


Dokumen Kurikulum 2013-2018
Program Studi : Teknik Tenaga Listrik
Lampiran I

Sekolah Teknik Elektro Dan Informatika
Institut Teknologi Bandung

	Bidang Akademik dan Kemahasiswaan	Kode Dokumen		Total Halaman
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KURIKULUM ITB 2013-2018 – PROGRAM SARJANA
Program Studi Teknik Tenaga Listrik
Sekolah Teknik Elektro Dan Informatika

Kode Matakuliah: EP 2092	Bobot sks: 3	Semester: 3	Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Probabilitas dan Statistika			
	Probability and Statistic			
Silabus Ringkas	<p>Pengantar teori probabilitas dan statistik matematika yang menekankan dasar-dasar probabilistik yang diperlukan untuk memahami model probabilitas, metode statistik, dan aplikasinya pada kasus-kasus umum dan kasus-kasus di ketenagalistrikan. Topik yang dibahas akan meliputi Konsep probabilitas, Variabel Acak, Distribusi Probabilitas Diskrit, Distribusi Probabilitas Kontinu, Fungsi Variabel Acak, Statistik Inferensi dan Teori Estimasi.</p> <p>An introduction to probability theory and mathematical statistics that emphasizes the probabilistic foundations required to understand probability models, statistical methods, and its applications. Topics covered will include Concept of probability, Random Variables, Discrete Probability Distributions, Continuous Probability Distributions, Functions of Random Variables, Statistics of Inference and Estimation Theory.</p>			
Silabus Lengkap	<ul style="list-style-type: none"> • PELUANG : ruang sampel, kejadian, peluang sebuah kejadian, hukum peluang, peluang bersyarat, Aturan Bayes. • PEUBAH ACAK : Konsep peubah acak, distribusi peluang diskrit, distribusi peluang kontinu, distribusi empirik, distribusi peluang bersama, espektasi matematika, hukum ekspektasi, sifat varians, Teorema Chebyshev's. • DISTRIBUSI PELUANG DISKRIT : Distribusi seragam, Distribusi binomial dan multinomial, Distribusi hypergeometri, Distribusi Poisson, Distribusi Binomial Negatif dan Distribusi Geometri. • DISTRIBUSI PELUANG KONTINU : Distribusi Normal/Gaussian, Daerah dibawah kurva distribusi normal, Pendekatan Distribusi Binomial dengan Kurva Normal, Distribusi Gamma, Distribusi Eksponensial, Distribusi Chi-Square dan Distribusi Weibull. • FUNGSI VARIABEL ACAK : Transformasi variable, Fungsi penghasil momen, Samping Acak, Teori Sampling, Sampling Distribusi Mean, Sampling distribusi $(n-1)S^2/\sigma^2$, Distribusi t. • STATISTIK INFERENSI : Parameter estimasi dan distribusi sampel, Teorema titik pusat, Pengestimasi maksimum "likelihood". • TEOREMA ESTIMASI : Metode estimasi klasik, estimasi mean, estimasi varians, Metode estimasi Bayes, Teori pengambilan keputusan <ul style="list-style-type: none"> • PROBABILITY: sample space, events, counting, probability of events, probability laws, conditional probability, Bayes' Rule • RANDOM VARIABLES: concept of r.v., discrete probability distributions, continuous prob. Distributions, empirical distributions, joint probability distributions, mathematical expectation, laws of expectation, properties of the variance, Chebyshev's Theorem • DISCRETE PROBABILITY DISTRIBUTIONS: Uniform distribution, binomial and multinomial distribution, hypergeometric distribution, Poisson distribution, negative binomial and geometric distributions • CONTINUOUS PROBABILITY DISTRIBUTIONS: Normal/Gaussian distribution, areas under normal curve, approximation of Binomial distribution with normal curve, Gamma, exponential and Chi-square distributions, Weibull distribution • FUNCTIONS OF RANDOM VARIABLES: Transformation of variables, moment-generating functions, random sampling, sampling theory, sampling distribution of means, sampling distribution of $(n-1)S^2/\sigma^2$, t-Distribution, • STATISTICS OF INFERENCE : Parameter estimation and sample distribution, central limit theorem, Maximum likelihood Estimator • ESTIMATION THEORY: classical estimation method, estimating the mean, estimating the variance, Bayesian method of estimation, decision theory 			
Luaran (Outcomes)	<ul style="list-style-type: none"> • Mahasiswa memiliki pemahaman yang baik tentang teori probabilitas, baik diskrit dan kontinu, termasuk penghitungan dasar dan kombinasi berbagai distribusi yang berguna, means dan varians, analisis statistik sampel, dan teorema limit pusat, seperti yang dijelaskan dalam silabus . • Mahasiswa memiliki kemampuan untuk memecahkan masalah-masalah umum di dunia rekayasa (<i>engineering</i>) dan masalah-masalah umum di teknik tenaga listrik menggunakan probabilitas dan metode statistik. • Mahasiswa mengetahui dan memahami beberapa metode dasar statistik sebagai dasar untuk 			

	studi lebih lanjut yang menggunakan statistik sebagai ilmu alat.	
Matakuliah Terkait	Kalkulus I	Prasyarat
	Kalkulus II	Prasyarat
Kegiatan Penunjang	Simulasi perhitungan statistik dengan perangkat lunak statistika seperti SPSS dan sejenisnya	
Pustaka	Dauglas C Montgomery, George C. Runger, <i>Applied Statistics and Probability for Engineers</i> , Fifth Edition, John Wiley and Sons, 2011 [Pustaka Utama]	
	R.E. Walpole and Myers, <i>Probability and Statistics for Engineers and Scientists</i> , Mac. Millan [Penunjang]	
	Ian F. Blake. <i>An Introduction to Applied Probability</i> , John Wiley and sons, 1987, [Penunjang]	
Panduan Penilaian	<ul style="list-style-type: none"> • Penilaian didapatkan dari : <ul style="list-style-type: none"> ○ Nilai Tugas (T) ○ Nilai Quiz (Q) ○ Ujian Tengah Semester (UTS) ○ Ujia Akhir Semester (UAS) • Nilai akhir dihitung berdasarkan rumus : $\text{Nilai Akhir} = \frac{T + Q + UTS + 2 \cdot UAS}{5}$ • Pemberian nilai mutu mempertimbangkan pencapaian rata-rata nilai akhir mahasiswa 	
Catatan Tambahan		

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Konsep Dasar Probabilitas I	Ruang Sampel, Kejadian, Counting, Peluang Kejadian		Dauglas C Montgomery, George C. Runger, <i>Applied Statistics and Probability for Engineers</i> , Fifth Edition, John Wiley and Sons, 2011 [Pustaka Utama]
2	Konsep Dasar Probabilitas II	Hukum Peluang , Peluang Bersyarat, Aturan Bayes.		
3	Peubah Acak I	Konsep Peubah Acak, Distribusi peluang diskrit, Distribusi Peluang Kontinu, Distribusi empiric, Distribusi Peluang Bersama (Quiz-I)		
4	Peubah Acak II	Ekspektasi matematik, Hukum ekspektasi, Sifat Varians, TeoremaChebyshev' s (Quiz-II)		
5	Distribusi Peluang Diskrit I	Distribusi seragam, Distribusi Binomial dan Multinomial		
6	Distribusi Peluang Diskrit II	Distribusi Hypergeometrik, Distribsi Poisson.		
7	Distribusi Peluang Diskrit III	Distrbsi Binomial Negatif dan Distribusi Geometrik (Quiz-III)		
8	<i>Ujian Tengah Semester</i>			
9	Distribusi Peluang Kontinu I	Distribusi Normal/Gaussian, Daerah dibawah kurva distribusi normal.		
10	Distribusi Peluang Kontinu II	Aproksimasi Distribusi Binomial dengan kurva normal, Distribusi Gamma dan Distribusi Eksponensial		Dauglas C Montgomery, George C. Runger,

11	Distribusi Peluang Kontinu II	Distribusi Chi-square, Distribusi Weibull (QUIZ-IV)		<i>Applied Statistics and Probability for Engineers</i> , Fifth Edition, John Wiley and Sons, 2011 [Pustaka Utama]
12	Fungsi Peubah Acak I	Transformasi Variabel, Fungsi pengasil momen, Sampling Acak, Teori sampling, Distribusi sampling means, Distribusi sampling $(n-1)S^2/\sigma^2$, Distribusi t (QUIZ-V)		
13	Statistik Inferensi	Parameter estimasi dan distribusi sampel, Teorema titik pusat, Pengestimasi maksimum "likelihood"		
14	Teori Estimasi I	Metode estimasi klasik, estimasi mean		
15	Teori Estimasi-II	Estimasi varians, Metode estimasi Bayesian, Teori Pengambilan Keputusan (TUGAS)		
16	<i>Ujian Akhir Semester</i>			

Kode Matakuliah: EP2076	Bobot sks: 3	Semester: 4	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Sistem Pengukuran Measurement System			
Silabus Ringkas	Pendahuluan, satuan, standard dan kalibrasi ; Kesalahan dalam pengukuran ; Metoda–metoda statistik dalam pemrosesan data pengukuran ; Komponen-komponen dasar dan karakteristik sistem pengukuran ; Fenomena fisik, stimulus dan sensor ; Besaran listrik ; Besaran non-listrik ; Pengkondisian sinyal ; Akuisisi data, pemrosesan dan transmisi ; Review teori dasar mikroprosesor ; Pengukuran berbasis mikroprosesor. Introduction, Units, standard and calibration ; Errors in measurement ; Statistical methods in measurement data processing ; Basic components and characteristics of instrumentation system; Physical phenomenon, stimulus and sensors ; Electrical quantities ; Non-electrical quantities ; Signal conditioning; Data acquisition, processing and transmission ; Review of basic theory of microprocessor ; microprocessor based instrumentations.			
Silabus Lengkap	Pendahuluan, satuan, standard dan kalibrasi ; Kesalahan dalam pengukuran ; Metoda–metoda statistik dalam pemrosesan data pengukuran ; Komponen-komponen dasar sistem pengukuran, alat ukur (meter) sederhana ; karakteristik static dan dinamik dari sistem pengukuran ; Jembatan AC dan jembatan DC ; Fenomena fisik, stimulus dan sensor ; Besaran listrik: tegangan, arus, energi, medan, impedansi, gangguan ; Besaran non-listrik: tekanan, suhu, aliran, kecepatan, dll. ; Pengkondisian sinyal, derau, pentanahan ; Akuisisi data, pemrosesan dan transmisi ; Teori dasar mikroprosesor ; Pengukuran berbasis mikroprosesor. Introduction, Unit system, standard and calibration ; Errors in measurement ; Statistical methods in measurement data processing ; Basic components of instrumentation system, simple meters ; Static and dynamic characteristics of instrumentation systems ; AC bridge and DC bridge ; Physical phenomenon, stimulus and sensors ; Electrical quantities: voltage, current, energy, fields, impedance, fault ; Non-electrical quantities: pressure, temperature, flow, speed, etc. ; Signal conditioning, noise, grounding ; Data acquisition, data processing, data transmission ; Basic theory of microprocessor ; microprocessor based instrumentations.			
Luaran (Outcomes)	Understanding the basic concept of measurement system and microprocessor based instrumentation, and its applications in power systems and industries.			
Matakuliah Terkait	Rangkaian Elektrik (<i>Electric Circuits</i>)	Pre-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka	1. Alan S. Moris, Measurement and Instrumentation Principles, Third Edition, Butterworth-Heinemann, 2001 2. John Crisp, Introduction to Microprocessors And Microcontrollers, Newness, 2004			
Panduan Penilaian				
Catatan Tambahan				
Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan		Mengetahui tujuan, aturan dasar, dan isi kuliah Memiliki motivasi untuk menjalani kuliah Memahami posisi pengukuran dalam proses engineering	
2	Prinsip dasar pengukuran		Memahami prinsip dasar pengukuran teknik	
3	Standar, satuan		Memahami pentingnya standard dalam proses pengukuran Mengetahui standard dan satuan yang berlaku dalam pengukuran	
4	Kesalahan dalam pengukuran		Memahami adanya kesalahan dalam pengukuran Memahami penjalaran kesalahan Memahami prinsip dasar mengurangi kesalahan	
5	Pengolahan data		Memahami prinsip dasar pengolahan data hasil pengukuran Mampu menerapkan teknik pengolahan data dalam kasus nyata	
6	Sistem sensor (karakteristik static dandinamik, macam-macam sensor)		Memahami komponen dasar system instrumentasi Memahami karakteristik dasar dan umum sensor Memahami cara kerja sensor	
7	Pengukuran besaran listrik (arus, tegangan, tahanan, impedansi, daya, energy)		Memahami pripsip dasar pengukuran besaran listrik Mampu menerapkan prinsip dasar pengukuran dalam kasus nyata ketenagalistrikan	
8	Pengukuran besaran non-listrik (suhu, tekanan, aliran)		Memahami pripsip dasar pengukuran besaran non-listrik Mampu menerapkan prinsip dasar	
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			pengukuran dalam kasus nyata industri	
9	Overview system mikroprosesor dan mikrocontroller		Memahami prinsip kerja dan komponen dasar system mikroprosesor dan mikrokontroler Memahami cara merangkai dan memprogram mikrocontroller	
10	Aplikasi mikrocontroller dalam pengukuran		Mampu merangkai dan memprogram mikrokontroler dalam pengukuran	
11	Proyek aplikasi mikrocontroller		Mampu menggunakan mikrocontroller dalam kasus nyata pengukuran	

