



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 : Mesin Listrik / <i>Electric Machines</i>
2	Kode Mata Kuliah / Course Code : EE234512
3	Kredit / Credits : 3 SKS
4	Semester / Semester : 5

Deskripsi Mata Kuliah / Course Description

Mata kuliah mesin listrik secara umum membahas tentang prinsip mesin konversi energi listrik. Secara detil menjelaskan tentang prinsip elektromagnetik, konstruksi dan operasional transformator, disain dan perhitungan tegangan yang dibangkitkan dalam mesin listrik berputar. Fitur dan karakteristik mesin sinkron, konstruksi dan analisis motor induksi, konstruksi dan analisis mesin dc baik konvensional dan brushless. / *The course on electrical machines generally covers the principles of electric energy conversion devices. It provides detailed explanations of electromagnetic principles, the construction and operation of transformers, the design and calculation of the generated voltage in rotating electrical machines. It also delves into the features and characteristics of synchronous machines, the construction and analysis of induction motors, and the construction and analysis of DC machines, both conventional and brushless.*

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

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. Menguasai konsep dasar mesin listrik dan karakteristik mesin listrik. / *Mastering the fundamental concepts of electric machines and the characteristics of electric machines.*
2. Mampu menghitung kebutuhan mesin listrik dalam sistem tenaga. / *Being able to calculate the electrical machine requirements in a power system.*
3. Mampu menganalisis parameter dalam mesin listrik / *Being able to analyze parameters in electric machines.*
4. Mampu mengidentifikasi Jenis dan pengoperasian mesin listrik / *Being able to identify types and the operation of electric machines.*

Pokok Bahasan / Contents

1. Konsep elektromagnet, dasar mesin elektrik, memahami peranan magnet dalam mesin elektrik, dasar-dasar analisis, tanda-tanda dari variabel mesin. / *Concept of electromagnetism, basics of electric machines, understanding the role of magnets in electric machines, fundamental analysis, signs of machine variables.*
2. Konsep dasar, konstruksi dan macam-macam transformator dalam sistem tenaga listrik dan operasionalnya dalam sistem tenaga listrik. / *Basic concepts, construction, and types of transformers in power systems and their operation in power systems.*
3. Konsep medan magnet berputar dalam mesin listrik, konstruksi belitan dan proses terbangkitnya tegangan dalam mesin listrik berputar. / *Concept of rotating magnetic field in electric machines, construction of windings, and the generation of voltage in rotating electric machines.*
4. Konstruksi dan fitur mesin sinkron beserta operasionalnya. / *Construction and features of synchronous machines and their operation.*
5. Penentuan rangkain ekivalen, parameter dan cara menganalisis mesin sinkron. / *Determination of equivalent circuits, parameters, and methods for analyzing synchronous machines.*

6. Konstruksi dan operasional mesin induksi / *Construction and operation of induction machines.*
7. Penentuan rangkain ekivalen, parameter dan cara menganalisis motor induksi. / *Determination of equivalent circuits, parameters, and methods for analyzing induction motors.*
8. Analisis performansi motor induksi. / *Analysis of induction motor performance.*
9. Pengaturan kecepatan dan starting motor induksi / *Speed control and starting of induction motors.*
10. Konstruksi mesin dc dan operasionalnya. / *Construction of DC machines and their operation.*
11. Karakteristik mesin dc. / *Characteristics of DC machines.*
12. Konstruksi motor dc brushless / *Construction of brushless DC motors.*
13. Pengaturan Kecepatan Motor dc Brushless / *Speed control of brushless DC motors.*

Prasyarat / Pre-requisite

Dasar Sistem Tenaga Listrik / *Introduction to Electric Power Systems*

Pustaka / Reference

1. J. Chapman, "Electric Machinery Fundamentals", McGraw-Hill, Inc., New York, St. Louis, San Francisco, Auckland, Bogotá, Caracas, Hamburg, Lisbon, London, Madrid, Mexico, Milan, Montreal, New Delhi, Paris, San Juan, São Paulo, Singapore, Sydney, Tokyo, Toronto, 1991.
2. S.K. Sen, "Electrical Machinery" Khanna Publishers, New Delhi, 1993.
3. B.S. Guru & H.R. Hiziröglu, "Electric Machinery and Transformers" Harcourt Brace Javanovich, Publishers, Technology Publications, San Diego, New York, Chicago, Austin, Washington DC, London, Tokyo, Toronto, 1988.

Mata Kuliah Course	Nama MK <i>Name</i>	: Mesin Listrik : <i>Electric Machines</i>
	Kode MK <i>Code</i>	: EE184512
	Kredit <i>Credits</i>	: 4 sks
	Semester <i>Semester</i>	: V (Wajib) : <i>V (Compulsory)</i>
	Beban Belajar <i>Workload</i>	: Kuliah : 4 x 50 = 200 menit/minggu Latihan/tugas : 4 x 60 = 240 menit/minggu Belajar mandiri : 4 x 60 = 240 menit/minggu <i>Lectures : 4 x 50 = 200 min/week</i> <i>Exercises/Assignments : 4 x 60 = 240 min/week</i> <i>Self learning : 4 x 60 = 240 min/week</i>
	Tingkatan <i>Module Level</i>	: Sarjana (S1) : <i>Undergraduate</i>
	Penanggung Jawab <i>PIC</i>	: Heri Suryoatmojo, ST, MT, PhD
	Pengajar <i>Lecturer</i>	: Heri Suryoatmojo, ST, MT, PhD : Dr. Ir. Soedibyo, MMT
	Bahasa <i>Language</i>	: Bahasa Indonesia dan Bahasa Inggris : <i>Bahasa Indonesia and English</i>
	Persyaratan dan Peraturan <i>Requirement and Regulation</i>	: Setiap mahasiswa harus menghadiri setidaknya 75% dari jumlah perkuliahan untuk dapat mengikuti ujian : <i>A student must have attended at least 75% of the lectures to sit in the exams</i>

