to understand the characteristic of electric machines

and apparatus being studied by using their background knowledge

ATTITUDE

Able to work as team to solve problem related to electric engineering and be responsible on their work

Main Subjects

1. Power system transmission line performance
2. Micro SCADA monitoring system
3. ETAP software package
4. 3 phase synchronous generator
5. 3 phase synchronous motor
6. 3 phase induction motor (squirrel cage and wave rotor)
7. 3 phase transformer
8. HV generation (ac, dc)
9. Dielectric testing (gaseous, solid, and liquid)
10. Insulator testing under high voltage ac

Reference(s)

[1] Experimental Module of Power System Analysis
[2] Experimental Module of Alternating Current Electric Machines
[3] Experimental Module of High Voltage

Prerequisite(s)

EE184511 Power System Analysis
EE184512 Alternating Current Electric Machine
EE184513 High Voltage Engineering