Kode Matakuliah: EP2094	Bobot sks: 3	Semester: 4	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Sinyal & Sistem			
	Signal & System			
Silabus Ringkas	Pengenalan sinyal dan sistem, sistem linear-time invariant, transformasi Laplace, transformasi z, analisis Fourier waktu kontinu, analisis Fourier time diskrit, pemerisaian, sampling, sistem umpan balik linear			
	Introduction to signal and systems, invariant linear-time systems, Laplace transformation, z transformation, continous-time Fourier analysis, discrete-time Fourier analyses, filtering, sampling, linear-feedback systems			
Silabus Lengkap	<p>Sinyal dan Klasifikasi Sinyal, Sinyal Continuous-Time Dasar, Sinyal Discrete-Time Dasar, Sistem dan Klasifikasi Sistem, Sistem Continuous-Time Dasar, Sistem Discrete-Time Dasar, Respon Sistem CT LTI dan Integral Konvolusi, Karakteristik Sistem CT LTI, Eigenfunction CT LTI, Persamaan Diferensial Sistem CT LTI, Respon DT LTI dan Jumlah Konvolusi, Karakteristik DT LTI, Eigenfunction DT LTI, Persamaan Diferensial Sistem DT LTI, Laplace Transform, Laplace Transform Beberapa Sinyal, Karakteristik Laplace Transform, Inverse Laplace Transform, System Function, Unilateral Laplace Transform, Z-Transform, Z-Transform Beberapa Sinyal, Karakteristik Z-Transform, Inverse Z-Transform, System Function Sistem DT LTI, Unilateral Z-Transform, Representasi Seri Fourier Sinyal Perodik, Fourier Transform, Karakteristik Fourier Transform CT, Respon Frekuensi Sistem CT LTI, Bode Plot, Filtering, Bandwidth, Seri Fourier Diskrit, Fourier Transform, Karakteristik Fourier Transform DT, Respon Frekuensi Sistem DT LTI, Respon Sistem Sinyal Sinusoidal Sample, Fourier Transform Diskrit Fast Fourier Transform, Ideal Frequency Selective Filters, Non-Ideal Frequency Selective Filters, CT Frequency Selective Filters, DT Frequency Selective Filters, Butterworth Frequency Selective Filters, Sampling Theorem, Interpolasi untuk Rekonstruksi Sinyal, Aliasing, Pemrosesan Waktu Diskrit dan Sinyal Waktu Kontinu, Sampling dalam domain Frekuensi, Sampling sinyal waktu Diskrit, Desimasi dan interpolasi waktu diskrit, Sistem umpan-balik linear dan aplikasinya, analisis Root-Locus dari sistem umpan-balik linear, kriteria Nyquist Stability Criterion, Gain and Phase Margins</p> <p>Signal and its clasification, Basic Continuous-Time Signal, Basic Discrete-Time Signal, System and its classification, Continuous-Time Systems, Basic Discrete-Time Systems, CT LTI System Response and Convolutional Integral, CT LTI System Characteristics, CT LTI Eigenfunction, CT LTI System Differential Equation, DT LTI System Response and Convolutional Sum, DT LTI System Characteristics, DT LTI Eigenfunction, DT LTI System Differential Equation, Laplace Transform, Laplace Transform of some signals, Laplace Transform characteristics, Inverse Laplace Transform, System Function, Unilateral Laplace Transform, z-Transform, z-Transform of some signals, z-Transform characteristics, Inverse z-Transform, DT LTI System Function, Unilateral Z-Transform, Fourier series representation of periodical signal, Fourier Transform, CT Fourier Transform characteristics, CT LTI System Frequency Response, Bode Plot, Filtering, Bandwidth, Discrete Fourier Series, Fourier Transform, DT Fourier Transform characteristics, DT LTI System Frequency Response, Sinusoidal signal sample, Discrete Fourier Transform, Fast Fourier Transform, Ideal Frequency Selective Filters, Non-Ideal Frequency Selective Filters, CT Frequency Selective Filters, DT Frequency Selective Filters, Butterworth Frequency Selective Filters, Sampling Theorem, Interpolation for Signal Reconstruction, Aliasing, DT Processing of CT Signals, Sampling in Frequency Domain, Sampling of DT Signals, DT Decimation and Interpolation, Linear Feedback Systems, Application of Feedback Systems Root-Locus Analysis of Linear Feedback Systems, Nyquist Stability Criterion, Gain and Phase Margins</p>			
Luaran (Outcomes)	This course should bring understanding on signal and systems with invariant linear time characteristics and their basic transformations, processing and applications.			
Matakuliah Terkait	1. Matematika Teknik I		Pre-requisite	
	2. Rangkaian Elektrik		Pre-requisite	
Kegiatan Penunjang	Programming			
Pustaka	1. Deny Hamdani, Sinyal dan Sistem, Penerbit ITB, 2012 (utama) 2. Deny Hamdani, Sinyal dan Sistem: Suplemen, Penerbit ITB, 2012 (utama) 3. H.P. Hsu, Signals and Systems: Schaum's Outline, McGraw-Hill, 1995 (utama) 4. A.V.W. Oppenheim, Signals and Systems, Prentice-Hall, 1997 (pendukung) 5. M.J. Roberts, Signals and Systems, 1997 (pendukung)			
Panduan Penilaian	Mid-test 30%, Final-Test 40%, Task 30%			
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Sinyal	Sinyal dan Klasifikasi Sinyal Sinyal Continuous-Time Sinyal Discrete-Time Dasar		Ref. 1 Chapter 1 Ref. 2 Chapter 1
2	Sistem	Sistem dan Klasifikasi Sistem Sistem Continuous-Time Sistem Discrete-Time Dasar		Ref. 1 Chapter 1 Ref. 2 Chapter 1
3	Sistem Linear Time-Invariant	Respon Sistem CT LTI dan Integral Konvolusi Karakteristik Sistem CT LTI Eigenfunction CT LTI Persamaan Diferensial Sistem CT LTI Respon DT LTI dan Jumlah		Ref.1 Chapter 2 Ref. 2 Chapter 2

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		Konvolusi Karakteristik DT LTI Eigenfunction DT LTI Persamaan Diferensial Sistem DT LTI		
4	Laplace Transform Dan Sistem CT LTI	Laplace Transform Laplace Transform Beberapa Sinyal Karakteristik Laplace Transform Inverse Laplace Transform System Function Unilateral Laplace Transform		Ref. 1 Chapter 3 Ref. 2 Chapter 5
5	Z-Transform Dan Sistem DT LTI	Z-Transform Z-Transform Beberapa Sinyal Karakteristik Z-Transform Inverse Z-Transform System Function Sistem DT LTI Unilateral Z-Transform		Ref. 1 Chapter 4 Ref. 2 Chapter 6
6	Analisa Fourier Sinyal Dan Sistem CT	Representasi Seri Fourier Sinyal Perodik Fourier Transform Karakteristik Fourier Transform CT Respon Frekuensi Sistem CT LTI Filtering Bandwidth		Ref. 1 Chapter 5 Ref. 2 Chapter 3
7	Analisa Fourier Sinyal Dan Sistem DT	Seri Fourier Diskrit Fourier Transform Karakteristik Fourier Transform DT Respon Frekuensi Sistem DT LTI Respon Sistem Sinyal Sinusoidal Sample Fourier Transform Diskrit Fast Fourier Transform		Ref. 1 Chapter 6 Ref. 2 Chapter 4
8	Filtering	Ideal Frequency Selective Filters, Non-Ideal Frequency Selective Filters, CT Frequency Selective Filters, DT Frequency Selective Filters, Butterworth Frequency Selective Filters		Ref. 2 Chapter 7
9	Sampling	Sampling Theorem, Interpolation for Signal Reconstruction, Aliasing, DT Processing of CT Signals, Sampling in Frequency Domain, Sampling of DT Signals, DT Decimation and Interpolation		Ref. 2 Chapter 8
10	Linear Feedback System	Linear Feedback Systems, Application of Feedback Systems Root-Locus Analysis of Linear Feedback Systems, Nyquist Stability Criterion, Gain and Phase Margins		Ref. 2 Chapter 9

Kode Matakuliah: EP3071	Bobot sks: 3	Semester: 5	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Mesin–Mesin Listrik			
	Electric Machines			
Silabus Ringkas	Kuliah ini membahas kinerja dan analisis bermacam mesin elektrik dan penggunaannya. Pembahasan dimulai dengan rangkaian magnetik dan transformator. Konsep konversi elektromekanik ditekankan. Mesin arus searah, mesin sinkron, dan mesin induksi dibahas mendalam dalam kuliah ini. Berbagai macam mesin elektrik jenis modern dibahas pula.			
	<i>This course dealt with performance and analysis of various electric machines and its applications. Starting with the electromagnetic circuits and transformers, the course then dealt with the of electromechanic conversion concept. The DC motors and generators, the AC machines are discussed thoroughly in this course. Its also discussed the modern concept of electric machine types.</i>			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Rangkaian Elektrik	Pre-requisite		
	2. Medan Elektromagnetik	Pre-requisite		
Kegiatan Penunjang				
Pustaka	1. Nagrath and Kothari, Electric Machines, Tata McGraw Hill, latest ed.			
	2. S.J. Chapman, Electric Machinery Fundamentals. McGraw Hill Int. Ed.. 1991			
	3. A.E. Fitzgerald,C.Kingsley Jr.,S.D. Umans; Eectric Machinery, McGraw-Hill.			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan	Konversi Energi Elektrik	Menjelaskan konsep dasar konversi energi elektrik	
2	Rangkaian magnetik	Rangkaian magnetik dan induktor	Menjelaskan konsep rangkaian magnetik, induktansi, dan induktor	
3	Trafo	Trafo 1 fasa	Menjelaskan trafo 1 fasa dan kinerjanya	
4	Trafo	Trafo 3 fasa	Menjelaskan trafo 3 fasa dan kinerjanya	
5	Konversi energi elektromekanik	Konversi energi elektromekanik	Menjelaskan konsep dasar konversi energi elektromekanik	
6	Mesin arus searah	Generator arus searah	Konsep mesin DC dan generator dc	
7	Mesin arus searah	Mesin arus searah	Menjelaskan kinerja motor DC dan penggunaannya	
8	Belitan tiga-fasa	Belitan tiga-fasa	Menjelaskan konsep belitan terdistribusi sinusoidal dan tiga-fasa	
9	Generator sinkron	Generator sinkron	Menjelaskan kinerja dan analisis generator sinkron	
10	Generator sinkron	Kerja paralel	Menjelaskan kinerja generator sinkron yang bekerja paralel	
11	Mesin induksi	Motor induksi tiga-fasa	Menjelaskan kinerja dan analisis motor induksi tiga-fasa	
12	Mesin induksi	Motor induksi satu-fasa	Menjelaskan kinerja dan analisis motor induksi satu-fasa	
13	Motor arus searah sebagai penggerak	Kinerja dinamik motor arus searah dan pengendaliannya	Menjelaskan kinerja motor arus searah sebagai pengendali kecepatan variabel	
14	Motor induksi sebagai penggerak	Kinerja motor arus sebagai penggerak	Menjelaskan prinsip pengendalian kecepatan motor induksi	
15	Motor sinkron sebagai penggerak	Kinerja motor sinkron pada sumber ac frekuensi variabel	Menjelaskan prinsip pengendalian kecepatan motor sinkron	
	-	-	UAS	