Deskripsi Mata Kuliah

Description of Course

Mata kuliah mesin listrik secara umum membahas tentang prinsip mesin konversi energi listrik. Secara detail, mata kuliah ini menjelaskan tentang prinsip elektromagnetik, konstruksi dan operasional transformator, disain dan perhitungan tegangan yang dibangkitkan dalam mesin listrik berputar. Fitur dan karakteristik mesin sinkron, konstruksi dan analisis motor induksi, konstruksi dan analisis mesin DC.

Electric machine courses generally discuss the principle of electric energy conversion machines. In detail describes the principles of electromagnetic, construction and operational transformer, design and calculation of voltage generated in a rotating electric engine. Features and characteristics of synchronous machines, construction and analysis of induction motors, construction and analysis of DC machines.

CPL Prodi yang Dibebankan

Description of Course

(CPL-01) Mampu menerapkan ilmu pengetahuan alam dan matematika pada bidang teknik elektro

(PLO-1) Capable to apply knowledge of natural sciences and mathematics to solve electrical engineering problem

(CPL-05) Mampu mengidentifikasi, memformulasikan dan menyelesaikan permasalahan dibidang teknik elektro

(PLO-5) Capable to identify, formulate and solve problems in the field of electrical engineering

(CPL-11) Mampu menerapkan metode, ICT, dan perangkat modern dalam penyelesaian permasalahan dibidang teknik elektro

(PLO-11) Capable to apply methods, ICT, and modern devices in solving problems in the field of electrical engineering

Capaian Pembelajaran Mata Kuliah

Course Learning Outcomes

(CPMK-01) Menguasai konsep dasar mesin listrik dan karakteristik mesin listrik.

(CLO-01) Mastering the basic concepts of electrical machinery and electrical machine characteristics.

(CPMK-02) Mampu menganalisis parameter dalam mesin listrik dan mampu menghitung menghitung kebutuhan mesin listrik dalam sistem tenaga.

(CLO-02) Able to analyze the parameters in an electric machine and able to calculate the need of electric machines in the power system.

Topik/Pokok Bahasan

Main Subjects

1. Konsep elektromagnet, dasar mesin elektrik, memahami peranan magnet dalam mesin elektrik, dasar-dasar analisis, tanda-tanda dari variabel mesin.
The concept of electromagnetism, the basis of electrical machinery, understands the role of magnets in electric machines, the basics of analysis, the signs of machine variables.
2. Konsep dasar, konstruksi dan macam-macam transformator dalam sistem tenaga listrik dan operasionalnya dalam sistem tenaga listrik.
Basic concepts, constructions and various transformations in electric power systems and their operations in electrical systems.
3. Konsep medan magnet berputar dalam mesin listrik, konstruksi belitan dan proses terbangkitnya tegangan dalam mesin listrik berputar.
The concept of a rotating magnetic field in an electric machine, winding construction and the process of voltage generation in rotating electrical machine.
4. Konstruksi dan fitur mesin sinkron beserta operasionalnya.
Construction and synchronous machine features and their operations.
5. Penentuan rangkain ekivalen, parameter dan cara menganalisis mesin sinkron.
Determination of equivalence circuit, analysis of parameters of synchronous machine.
6. Konstruksi dan operasional mesin induksi
Construction and operation of induction machines
7. Analisis performansi motor induksi.
Induction motor performance analysis.
8. Konstruksi mesin dc dan operasionalnya.
Construction of dc machine and its operation.

9. Karakteristik mesin dc.
Characteristics of dc machine.

Pembelajaran dan ujian

Study and examination

- Latihan di kelas
In-class exercises
- Tugas 1, 2, 3
Assignment 1, 2, 3
- Ujian tengah semester
Mid-term examination
- Ujian akhir semester
Final examination

Pustaka

Reference(s)

- [1] J. Chapman, "Electric Machinery Fundamentals", McGraw-Hill, Inc., New York, St. Louis, San Francisco, Auckland, Bogotá, Caracas, Hamburg, Lisbon, London, Madrid, Mexico, Milan, Montreal, New Delhi, Paris, San Juan, São Paulo, Singapore, Sydney, Tokyo, Toronto, 1991.
- [2] S.K. Sen, "Electrical Machinery" Khanna Publishers, New Delhi, 1993.
- [3] B.S. Guru & H.R. Hiziröglu, "Electric Machinery and Transformers" Harcourt Brace Javanovich, Publishers, Technology Publications, San Diego, New York, Chicago, Austin, Washington DC, London, Tokyo, Toronto, 1988.

Prasyarat

Prerequisite(s)

EE184402 Introduction to Power System