Kode Matakuliah: EP3073	Bobot sks: 3	Semester: 3	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Analisis Numerik dalam Tenaga Listrik			
	Numerical Analysis in Electrical Power			
Silabus Ringkas	Pengenalan metode numerik, metode numerik umum, metode numerik untuk aljabar linear, metode numeric persamaan diferensial, aplikasi metode numerik dalam teknik tenaga listrik			
	Introduction to numerical methods, general numerical methods, numerical methods for linear algebra, numerical methods for differential equation, application of numerical methods in power engineering			
Silabus Lengkap	fixed point, newton, secant iteration, lagrange, newton's, splines interpolation, rectangular, trapezoidal, simpson Integration and differentiation, iterasi gauss-seidel, jacobi, LU factorization-doolittle and crout, cholesky, ill-conditioning and norm, least squares, eigenvalue matrices-inclusion concepts, power methods, tridiagonalization-householder method, QR factorization, first order-euler, heun, runga-kutta, runga-kutta-fehlberg, higher order-euler, runga-kutta, partial differential-elliptic, parabolic, hyperbolic type			
	iterasi-fixed point, newton, secant, Interpolasi-lagrange, newton's, splines, Integration and differentiation-rectangular, trapezoidal, simpson, gauss-seidel, Jacobi iteration, LU factorization-doolittle and crout, cholesky, ill-conditioning and norm, least squares, eigenvalue matrices-inclusion concepts, power methods, tridiagonalization-householder method, QR factorization, first order-euler, heun, runga-kutta, runga-kutta-fehlberg, higher order-euler, runga-kutta, partial differential-elliptic, parabolic, hyperbolic type			
Luaran (Outcomes)	This course should bring understanding on numerical analysis and its application for solving engineering problems. This course leads to capability of computation focused programming			
Matakuliah Terkait	<i>Engineering mathematics</i> Matematika Teknik	Prerequisite		
Kegiatan Penunjang	Programming			
Pustaka	1. Deny Hamdani, Komputasi dan Analisa Numerik, Penerbit ITB, 2008			
	2. E. Kreyzig, Advanced Engineering Mathematics, John Wiley & Sons, 1999			
Panduan Penilaian	Mid-test 40% , Final-test 50% , Task 10%			
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Introduction to numerical methods	History and Overview, Computer Arithmetic and Computation Errors, System of Linear Equations	Understanding some principles in numerical methods	Ref. 1 Chapter 1
2	General numerical methods: Solution of non-linear equations	Iteration- <i>fixed point, newton, secant</i>	Understanding numerical methods for solving problem of non-linear equations	Ref. 1 Chapter 1
3	General numerical methods: Interpolations and integration	<i>Interpolation-lagrange, newton's, splines, Integration and differentiation-rectangular, trapezoidal, simpson</i>	Understanding numerical methods for solving problem of data fitting	Ref. 1 Chapter 1
4	Numerical methods for linear algebra: iteration	<i>iteration-gauss-seidel, jacobi,</i>	Understanding numerical methods for solving problems of sparse matrices	Ref. 1 Chapter 2
5	Numerical methods for linear algebra: LU factorization	<i>LU factorization-doolittle and crout, cholesky, ill-conditioning and norm,</i>	Understanding numerical methods for solving problems of sparse matrices	Ref. 1 Chapter 2
6	Numerical methods for linear algebra: least squares, eigenvalue matrices	<i>least squares, eigenvalue matrices-inclusion concepts, power methods</i>	Understanding numerical methods for solving problems of sparse matrices	Ref. 1 Chapter 2
7	Numerical methods for linear algebra: tridiagonalization	<i>tridiagonalization-householder method, QR factorization</i>	Understanding numerical methods for solving problems of sparse matrices	Ref. 1 Chapter 2
8	Numerical methods for differential equations: first order	<i>first order-euler, heun, runga-kutta, runga-kutta-fehlberg</i>	Understanding numerical methods for solving first-order differential equations	Ref. 1 Chapter 3
9	Numerical methods for differential equations: higher order	<i>higher order-euler, runga-kutta</i>	Understanding numerical methods for solving higher-order differential equations	Ref. 1 Chapter 3
10	Numerical methods for differential equations: partial differential	<i>partial differential-elliptic, parabolic, hyperbolic type</i>	Understanding numerical methods for solving partial differential equations	Ref. 1 Chapter 3
11	Application of numerical methods for power engineering		Understanding application of numerical methods for power engineering	

KodeMatakuliah: EP3095	Bobot sks: 3	Semester: 5	KK / Unit PenanggungJawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
NamaMatakuliah	Material Elektroteknik			
	Electrical Engineering Material			
SilabusRingkas	Teori electron klasikdan modern, struktur atom, statistic elektron dan teori pita energy; sifat-sifat material konduktor, superkonduktor, semikonduktor, dielektrik, magnetic dan optic.			
	Classical and modern electron theories; atom structure, electron statistics and energy band theory, properties of conductor, superconductor, semiconductor, dielectrics, magnetic and optical materials.			
SilabusLengkap	Teori electron klasik dan modern, efek fotolistrik, persamaan Schrodinger, struktur atom, statistic electron dan teori pita energy, teori ikatan dan struktur kristal; sifat-sifat material konduktor: konduktivitas, efek temperature dan campuran, efek kulit,efek Hall, potensial kontak, efek Seebeck dan termokopel, emisi thermal dan medan; superkonduktor: superkonduktivitas, temperature dan medan kritis, superkonduktor tipe I dan II, efek Meissner, aplikasi superkonduktor, semikonduktor: semikonduktor intrinsic dan ekstrinsik, doping dan pembawa muatan, pengaruh temperature, konduktivitas, P-N junction dan prinsip divais, dielektrik: polarisasi, persamaan Clausius-Mossotti, pengaruh temperature pada dielektrik, rugi-rugi dielektrik dan rangkaian ekivalen, kekuatan dielektrik, Piezoelectric dan ferroelectric; magnetic : dipole dan momen magnetic, klasifikasi material magnetic, teori kemagnetan, kurva magnetisasi dan histerisis, temperature Curie dan Neel, teori domain, material magnetic keras dan lunak, rugi-rugi magnetic, aplikasi material magnetik; dan optic: prinsip-prinsip dasar sifat optik, sensor optic, sensor fotovoltaik dan solar cell, light emitting diode (LED), LASER.			
	Classical and modern electron theory, Photoelectric effect, Schrodinger equation, atom structure, electron statistics and energy band theory, bonding theory and cristal structure; conductor material: conductivity, temperature and mixture effects, skin and Hall effects, contact potential, Seebeck Effect and thermocouple, thermal and high field electron injection; superconductor: superconductivity, critical temperature and field, superconductor type I and II, Meissner Effect, superconductor applications, semiconductor: intrinsic and extrinsic semiconductors, doping and carriers, temperature effects, conductivity, P-N junction, and device principles;dielectric materials: polarization, Clausius-Mozotti Equation, temperature effects on dielectric properties, losses and equivalent circuit, electric strength, piezoelectric and ferroelectric;magnetic materials: magnetic dipole and moment, magnetic material classification, magnetic theory, magnetization and hysteresis curves, Curie and Neel temperatures, domain theory, soft and hard magnetic materials, magnetic losses, application of magnetic materials; Optic: optical properties fundamental, optical sensors, photovoltaic sensor and solar cell, light emitting diode (LED) and LASER			
Luaran (Outcomes)	Mahasiswamemahami teori electron danatom ,sifat-sifat material konduktor, superkonduktor, semikonduktor, dielektrik, magnetic dan optic sertateori yang berhubungandengan material tersebut.			
MatakuliahTerkait	Medan elektromagnetik	Pre-requisite		
	Electromagnetics	Pre-requisite		
KegiatanPenunjang	Praktikum/ demo			
Pustaka	1. Suwarno, Material Elektroteknik, PenerbitMegatama, 2006			
	2. S.O. Kasap, Principles of Electrical Engineering Materials and Devices, Irwin Mc Graw Hill, 1997			
	3. L. Solymar, D. Walsh, Lectures on the Electrical Properties of Materials, Oxford University Press, USA, 1988, 4th Edition.			
PanduanPenilaian	UTS, UAS, Quiz dan tugas			
Catatan Tambahan				

Mg#	Topik	Sub Topik	CapaianBelajarMahasiswa	SumberMateri
1	Classical and Modern Electron Theory	ClassicalElectron Theory, background of modern electron theory, photoelectric effect, electron as particle and wave, Heisenberg uncertainty principle	Students are able to explain ClassicElectron Theory, modern electron theory, photoelectric effect, electron as particle and wave, Heisenberg uncertainty principle	Chapter I
2	Schrodinger Equation	Classical and quantum Mechanics, Schrodinger equation, electron in the potential well, electron in infinite and finite potential wells	Students understand about Classical and quantum Mechanics, mechanics, Know about Schrodinger equation, electron in the potential well, electron in infinite and finite potential wells	Chapter II
3	Atom Structure and Electron Statistic	Structure of hydrogen atom, quantum number, theory of energy band and electron distribution, atom and molecule bondings and crystal structure	Students understand about Structure of hydrogen atom, quantum number, theory of energy band and electron distribution, atom and molecule bonding and crystal structure,	Chapter III
4	Conductor Material	The concept of materialconductivityand effect of temperature, effect of mixture, skin effect on conductor	Students understand about theroty of material conductivity and effect of temperature, effect of mixture, skin effect on conductor	Chapter IV
5	Conductor Material	Hall effect, contact potential,	Students are able to explain Hall	Chapter IV

		Seebeck effect and thermocouple and electron temperature and field emission	effect, contact potential, Seebeck effect and thermocouple and electron temperature and field emission	
6	Superconductor	superconductivity, critical temperature and field, superconductor type I and II, Meissner Effect, superconductor applications	Students understand about superconductivity, critical temperature and field, superconductor type I and II, Meissner Effect, superconductor applications	Chapter IV
7	Semiconductor Material	Intrinsic and extrinsic semiconductor, doping and carriers, conductivity of semiconductors, effect of temperature on semiconductor	Students understand about intrinsic and extrinsic semiconductor, doping and carriers, conductivity of semiconductors, effect of temperature on semiconductor	Chapter V
8	Semiconductor Material	Band theory in semiconductor, Diffusion and conduction on semiconductor, P-N junction, Principle of electronic device	Students understand about band theory in semiconductor, Diffusion and conduction on semiconductor, P-N junction, Principle of electronic device	Chapter V
9	UTS			
10	Dielectric Material	Polarization and dielectric constant, Polarization Types, Polarization on Solid Material and Clausius-Mossotti Equation, Effect of frequency on dielectric material	Students understand about Polarization and dielectric constant, Polarization Types, Polarization on Solid Material and Clausius-Mossotti Equation, Effect of frequency on dielectric material	Chapter VI
11	Dielectric Material	Dielectric Losses and Equivalent Circuit of dielectric Dielectric strength and dielectric breakdown, Piezoelectric and ferroelectric	Students understand about Dielectric Losses and Equivalent Circuit of dielectric Dielectric strength and dielectric breakdown, Piezoelectric and ferroelectric	Chapter VI
12	Magnetic Material	Magnetic Dipole and Magnetic Moment of Atom, Classification of Magnetic Material, Magnetism Theories Magnetization Curve and Hysteresis	Students are able to explain about Magnetic Dipole and Magnetic Moment of Atom, Classification of Magnetic Material, Magnetism Theories Magnetization Curve and Hysteresis	Chapter VII
13	Magnetic Material	Curie temperature and Neel temperature, Domain theory, Soft and hard magnetic materials, Magnetic losses, application of magnetic materials	Students understand about Curie temperature and Neel temperature, Domain theory, Soft and hard magnetic materials, Magnetic losses, application of magnetic materials	Chapter VII
14	Optic Material	Optical Properties, spectrum response of human eyes, optic sensors, photovoltaic sensor, solar cell, light emitting diode (LED), LASER	Students understand about Optical Properties, spectrum response of human eyes, optic sensors, photovoltaic sensor, solar cell, light emitting diode (LED), LASER	
15	Review and assingment			
16	Final Test			

Kode Matakuliah: EP3075	Bobot sks: 3	Semester: 5	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Analisis Sistem Tenaga			
	Power System Analysis			
Silabus Ringkas	Pendahuluan, sistem per-unit, representasi komponen sistem tenaga, Parameter saluran transmisi, Pengenalan saluran daya arus searah, Pemodelan dan perhitungan jaringan, Solusi aliran daya, Gangguan simetris dan taksimetris, Kestabilan transien, Kendali sistem tenaga, Pengenalan operasi ekonomik.			
	Introduction, per-unit system, representation of power system components, Transmission line parameter, Introduction to HVDC transmission, Network modelling and calculation, Power flow solution, Symmetrical and unsymmetrical faults, Transient stability, System controls, Introduction to economic operation.			
Silabus Lengkap	Sistem satu fasa dan tiga fasa, konsep daya aktif dan reaktif, diagram garis tunggal, sistem per-unit, struktur sistem tenaga, gardu induk, model generator sinkron, model transformator, Impedansi seri dan kapasitansi saluran udara, saluran transmisi kabel, ubungan tegangan dan arus di saluran, Kinerja saluran transmisi, pembebanan daya dan kestabilan, Pengenalan saluran daya arus searah, Model admittansi dan persamaan jaringan, model impedansi dan persamaan jaringan, Solusi aliran daya, Gangguan simetris, komponen urutan dan jaringan urutan, gangguan taksimetris, Kestabilan transien sistem tenaga, Kendali daya aktif-frekwensi, kendali daya reaktif-tegangan, pengenalan FACTS, Pengenalan operasi ekonomik sistem tenaga.			
	Single-phase and three-phase systems, active and reactive power, single line diagram, per-unit system, power system structure, substation, synchronous generator model, power transformer model, Transmission line-series impedance and capacitance, underground and submarine cable transmission, voltage and current relations, performances of transmission lines, power loading and stability, Introduction to HVDC transmission, Admittance model and network calculation, impedance model and network calculation, Power flow solutions, Symmetrical faults, symmetrical components and sequence networks, unsymmetrical faults, Power system transient stability, Active power and frequency control, reactive power and voltage control, FACTS devices, Introduction to economic operations of power system..			
Luaran (Outcomes)	The students understand and have an ability to calculate and to analyse: power system component parameters, power flow, symmetrical and unsymmetrical faults, and transient stability; and they know about the principles of power system controls and economic operations.			
Matakuliah Terkait	<i>Rangkaian Elektrik</i> Electric circuit	Pre-requisite		
	<i>Mesin-mesin Listrik</i> Electrical Machines	Co-requisite		
Kegiatan Penunjang	Demo software, Praktikum			
Pustaka	1. J. J. Grainger, W. D. Stevenson, JR, <i>Power System Analysis</i> , McGraw-Hill, 1994			
	2. M. El Hawary, <i>Electrical Power System, Design & Analysis</i> , IEEE Press, 1995			
	3. Prabha Kundur, <i>Power System Stability & Control</i> , McGraw-Hill, 1994			
Panduan Penilaian	Tugas / Assignment : 20%			
	Ujian 1 / 1 st Exam : 40%			
	Ujian 2 / 2 nd Exam : 40%			
	Ujian Akhir / Final Exam : 80%			
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Introduction	Course rules, grading system Single-phase and three-phase system, active and reactive power, single line diagram, per-unit system,	1. Review and understand the concept of single phase and three phase system 2. Know how to draw single line diagram and impedance diagram 3. Able to perform calculation in per unit system	[1] chapter 1.2 [2] chapter 1.2 [3] chapter 1.3
2	Power System Component Representation	Power system structure, synchronous generator, power transformer, load.	1. Describe the representation of generator, transformer, and load in power system analysis 2. Know some types of substations 3. Write the main components of AC transmission line 4. Know the components of AC transmission lines	[1] chapter 2,3 [2] chapter 2,3 [3] chapter 3,7
3	AC Transmission lines parameters	Resistance, single-phase symmetrical three-phase lines inductance, unsymmetrical three-phase lines inductance, <i>bundled conductor</i> inductance. Two-wire lines capacitance, symmetrical three-phase line capacitance, <i>bundled conductor</i> capacitance, three-phase double line capacitance.	1. Calculate series impedance and shunt admittance of AC overhead lines.	[1] chapter 4,5 [2] chapter 4 [3] chapter 6
4	Underground cable lines	Underground cable type and	1. Know the parameters of	[1] chapter 5,6

	Relation between voltage and current	technology Transmission lines representation, short, middle, and long lines, ABCD constants	2. Articulate the difference between short, medium and long transmission line representations 3. Calculate ABCD constants	[2] chapter 4 [3] chapter 6
5	Transmission lines performance	Line power flow, line loading, reactive power compensation, line transient, traveling wave, and wave reflection. DCHV main application, DCHV converter, DCHV link and converter characteristic, advantages of DCHV, economic consideration of DCHV.	1. Indicate voltage-power characteristics of overhead lines for various power factors 2. Determine performances of AC transmission lines 3. Acknowledge the basic principles of HVDC transmission lines 4. Know the advantages and disadvantages of HVDC transmission lines	[1] chapter 6 [3] chapter 6,10
6	Admittance model and network calculation	Branch and node admittance, mutual coupling in Y_{bus} , equivalent admittance network, Y_{bus} modification, network incidence matrix and Y_{bus} , Kron reduction, triangle factorization.	1. Form and modify bus admittance matrix using building block approach 2. Form bus admittance matrix using network incidence matrix 3. Know how to use bus admittance matrix in network calculation	[1] chapter 7
7	Impedance model and network calculation	Bus admittance and impedance matrix, Thevenin theorem and Z_{bus} , Z_{bus} modification, direct determination of Z_{bus} , calculation of Z_{bus} dari from Y_{bus} element, coupled branch in Z_{bus}	1. Form and modify bus impedance matrix using Direct Determination method 2. Determine bus impedance matrix elements from bus admittance matrix 3. Know how to use bus impedance matrix in network calculation	[1] chapter 8
8	1st mid-semester exam			
9	Power flow solutions	Power flow, Gauss-Seidel Method Newton-Raphson method, Fast-Decoupled method, power flow solution on design and system operation.	1. Write the power flow equations 2. Able to perform power flow analysis using Gauss-Seidel and Newton-Raphson methods 3. Know how to use Fast-Decoupled method to solve power flow problems	[1] chapter 9 [2] chapter 6
10	Symmetrical faults	Series RL circuit transient, machine internal voltage during fault condition, fault calculation using Z_{bus} , breaker choosing	1. Calculate symmetrical short circuit currents and voltages in faulted power system network 2.	[1] chapter 10 [2] chapter 8
11	Unsymmetrical faults	Symmetrical component theory, sequence impedance, sequence network, short circuit fault: single-phase, double-phase, double-phase to ground, open conductor fault: single-phase, double-phase	1. Describe the principle of symmetrical component theory and sequent networks 2. Calculate unsymmetrical short circuit current and voltages in a faulted power system network	[1] chapter 11,12 [2] chapter 8
12	Transient Stability of power system	Power system stability, dynamic equation, loss-power formula, equal-area criterion, multi machine transient stability study	1. Able to evaluate transient stability of single machine to infinite bus (SMIB) system 2. Calculate critical clearing angle of a synchronous machine using Equal Area Criterion method 3. Know the principle of transient stability assesment using multy machine approach	[1] chapter 11,12 [2] chapter 8
13	Transient Stability of power system	Power system stability, dynamic equation, loss-power formula, equal-area criterion, multi machine transient stability study	4. Able to evaluate transient stability of single machine to infinite bus (SMIB) system 5. Calculate critical clearing angle of a synchronous machine using Equal Area Criterion method 6. Know the principle of transient stability assesment using multy machine approach	[1] chapter 16 [2] chapter 10 [3] chapter 13
14	Introduction to power system controls		1. Describe the principle of active power – frequency (P-f) control in power system 2. Indicate the hyrarchy of P-f controls in power system 3. Describe the principle of reactive power – voltage (Q-V) control in power system 4. Indicate some Q-V control devices in power system	[2] chapter 11
15	Introduction to power system economics		1. Describe the principle of economic dispatch and units commitment 2. Know the principle of optimal power flow.	[1] chapter 13 [2] chapter 11
16	2 nd mid-semester exam		3.	

Kode Matakuliah: EP3171	Bobot sks: 2	Semester: 5	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Praktikum Tenaga Listrik I			
	Power Engineering Laboratory I			
Silabus Ringkas	Praktikum Mesin-mesin listrik: Mesin sinkron, Mesin asinkron, Transformator daya, Mesin arus searah. Praktikum Analisis Sistem Tenaga: Persiapan perangkat lunak ETAP, Aliran beban dan analisis kontingensi, Analisis hubung singkat simetris dan taksimetris, Analisis pengasutan motor, Analisis Kestabilan transien. Praktikum Sistem Kendali.			
	Electric Machinery Practice consists of Synchronous machines, Asynchronous machines, Power Transformer, DC machines. Power System Analysis Practice consists of Preparation of ETAP software, Load flow and Contingency analysis, Symmetrical and Unsymmetrical short circuit analysis, Motor starting analysis and Transient stability analysis. Control system Practice.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Mesin-mesin Listrik	Co-requisite		
	2. Analisis Sistem Tenaga	Co-requisite		
	3. Sistem Kendali	Co-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka				
Panduan Penilaian				
Catatan Tambahan				

Kode Matakuliah: EP3172	Bobot sks: 2	Semester: 6	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Praktikum Tenaga Listrik II			
	Power Engineering Laboratory II			
Silabus Ringkas	Praktikum Elektronika Daya: Pensaklaran static, Konverter DC – DC, Konverter AC – DC (penyearah), Konverter DC –AC. Praktikum Teknik Tegangan Tinggi: Pembangkitan tegangan tinggi DC, Pembangkitan tegangan tinggi impuls, Distribusi tegangan pada rantai isolator, Tembus pada gas. Praktikum Proteksi Sistem Tenaga.			
	Power Electronic Practice consists of Static Switching, DC to DC Converter, AC to DC Converter (Rectifier) and DC to AC Converter. High Voltage Engineering Practice consists of DC high voltage generation, Impulse high voltage generation, Voltage distribution on chain insulators, and Gas breakdown. Power System Protection Practice.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Elektronika Daya	Co-requisite		
	3. Teknik Tegangan Tinggi	Co-requisite		
	2. Proteksi Sistem Tenaga	Co-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka				
Panduan Penilaian				
Catatan Tambahan				

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Dilarang untuk me-reproduksi dokumen ini tanpa diketahui oleh Dirdik-ITB dan EP-ITB.

Kode Matakuliah: EP3070	Bobot sks: 3	Semester: 6	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Pembangkit Tenaga Listrik			
	Electric Power Plant			
Silabus Ringkas	Pendahuluan pembangkitan tenaga listrik, factor ekonomik pembangkitan tenaga listrik, analisis siklus uap, pembangkitan <i>combined cycle</i> , bahan bakar dan pembakaran, mekanisme pembakaran, peralatan dan metode penyalaan, pembangkit uap, turbin uap, condenser, air umpan ketel dan sistem sirkulasi air, pembangkit tenaga nuklir, pmebangkit tenaga air, mesin diesel, pembangkit tenaga gas, penyimpan energy.			
	Introduction to electricity generation, economics of power generation, analysis of steam cycles, combined cycle power generation, fuels and combustion, combustion mechanism, combustion equipment and firing methods, steam generator, steam turbines, condenser, feedwater and circulating water systems, nuclear power plant, hydroelectric power plant, diesel engine and gas turbine power plants, energy storage .			
Silabus Lengkap				
Luaran (Outcomes)	This course emphasis on understanding and exposing the students to modern methods of electric power generation with analysis firmly based on thermodynamics ,heat transfer and fluid mechanics.			
Matakuliah Terkait	1. Electrical Machinery	Pre-requisite		
	2. Thermal Engineering & Fluid mechanics	Pre-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka	1. PK Nag, <i>Power Plant Engineering System, Second Edition</i> , McGraw-Hill, 2002			
	2. Paul Breeze, <i>Power Generation Technologies</i> , Elsevier Newnes, 2005			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan pembangkitan tenaga listrik,			
2	factor ekonomik pembangkitan tenaga listrik,			
3	analisis siklus uap,			
4	pembangkitan <i>combined cycle</i> ,			
5	bahan bakar dan pembakaran,			
6	mekanisme pembakaran,			
7	peralatan dan metode penyalaan,			
8	pembangkit uap			
9	, turbin uap,			
10	condenser,			
11	air umpan ketel dan sistem sirkulasi air,			
12	pembangkit tenaga nuklir,			
13				
14				
15				

Kode Matakuliah: EP3072	Bobot sks: 3	Semester: 6	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Elektronika Daya			
	Power Electronics			
Silabus Ringkas	Konsep dasar elektronika daya dan konverter daya. Semikonduktor daya. Konverter daya ac-ac, ac-dc, dc-dc, dc-ac, dan pemakaiannya. Pengendalian konverter daya.			
	Basic concept of power electronics and power converters. Power semiconductor, ac-ac, ac-dc, dc-dc, dc-ac power converters and its applications. Power converter controls.			
Silabus Lengkap				
Luaran (Outcomes)	Kuliah ini bertujuan menjelaskan konsep dasar konversi daya dengan menggunakan teknologi elektronika dan penggunaannya.			
Matakuliah Terkait	Rangkaian Elektrik	Pre-requisite		
	Elektronika	Pre-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka	1. Mohan, et.al., <i>Power Electronics</i> , John Wiley, latest ed.			
	2. Kassakian, et.al., <i>Principles of Power Electronics</i> , Addison Wesley, latest ed.			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan	Elektronika Daya	Menjelaskan konsep elektronika daya dan perbedaannya dengan elektronika sinyal	
2	Saklar semikonduktor daya	Semikonduktor daya	Menjelaskan komponen utama konverter daya	
3	Penyearah	Penyearah dioda	Menjelaskan prinsip kerja dan analisis penyearah dioda	
4	Penyearah	Penyearah thyristor	Menjelaskan prinsip kerja dan analisis penyearah thyristor	
5	Regulator tegangan AC	Regulator tegangan	Menjelaskan prinsip kerja dan penggunaan regulator AC	
6	Konverter 4 kuadran dan siklokonverter	Siklokonverter	Menjelaskan prinsip kerja konverter 4 kuadran dan siklokonverter	
7	Konverter DC-DC	Konverter DC-DC	Menjelaskan prinsip kerja dan analisis konverter dc-dc	
8	Konverter DC-AC	Inverter	Menjelaskan prinsip kerja dan analisis inverter	
9	Konverter DC-AC	Teknik PWM	Menjelaskan bermacam teknik PWM	
10	Soft switching	Soft switching	Menjelaskan konsep soft switching	
11	Catu daya switching dan UPS	Menjelaskan konsep UPS	Menjelaskan prinsip kerja UPS	
12	Pengendalian motor	Pengendalian motor dengan konverter	Menjelaskan penggunaan elektronika daya dalam pengendalian motor	
13	PWM rectifiers	PWM rectifiers	Menjelaskan konsep penyearah frekuensi switching tinggi	
14	Elektronika daya dalam sistem tenaga	FACTS	Menjelaskan penggunaan elektronika daya dalam sistem tenaga elektrik	
15	Ujian akhir			

Kode Matakuliah: EP3074	Bobot sks: 3	Semester: 6	KK / Unit Penanggung Jawab: Electrical Power Eng/Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Teknik Tegangan Tinggi			
	High Voltage Technology			
Silabus Ringkas	Pengantar: transportasi energi tegangan tinggi, aplikasi teknik tegangan tinggi di industri, Medan listrik, metoda perhitungan medan listrik, mekanisme tembus listrik pada gas, cair dan padat, Isolasi tegangan tinggi, Pembangkitan pengukuran dan pengujian tegangan tinggi, Pengujian tegangan tinggi			
	Introduction to			
Silabus Lengkap	Transportasi tenaga listrik dengan tegangan tinggi, aplikasi teknik tegangan tinggi Pengertian medan listrik, metoda perhitungan medan listrik, conformal mapping Materi didalam medan listrik, dielektrika Multi layer dielectric Mekanisme tembus listrik pada gas, cair dan padat, Isolasi tegangan tinggi gas, padat dan cair. Isolasi gas SF6 Pembangkitan pengukuran dan pengujian tegangan tinggi Pengujian tegangan tinggi			
Luaran (Outcomes)	Peserta didik mendapatkan pengetahuan dasar tegangan tinggi dan peranannya dalam transportasi energi. Memiliki pengetahuan tentang dan kemampuan untuk menghitung, melakukan analisis medan elektrostatik pada peralatan tegangan tinggi. Memiliki pengetahuan tentang ketahanan dielektrik berbagai bahan isolasi dibawah kondisi tegangan tinggi, meliputi isolasi gas, cair dan padat. Menguasai cara pembangkitan dan pengukuran tegangan tinggi serta pengujian tegangan tinggi			
Matakuliah Terkait	<i>Rangkaian Elektrik</i> Electric circuit	Pre-requisite		
	Medan Elektromagnetik Electromagnetic Field	Pre-requisite		
Kegiatan Penunjang	Praktikum, Presentation			
Pustaka	1. Darwanto, Djoko; Teknik Tegangan Tinggi; Lecture Notes			
	2. Hilgarth, Guenther; Hochspannungstechnik; B.G. Teubner Stuttgart			
	3. Kind, Dieter; Pengantar Teknik Eksperimental Tegangan Tinggi; Penerbit ITB Bandung			
	4. Andreas Kuechler; Hochspannungstechnik; Springer Verlag			
Panduan Penilaian	Mid-Test 30%, Final-Test 30%, Task 40%			
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pengenalan Teknik Tegangan Tinggi	Teknik tegangan tinggi sebagai sarana transportasi tenaga listrik; Tegangan tinggi dibidang penelitian fisika: Masalah tegangan tinggi		
2	Pengertian Medan Listrik	Kuat Medan Listrik Fluksi Pergesaran dan Rapat Fluksi Potensial Listrik dan Tegangan Tahanan Dielektrika dan Kapasitansi		
3	Perhitungan Medan Listrik	Perhitungan Medan Listrik: Pelat Paralel Mendatar, Silinder Koaksial, Bola-Bola Konsentris, Silinder Paralel Muatan Bayangan, Kapasitansi Satuan di Udara		
4	Materi didalam medan listrik	Hukum Coulomb, Muatan Ruang, Energi dan Daya, Materi didalam Medan Listrik Polarisasi, Rugi-Rugi Dielektrik, Efek Muatan Sisa		
5	Multi layer dielectric	Medan Listrik di Bidang Batas Dielektrika Berlapis, Pelat Paralel, Silinder Koaksial, Bola-Bola Konsentris Pemanasan dielektrika		
6	Conformal mapping	Metode Grafis untuk Penentuan Medan Cara Kapasitansi, Transformasi Koordinat Efisiensi Geometri, Medan Listrik Elektroda Bola dan Silinder		

7	Pelepasan muatan pada Gas (Gas Discharge)	Gerakan Partikel Bermuatan, Eksitasi, Ionisasi, dan Energi pelepasan Pelepasan Muatan pada Gas (Gas Discharge), Jarak Lintasan Bebas, Koefisien Ionisasi (α), Avalans Elektron Koefisien Pukulan Balik		
8	Tembus listrik pada gas (Gas Breakdown)	Tembus Listrik pada Medan Homogen Mekanisme Generasi (Mekanisme Townsend) Mekanisme Streamer (Raether & Meek) Penundaan waktu pelepasan muatan (Discharge Delay) Rapat Gas Relative dan Faktor Koreksi Rapat Udara		
9	Isolasi Gas	Isolasi Gas Peralatan Tegangan Tinggi Tembus listrik pada medan tidak homogen Kuat Medan Listrik Awal, Elektroda Silinder, Elektroda Bola		
10	Isolasi Padat	Jenis dan penggunaannya, Tembus listrik pada isolasi padat, Tembus listrik thermal Aplikasi dielektrika berlapis, Partial Discharge didalam isolasi padat		
11	Pembangkitan Tegangan tinggi	Pembangkitan Tegangan Tinggi AC, DC, impuls petir		
12	Pengukuran Tegangan tinggi	Pengukuran Tegangan Tinggi AC, DC, impuls petir		
13	Pengujian tegangan tinggi	Analisa statistic pengujian tegangan tinggi Standar Nasional, Internasional Teknik Pengujian Tegangan Tinggi		

Kode Matakuliah: EP3076	Bobot sks: 3	Semester: 6	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Proteksi Sistem Tenaga			
	Power System Protection			
Silabus Ringkas	Pendahuluan, Sumber-sumber tegangan lebih, gelombang merambat, fenomena petir, impedansi surja menara dan saluran transmisi, peralatan proteksi terhadap tegangan lebih, lightning performance, koordinasi isolasi, sistem tiga fasa, parameter saluran dan sistem pada kondisi hubung singkat, review komponen simetris dan perhitungan arus /tegangan pada kondisi gangguan hubung singkat, relay proteksi, koordinasi relays pada sistem proteksi			
	Introduction, overvoltage sources, travelling wave, lightning phenomenon, surge impedance of tower and transmission line, overvoltage protection equipment, lightning performance, insulation coordination, three phase system, line and system parameters under short circuit fault condition, review of symmetrical components and current and voltage calculation under short circuit faults, protection relay, relay coordination in protection system.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Medan Elektromagnetik	Pre-requisite		
	2. Analisa Sistem Tenaga	Pre-requisite		
Kegiatan Penunjang	Praktikum			
Pustaka	1. Dr. Reynaldo Zoro, "Sistem Proteksi pada Sistem Tenaga Listrik-Proteksi Tegangan Lebih", Lecture Notes, Penerbit ITB, 2002			
	2. Greenwood, Electrical Transient in Power System, John Wiley, 19			
	3. Jones, D., Analysis and Protection of Electrical Power System, Wheeler Publishing, 1 st Edition			
	4. J. L. Blackburn, Protective Relaying, principles and application, Marcel Dekker, Inc., 1998			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pengantar	Gangguan dan tegangan lebih di sistem tenaga listrik	Mampu menjelaskan gangguan-gangguan yang terjadi di sistem transmisi	
2	Temporary Over Voltage (TOV), Switching Over Voltage (SOV)	Sumber- sumber TOV, penentuan/pemilihan Lightning Arrester dan desain sistem dari sudut pandang TOV, pengaruh dari TOV atas penentuan spesifikasi isolasi peralatan	Mengenal adanya TOV dan pengaruhnya pada penentuan rating LA Mengetahui besaran SOV dari parameter sistem dan perancangan isolator	
3	Lightning Over Voltage (LOV) dan parameter petir	Mekanisme pembentukan awan bermuatan listrik, proses pelepasan muatan, parameter petir dan pengaruhnya pada objek/peralatan yang terkena sambaran petir	Memahami proses terjadinya awan petir, material yang dibutuhkan, fenomena tropis Mampu menentukan pengaruh sambaran petir pada objek dan upaya/cara meredam	
4	Gelombang merambat (travelling wave) dan terpaan petir langsung	Teori rambatan gelombang, sambaran petir langsung pada konduktor fasa, lewat denyar balik (backflashover)	Sumber flashover pada isolator dan LA akibat travelling wave	
5	Sambaran petir langsung dan taklangsung	Sambaran petir pada menara transmisi dan Ground Wire, kenaikan tegangan pada isolator akibat petir, sambaran petir di dekat saluran transmisi/distribusi, koppel induktif dan kapasitif	Sumber dan penyebab back flashover dan shielding failure Mampu menentukan pengaruh induksi pada hantaran	
6	Impedansi surja dan kecepatan rambat gelombang	Impedansi surja objek yang terkena sambaran petir langsung, kecepatan rambat gelombang tegangan dan arus surja pada saluran transmisi	Mampu menghitung Z dan V hantaran udara dan kabel	
7	Peralatan proteksi tegangan lebih	Arcing Horn, Protection Valve dan Lightning Arrester,	Mengetahui fungsi masing-masing alat proteksi	
8	Pengantar dan filosofi umum proteksi sistem tenaga terhadap gangguan hubung singkat, besaran ukur untuk proteksi	Protective Relays and Relay System, objektif proteksi sistem tenaga, kinerja protective relay, klasifikasi Relays, Review sistem pada kondisi gangguan, komponen simetris dan rangkaian urutan, besaran ukur	Memahami arti dari protective relaying pada sistem tenaga Memahami objektif sistem proteksi Mengetahui kondisi sistem pada keadaan gangguan Mengetahui besaran urutan positif, negatif dan nol akibat	

		(BU) dan sirkit untuk memperoleh BU	ketakseimbangan fasa pada saat gangguan	
9	Sumber masukan relays	Sirkuit ekuivalen Current dan Voltage Transformers (CT dan VT), CT untuk aplikasi proteksi, CT pada kondisi sistem 3 fasa simetris, Burden pada waktu terjadi gangguan, kinerja dan pemilihan CT	Memahami prinsip kerja transformator untuk mendapatkan Besaran Ukur rele Mampu membedakan karakteristik CT untuk tujuan pengukuran dan untuk proteksi, Mengenal karakteristik Burden CT pada saat gangguan	
10	Sumber masukan relays	Evaluasi kinerja Ground Relays, perilaku CT atas DC Component, transformator tegangan untuk proteksi: Electromagnetic-type VT, Capacitor-type VT, Burden dan tahanan konduktor penghubung, VT untuk proteksi	Memahami prinsip kerja dan aplikasi Voltage Transformer untuk tujuan proteksi sistem tenaga Mengenal tipe-tipe VT Memahami efek Burden dan konduktor penghubung atas kinerja VT	
11	Dasar-dasar dan prinsip-prinsip dalam desain proteksi	Prinsip differensial, Overcurrent-Distance Protection, Back-up Protection, Static Relays dan relays berbasis mikroprosesor	Mengenal dan mampu menjabarkan prinsip kerja berbagai tipe rele proteksi Mengenal teknologi rele-rele proteksi	
12	Dasar-dasar dan prinsip-prinsip dalam desain proteksi	Overcurrent Relays: tipe, settings, koordinasi relay dengan fuse, Directional Control: Directional Relays, Directional earth-fault Relays, Differential Relay	Mengenal cara penentuan setting rele-rele arus lebih, rela arah dan rele differensial Mampu melakukan koordinasi antara OCR dan Fuse	
13	Dasar-dasar dan prinsip-prinsip dalam desain proteksi	Distance Relays: prinsip kerja, elemen pengukur impedansi, karakteristik relay, pertimbangan praktis dalam aplikasi distance relays untuk proteksi sistem tenaga	Memahami prinsip proteksi dengan rele jarak (Distance Relay), Mengenal berbagai tipe rele jarak, Mengenal kondisi-kondisi praktis yang harus diperhatikan dalam penggunaan rele jarak pada proteksi saluran transmisi	
14	Prinsip-prinsip dalam aplikasi daan koordinaasi relays	Contoh koordinasi relays	Memahami prinsip koordinasi berbagai rele dalam proteksi peralatan dan sistem tenaga listrik	
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Kode Matakuliah: EP4073	Bobot sks: 2	Semester: 7	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Kapita Selektia Tenaga Listrik			
	Selected Topics in Electrical Power System			
Silabus Ringkas	Pendahuluan. Perkembangan teknologi ketenagalistrikan. <i>Energy outlook</i> dunia, <i>Energy outlook</i> Indonesia, kuliah tamu dari industri dan institusi lain tentang ketenagalistrikan atau yang terkait dan <i>softskill</i> .			
	Introduction. Electrical power technologies. World energy outlook, Indonesian energy outlook. Invited speakers from industries and other institution concerning electricity and related topics and softskill.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait			Pre-requisite	
			Pre-requisite	
Kegiatan Penunjang	Praktikum			
Pustaka	1.			
	2.			
	3.			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan		Mengetahui tujuan, aturan dasar, dan isi kuliah Memiliki motivasi untuk menjalani kuliah	
2	Perkembangan teknologi ketenagalistrikan		Memahami perkembangan teknologi dalam ketenagalistrikan	
3	Energi outlook dunia		Mengetahui outlook energy dunia	
4	Energi outlook Indonesia		Memahami outlook energy indonesia	
5	Kuliah tamu		Mengetahui dari tangan pemakai dan memahami tantangan teknologi dan kerja dalam dunia ketenagalistrikan	
6	Kuliah tamu		Memahami pentingnya aspek aspek non-teknis dalam dunia kerja ketenagalistrikan	
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Kode Matakuliah: EP4075	Bobot sks: 3	Semester: 7	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Sistem Distribusi Tenaga Listrik			
	Electrical Power Distribution Systems			
Silabus Ringkas	<p>Pendahuluan, Fungsi dasar sistem distribusi, Beban system distribusi, sistem jaringan distribusi, Analisais dan pemodelan sistem distribusi, Komponen-komponen system distribusi (penghantar, isolator, sekering, pemutus tenaga, serandang hubung, dll.), Sistem distribusi di atas tanah, Sistem distribusi bawah tanah Kualitas daya dan kompensasi daya pada sistem distribusi, Keandalan sistem distribusi, Otomasi distribusi dan sistem SCADA.</p> <p>Introduction, Basic distribution system functions, Power distribution system loads, Distribution network system, Distribution system modelling and analysis, Power distribution system components (Conductor, Insulator, Fuse, Circuit breaker, Switchgear etc.), Overhead distribution systems, Underground distribution systems, Power quality and distribution power compensation, Reliability Power distribution systems, Distribution automation and SCADA systems</p>			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Rangkaian Elektrik	Pre-requisite		
	2. Analisis Sistem Tenaga	Pre-requisite		
Kegiatan Penunjang				
Pustaka	<ol style="list-style-type: none"> L.L. Grigsby, Electric Power Engineering, CRC Press 1998. H Lee Willis, Power Distribution Planning Reference Book, Marcel Dekker, 1997 William H Kersting, Distribution System Modeling and Analysis, CRC Press, 2002 Electrical Distribution systems, The Fairmont Press inc 1999. Turan Gonen, Electric Distribution System Engineering, Press, New York, 1996 Electric power distribution for industrial plants, IEEE Press 1996. 			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Introduction and Basic distribution system functions	Distribution system planning and process, Distribution system component and functions, Distribution system network and topology	Memahami tentang maksud dan tujuan serta peranan sistim distribusi dalam penyaluran daya dari sumber daya ke konsumen serta kaitannya dengan proses perencanaan.	
2	Power distribution system loads	Distribution load model, Distribution load classification, Distribution load characteristic.	Mengerti dan memahami mengenai model beban serta karakteristiknya yang digunakan dalam proses analisis..	
3	Power distribution system components and Switchgear	Conductor, Insulator, Fuse, Circuit breaker, Switchgear	Mengerti dan memahami karakteristik dan peranan komponen2 dalam pendistribusian energi.	
4	Power distribution system components and Switchgear	Conductor, Insulator, Fuse, Circuit breaker, Switchgear	Mengerti dan memahami karakteristik dan peranan komponen2 dalam pendistribusian energi listrik.	
5	Distribution network system, modelling and analysis	Distribution network system modelling Distribution topological analysis.	Mengerti dan memahami pemodelan2 analisis makro dan mikro dalam pendistribusian energi.	
6	Distribution network system, modelling and analysis	Distribution topological analysis. Radial load flow analysis,	Mengerti dan memahami pemodelan2 analisis makro dan mikro dalam pendistribusian energi.	
7	Distribution network system, modelling and analysis	Radial Short circuit analysis,	Mengerti dan memahami pemodelan2 analisis makro dan mikro dalam pendistribusian energi.	
8	Distribution system protection	Swthgear protections Feeder Protections.	Mengerti dan memahami karakteristik, fungsi dan peranan peralatan proteksi dalam pendistribusian energi listrik	
9	Overhead distribution systems,	Overhead distribution systems structure & analisis,	Mengerti dan memahami teknik penyaluran energi listrik menggunakan Hantaran Udara	
10	Underground distribution systems	Underground distribution systems & analisis,	Mengerti dan memahami teknik penyaluran energi listrik menggunakan Kabel .	
11	Power quality and distribution power compensation,	Mathematical model power quality analysis Reactive	Mengerti dan memahami tentang peralatan Power Quality dan cara	

		power compensation calculation.	kerjanya dalam penyaluran energi listrik.	
12	Power Reliability Analysis	Power Reliability Analysis & Calculation.	Mengerti dan memahami cara2 analisis dan peranan aspek reability dalam penyaluran energi listrik.	
13	DADSM	Distribution Management system	Mengerti dan memahami tentang Distribution Management system	
14	DADSM	Distribution automation and Scada systems	Mengerti dan memahami tentang Distribution automation and Scada systems	
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Kode Matakuliah: EP4070	Bobot sks: 2	Semester: 8	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Disain Sistem Tenaga Listrik			
	Electrical Power System Design			
Silabus Ringkas	Pendahuluan, Prinsip desain sistem pada sistem tenaga listrik, Siklus desain, Manajemen kualitas, dokumentasi dan spesifikasi teknis peralatan dan sistem tenaga, Standar-standar dan panduan praktis instalasi listrik, HAKI dan paten, Aspek ekonomis pada desain, Aspek keselamatan dan lingkungan pada desain, Studi kasus, Proyek kelompok.			
	Introduction, Products and System design principal on Electric Power System, Design Cycle, Quality management, documentation and technical specification on equipment and power system, Standards and practical of electric installation, HAKI and patent, Economic aspect on design, Safety and environmental aspect on design, Cases study, Group project.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	Analisis Sistem Tenaga	Pre-requisite		
		Pre-requisite		
Kegiatan Penunjang	Proyek / tugas besar kelompok			
Pustaka	1.			
	2.			
	3.			
Panduan Penilaian				
Catatan Tambahan				

Mg #	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan dan overview desain		Mengetahui tujuan, aturan dasar, dan isi kuliah Memiliki motivasi untuk menjalani kuliah Memahami posisi desain dalam proses engineering Memahami prinsip dasar desain teknik	
2	Standar disain dan instalasi listrik internasional dan nasional		Memahami pentingnya standard dalam proses desain Mengetahui standar yang berlaku dalam desain ketenagalistrikan Memahami isi PUIL	
3	Best practices disain dan instalasi listrik di perusahaan terkemuka		Mengetahui spesifikasi umum desain ketenagalistrikan Mengetahui spesifikasi teknik desain ketenagalistrikan	
4	Overview gambar teknik ketenagalistrikan		Mengetahui prinsip dasar dan konvensi dalam gambar desain teknik Mampu membaca gambar teknik Mampu menggambarkan desain dalam gambar teknik	
5	Desain system transmisi		Memahami prinsip desain system transmisi	
6	Desain system distribusi		Memahami prinsip desain system distribusi	
7	Desain gardu		Memahami prinsip desain gardu listrik	
8	Desain instalasi		Memahami prinsip desain instalasi gedung dan industri	
9	Studi kasus		Mampu menerapkan standar, best practices, dan pengetahuan dalam mendesain system ketenagalistrikan	
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Kode Matakuliah: EP4071	Bobot sks: 3	Semester: 7	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Pemanfaatan Energi Listrik Utilization of Electrical Energy			
Silabus Ringkas	Pendahuluan ; Dasar-dasar pemanasan ; isolasi termal ; Pemanasan listrik ; <i>Electric Furnace</i> ; Penerangan ; Penggerak listrik ; <i>Electric Precipitation</i> ; Aplikasi listrik lain di industri ; <i>District Cooling</i> ; Pemanasan dan Daya ; Efisiensi energi ; Pertimbangan lingkungan. Introduction ; Basic of Heating ; Thermal Insulation ; Electric Heating ; Electric Furnace ; Lighting ; Electric Drive ; Electric Precipitation ; Other industrial electric applications ; District Cooling, Heating and Power ; Energy Efficiency ; Environmental Consideration.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	Mesin-mesin Listrik	Pre-requisite		
	Rekayasa Termal & Mekanika Fluida	Pre-requisite		
Kegiatan Penunjang				
Pustaka	1. C.L. Wadhwa, <i>Generation, Distribution and Utilization of Electrical Energy</i> , New Age International (P) Limited Publisher, New Delhi 2005 2.			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Introduction	Gain Motivation Contents and references Class Rule	Gain Motivation Understand Contents and references Understand Class Rule	
2	Basic of Heating	Thermal Unit Relationship Between Heat and Work Heat Transfer Specific, Sensible, and Latent Heat Heat-Conveying Mediums	Understand: Thermal Unit Relationship Between Heat and Work Heat Transfer Specific, Sensible, and Latent Heat Heat-Conveying Mediums	
3	Thermal Insulation	Insulating Structures Principles of Heat Transmission Condensation Insulating Materials	Understand: Insulating Structures Principles of Heat Transmission Condensation Insulating Materials	
4	Electric Heating	Heating Planning and Design Central Hot-Water Systems Central Forced-Warm-Air Heating Systems Radiant Heating Systems Baseboard Heating Systems Electric Unit Ventilators Electric Unit Heaters Electric Space Heaters Heat Pumps	Understand: Heating Planning and Design Central Hot-Water Systems Central Forced-Warm-Air Heating Systems Radiant Heating Systems Baseboard Heating Systems Electric Unit Ventilators Electric Unit Heaters Electric Space Heaters Heat Pumps	
5	Electric Furnace	Basic of Furnace Electrical Power Supply Furnace Planning and Design Basic Components Controls	Understand: Basic of Furnace Electrical Power Supply Furnace Planning and Design Basic Components Controls	
6	Lighting	Basic of Lightning Planning and design of lighting Technology of lighting	Understand: Basic of Lightning Planning and design of lighting Technology of lighting	
7	Electric Drive	Review of Basic of electric drive Design of Electric drive New Technologies of Electric Drive	Review of Basic of electric drive Understand: Design of Electric drive New Technologies of Electric Drive	
8	Mid Semester Exam			

9	Electric Precipitation	Basic of Precipitation Design of Electric Precipitation Technology of Electric Precipitation	Understand: Basic of Precipitation Design of Electric Precipitation Technology of Electric Precipitation	
10	Other industrial electric applications	New industrial electric applications	Understand: New industrial electric applications	
11	District Cooling, Heating and Power	Basic of district heating and cooling Basic of Co-generation Technology of CHP	Understand: Basic of district heating and cooling Basic of Co-generation Technology of CHP	
12	Energy Efficiency	Efficiency in heating Efficiency in lighting Efficiency of industry and residential use	Understand: Efficiency in heating Efficiency in lighting Efficiency of industry and residential use	
13	Environmental Consideration	Environmental consideration in energy utilization	Understand: Environmental consideration in energy utilization	
14	Resume			

Kode Matakuliah: EP4096	Bobot sks: 2	Semester: 7	KK / Unit Penanggung Jawab: Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Tugas Akhir I dan Seminar			
	Final Project I and Seminar			
Silabus Ringkas	Pengenalan metodologi penelitian, prosedur penelitian, presentasi dan penulisan ilmiah, belajar dari pengalaman, pembimbingan proposal tugas akhir, penelitian awal, seminar dan evaluasi.			
	Introduction to research methodology, procedure of research, scientific writing and presentations, lesson-learned, guidance of final project proposal, preliminary research, seminar and evaluation			
Silabus Lengkap	Sejarah dan terminology, logika ilmiah, tujuan, tipe, variable, metode, teknik, perancangan, identifikasi masalah, hipotesis, landasan teori, pengumpulan dan sampling data, instrumentasi, pemrosesan, presentasi dan analisis data, kesimpulan dan saran			
	History and terminology, scientific logic, purpose, type, variable, methods, techniques, design of research, Problem identification, hypothesis, basics theory, data collection and sampling, instrumentation, data processing, presentation and analysis, conclusion and suggestion, oral and poster presentation techniques and hints, learning from frequent mistakes in writing and presentation, experience sharing, Knowledge and experience sharing in pursuing research			
Luaran (Outcomes)	This course should bring understanding on running research based on scientific methodology and capable of writing and presenting final project proposals			
Matakuliah Terkait	Tata Tulis Karya Ilmiah		Prerequisite	
Kegiatan Penunjang				
Pustaka	1. Deny Hamdani, Pengantar Metodologi Penelitian: Panduan Penulisan Tugas Akhir, Penerbit ITB, 2010 (utama)			
Panduan Penilaian	Research Proposal 40%, Seminar 25%, Final-test 20%, Task 15%			
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Introduction to research methodology	History and terminology, scientific logic, purpose, type	1. Understand the history and the definition of scientific research 2. Understand the principle of doing research	Ref.1 Chapter 1
2	Introduction to research methodology	variable, methods, techniques, design	1. Understand the principle of doing research	Ref.1 Chapter 1
3	Procedure of research	Problem identification, hypothesis, basics theory, data collection and sampling, instrumentation, data processing, presentation and analysis, conclusion and suggestion	1. Understand the standard procedure in doing research	Ref.1 Chapter 2
4	Scientific writing and presentation	techniques and hints in scientific writing, oral and poster presentation	1. Understand the principles of scientific writing and presentation 2. Understand some techniques and hints in scientific presentation	Ref.1 Chapter 5
5	Lesson-learned	Learning from frequent mistakes in writing and presentation, experience sharing	1. Understand frequent mistakes in writing 2. Understand frequent mistakes in presentation	Ref.1 Chapter 4
6	Guidance of Final Project Proposal	Knowledge and experience sharing in pursuing research	1. Understand how to disseminate the principals of research methodology 2. Understand how to properly write and compile a research proposal	
7	Preliminary Research	Doing preliminary research and writing the research proposal of final project	Capable of doing research and writing its progress in a research proposal	
8	Seminar and Evaluation	Doing Oral presentation of the research proposal of final project	Cabable of presenting research progress	

Kode Matakuliah: EP4091	Bobot sks: 2	Semester: 8	KK / Unit Penanggung Jawab: Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Kerja Praktek			
	Industrial Experience			
Silabus Ringkas	Mahasiswa melaksanakan program kerja praktek selama 2 bulan (disarankan pada masa libur akhir semester genap) untuk mendapatkan pengalaman kerja yang terkait dengan bidang teknik tenaga listrik di perusahaan/industri.			
	Students spend 2 months for internship programs (preferably during a summer break) to gain work experiences related to the field of electrical power engineering in companies/industries.			
Silabus Lengkap				
Luaran (Outcomes)	Memberikan pengalaman bekerja kepada mahasiswa di perusahaan/industri khususnya di bidang teknik tenaga listrik, dibekali pengetahuan yang diperolehnya selama kuliah sampai dengan tingkat tiga.			
Matakuliah Terkait	Telah lulus 108 sks		Prerequisite	
Kegiatan Penunjang				
Pustaka				
Panduan Penilaian				
Catatan Tambahan				

Kode Matakuliah: EP4099	Bobot sks: 4	Semester: 8	KK / Unit Penanggung Jawab: Teknik Ketenagalistrikan	Sifat: Wajib Prodi
Nama Matakuliah	Tugas Akhir II			
	Final Project II			
Silabus Ringkas	Mahasiswa melaksanakan usulan tugas akhirnya yang disusun pada EP4096 Tugas Akhir I & Seminar, termasuk evaluasi untuk mendapatkan solusi terhadap persoalan yang dirumuskan pada EP4096. Mahasiswa menyerahkan Buku laporan tugas akhir disertai makalah ringkasan tugas akhir dan mempertahankannya di Sidang Tugas Akhir.			
	Students carry out the proposed project in EP4096 Final Project I & Seminar, including an evaluation for assessing the extent to which it has addressed the formulated problem. Students submit project reports & resume paper and defend them at the Final project Exam.			
Silabus Lengkap				
Luaran (Outcomes)	This course should bring understanding on running research based on scientific methodology and/or engineering problem solving, specially in the field of electrical power and capable of writing and presenting final project report			
Matakuliah Terkait	Tugas Akhir I & Seminar		Prerequisite	
Kegiatan Penunjang				
Pustaka				
Panduan Penilaian	Nilai TA diberikan oleh Pembimbing dengan mempertimbangkan nilai Sidang Tugas Akhir			
Catatan Tambahan				

Kode Matakuliah: EP4074	Bobot sks: 3	Semester: 7/8	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Pilihan
Nama Matakuliah	Rekayasa Sistem			
	System Engineering			
Silabus Ringkas	Teori system, pengendali berbasis mikroprosesor, kendali computer waktu nyata, konsep keandalan dan penggunaannya, teori antrian dan penggunaannya, optimisasi kerekayasaan, fungsi biaya produksi, ekonomi kerekayasaan, analisis pembuatan keputusan.			
	System theory, microprocessor based controller, real time computer control, reliability concept and application, queing theory and application, engineering optimization, production cosf function, engineering economic, decision making analysis.			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	1. Sistem Kendali	Pre-requisite		
Kegiatan Penunjang				
Pustaka	1. Stuart Bennet, <u>Real Time Computer Control, An Introduction</u> , Second Edition, Prentice Hall International			
	2. G J Olsder, <u>Mathematical System Theory</u> , Delftse Uitgevers Maatschappij			
	3. Andrew P Sage, <u>Methodology for Large Scale System</u> , McGraw Hill Book			
	4. Douglas V Hall, <u>Microprocessor and Interfacing, Programming and Hardware</u> , McGrawHill			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	System Engineering, Modelling Principles	<ul style="list-style-type: none"> • Conservation law, environmental consideration • Physical principles and laws : thermodynamic, electromagnetism, mechanics, and examples • Computer based controller • Economic and large scale modelling 		
2	Linear differential system and state space analysis	<ul style="list-style-type: none"> • Linearization, continous and discrete • State space modelling, impulse and step response • Solution in state space 		
3	Linear differential system and state space analysis	<ul style="list-style-type: none"> • System properties, stability • Lyapunov stability, interval stability, input-output stability • Controlability, observability 		
4	Computer, Microcomputer and Microprocessor	<ul style="list-style-type: none"> • Memory, cpu, adress bus, data bus, control bus, excecution sequence • Basic computer architectures • Low level (assembly) programming 		
5	Computer, Microcomputer and Microprocessor	<ul style="list-style-type: none"> • Low level (assembly) programming • Communication asynchronous and synchronous • Test case using AVR micro 		
6	Real time computer control	<ul style="list-style-type: none"> • Real time system, classification, definition, time constraint • Concepts of computer control ; batch, continous, general embeded system • Squential control, loop control, supervisory control, 		
7	Real time computer control	<ul style="list-style-type: none"> • Languages for real time application, operating system • Design of simple real time system 		
8	Relibility in Engineering System	<ul style="list-style-type: none"> • Empirical reliability measures • Reliability distribution, hazard function, poisson process, Gamma distribution, Weillbul • Simple application 		
9	Relibility in Engineering System	<ul style="list-style-type: none"> • Multi componen analysis : series, parallel, time dependent case • Standby redundancy • Test case in power system/power plant 		

10	Queing Theory and application	<ul style="list-style-type: none"> • Basic queing theory • Markov Chain, transition matrix • Application examples 		
11	Production cost and engineering economic	<ul style="list-style-type: none"> • Supply –demand analysis • Coub-Douglas production function • Utility maximization • Basic pricing, marginal utility, marginal cost, marginal revenue 		
12	Production cost and engineering economic	<ul style="list-style-type: none"> • Cost of money, present value, future value, annualize, leveled cost, • Economic analysis : NPV, Payback periods, IRR, Profitability index 		
13	Decision analysis	<ul style="list-style-type: none"> • Elementary decision analysis • Structure of decision analysis problem • Decision without prior information • Decision analysis under risk • Utility theory : assumption • Risk averse, risk neutral, risk prone behaviour 		
14	Optimization engineering	<ul style="list-style-type: none"> • Optimization : without /within constraint, lagrange • Linear programming, concept and duality • Application example 		
15	Optimization engineering	<ul style="list-style-type: none"> • Dynamic programming and application 		
16	Engineering design and implementation	<ul style="list-style-type: none"> • Consideration in engineering design • Cost reliability analysis • Benefit cost analysis • Sensitivity analysis 		

Kode Matakuliah: EP4075	Bobot sks: 3	Semester: 7/8	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Pilihan
Nama Matakuliah	Penggunaan Motor Listrik			
	Applications of Electrical Motors			
Silabus Ringkas	<p>Pendahuluan. Karakteristik beban mekanik. Pemodelan dan pengendalian mesin DC menggunakan penyearah kendali fasa dan chopper dengan riak minimum. Pemodelan mesin listrik salient dan non salient. Transformasi Park dq dan system kompleks (phasor ruang) menggunakan <i>power invariant and amplitude invariant</i>. Kendali skalar dan kendali vektor motor induksi. Vektor ruang pada mesin induksi. Kendali vektor motor sinkron motor sinkron magnet permanen (motor DC tanpa sikat).</p> <p>Introduction. Characteristic of mechanical load. Modelling and control of DC machines by phase control rectifier and chopper with minimum ripple. Modeling of non salient and salient electrical machines, Park dq transformation and complex system (space phasor) by using power invariant and amplitude invariant. Scalar control and vector control of induction motor. Space vector of induction machines. Vector control of synchronous motor and permanent magnet synchronous motor (brushless DC motor).</p>			
Silabus Lengkap				
Luaran (Outcomes)				
Matakuliah Terkait	Mesin-mesin Listrik	Pre-requisite		
	Sistem Kendali	Pre-requisite		
Kegiatan Penunjang				
Pustaka	<p>1. -----, A Tutorial in AC Induction and Permanent Magnet Synchronous Motors. Analog Devices 1994</p> <p>2. Yanuarsyah Haroen, Diktat : Analisis Peralihan pada Mesin Elektrik, 1998.</p>			
Panduan Penilaian				
Catatan Tambahan				

Mg#	Topik	Sub Topik	Capaian Belajar Mahasiswa	Sumber Materi
1	Pendahuluan.			
2	Karakteristik beban mekanik.			
3	Pemodelan dan pengendalian mesin DC menggunakan penyearah kendali fasa dan chopper dengan riak minimum.			
4	Pemodelan mesin listrik salient dan non salient.			
5	Transformasi Park dq dan system kompleks (phasor ruang) menggunakan <i>power invariant and amplitude invariant</i> .			
6	Kendali skalar dan kendali vektor motor induksi.			
7	Vektor ruang pada mesin induksi.			
8	Kendali vektor motor sinkron motor sinkron magnet permanen (motor DC tanpa sikat).			
9				
10				
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14				
15				

Kode Matakuliah:	Bobot sks:	Semester:	KK / Unit Penanggung Jawab:	Sifat:
Bidang Akademik dan Kemahasiswaan ITB		Kur2013-{TTL}		Halaman 32 dari 37
Template Dokumen ini adalah milik Direktorat Pendidikan - ITB Dokumen ini adalah milik Program Studi Teknik Tenaga Listrik ITB. Dilarang untuk me-reproduksi dokumen ini tanpa diketahui oleh Dirdik-ITB dan EP-ITB.				

EP4050	3	1/2	KK Teknik Ketenagalistrikan	Pilihan
Nama Matakuliah	Manajemen Proyek Sistem Kelistrikan			
	Project Management of Electricity System			
Silabus Ringkas	<p>Penerapan ilmu-ilmu manajemen proyek yang meliputi dasar perencanaan proyek, teknik optimasi perencanaan proyek, implementasi perencanaan proyek serta monitoring dan kontrol pelaksanaan proyek di proyek-proyek sistem kelistrikan yang meliputi proyek perencanaan dan konstruksi pembangkit, saluran transmisi dan distribusi.</p> <p>The application of project management which includes basic project planning, project planning optimization techniques, project planning implementation and monitoring and control of the implementation of projects in the electricity system projects that include project planning and construction of power plant, transmission and distribution.</p>			
Silabus Lengkap	<ul style="list-style-type: none"> • PENGERTIAN PROJEK : Karakteristik Dasar Proyek, Karakteristik Proyek di Sistem Kelistrikan, Pengertian umum Manajemen Proyek Sistem Kelistrikan. • PERENCANAAN PROJEK SISTEM KELISTRIKAN : <i>Network Planning, Critical Path Method</i>, Review dan Evaluasi Perencanaan Teknik, Analisis Resiko dalam Perencanaan Proyek, Faktor Probabilistik dalam Perencanaan Proyek. • OPTIMASI PERENCANAAN PROJEK SISTEM KELISTRIKAN : Metode-metode dalam Perencanaan Proyek yang Optimal (<i>Work Breakdown Structure/WBS, Organization Analysis Table/OAT, Kombinasi teknik WBS dan OAT, Milestone, Subnetworks</i>), Prosedur Perencanaan Proyek, Teknik Pengalokasian Sumber Daya, Keekonomian Perencanaan Proyek (Penentuan durasi proyek yang paling ekonomis, proyeksi aliran kas dalam perencanaan proyek, penganggaran proyek, prosedur optimasi perencanaan proyek) • IMPLEMENTASI PERENCANAAN, MONITORING DAN KONTROL PROJEK : Mekanisme Umpan Balik dan Kontrol Jadwal Proyek, Kontrol Performansi Proyek, Kontrol Finansial Proyek, Klaim dalam Pelaksanaan Proyek, Pengorganisasian Proyek <ul style="list-style-type: none"> • DEFENITION OF THE PROJECT: Characteristics of Project, Project Characteristics in the Electrical System, General Understanding of Project Management in the Electrical Systems. • PROJECT PLANNING IN ELECTRICAL SYSTEM: Network Planning, Critical Path Method, Program Evaluation and Review Technique, Risk Analysis in Project Planning, Probabilistic in Project Planning. • PLANNING OPTIMIZATION IN ELECTRICAL SYSTEM PROJECT: Methods in Optimal Planning Project (Work Breakdown Structure / WBS, Organization Analysis Table / OAT, Combination of WBS and OAT, Milestone, Subnetworks), Project Planning Procedures, Resource Allocation Techniques, Economics of project planning (Determination of the duration of the most economical project, cash flow forecasting in project planning, project budgeting, project planning optimization procedure). • PLAN IMPLEMENTATION, MONITORING AND CONTROL OF THE PROJECT : Feedback Mechanisms and Control of Project Schedules, Project Performance Control, Control of Project Financial, Claims in Project Implementation, Organizing Project 			
Luaran (Outcomes)	<ul style="list-style-type: none"> • Mahasiswa memiliki pemahaman yang baik tentang ilmu manajemen proyek yang meliputi pemahaman karakteristik proyek, perencanaan proyek, perencanaan proyek yang optimal, implementasi, monitoring dan kontrol proyek. • Mahasiswa memiliki kemampuan membuat perencanaan proyek sistem kelistrikan menggunakan ilmu manajemen proyek, • Mahasiswa mengetahui dan memahami teknik implementasi, monitoring dan kontrol pelaksanaan proyek sistem kelistrikan 			
Matakuliah Terkait	-	-	-	-
Kegiatan Penunjang	-			
Pustaka	<p>Hira N Ahuja, <i>Project Management</i>, John Wiley and Sons [Pustaka Utama]</p> <p>Albert Lester, <i>Project Management, Planning and Control</i>, Fifth Edition, Elsevier Science and Technology Book, 2006 [Penunjang]</p>			
Panduan Penilaian	<ul style="list-style-type: none"> • Penilaian didapatkan dari : <ul style="list-style-type: none"> o Nilai Tugas (T) o Nilai Quiz (Q) o Ujian Tengah Semester (UTS) 			

	<ul style="list-style-type: none"> ○ Ujia Akhir Semester (UAS) • Nilai akhir dihitung berdasarkan rumus : $\text{Nilai Akhir} = \frac{T + Q + UTS + 2 \cdot UAS}{5}$ • Pemberian nilai mutu mempertimbangkan pencapaian rata-rata nilai akhir mahasiswa
<i>Catatan Tambahan</i>	

<i>Mg#</i>	<i>Topik</i>	<i>Sub Topik</i>	<i>Capaian Belajar Mahasiswa</i>	<i>Sumber Materi</i>
1	Pengertian Projek	Karakteristik Dasar Projek, Karakteristik Projek di Sistem Kelistrikan,		Hira N Ahuja, <i>Project Management</i> , John Wiley and Sons
2	Pengertian Projek	Pengertian Umum Manajemen Projek Sistem Kelistrikan		
3	Perencanaan Projek Sistem Kelistrikan	Network Planning Critical Path Method		
4	Perencanaan Projek Sistem Kelistrikan	Review dan Evaluasi Perencanaan Teknik Analisis Resiko dalam Perencanaan Projek		
5	Perencanaan Projek Sistem Kelistrikan	Faktor Probabilistik dalam Perencanaan Projek (QUIZ 1)		
6	Optimasi Perencanaan Projek Sistem Kelistrikan	WBS/Work Breakdown Structure, OAT/Organisation Analysis Table Kombinas WBS - OAT		
7	Optimasi Perencanaan Projek Sistem Kelistrikan	Milestone Subnetworks Prosedur Perencanaan Projek		
8	<i>Ujian Tengah Semester</i>			
9	Optimasi Perencanaan Projek Sistem Kelistrikan	Teknik Pengalokasian Sumber Daya		Hira N Ahuja, <i>Project Management</i> , John Wiley and Sons
10	Optimasi Perencanaan Projek Sistem Kelistrikan	Penentuan durasi projek yang paling ekonomis, Proyeksi aliran kas dalam perencanaan projek,		
11	Optimasi Perencanaan Projek Sistem Kelistrikan	Penganggaran Projek, Prosedur optimasi perencanaan projek (QUIZ 2)		
12	Implementasi Perencanaan, Monitoring dan Kontrol	Mekanisme umpan balik dan kontrol jadwal projek		
13	Implementasi Perencanaan, Monitoring dan Kontrol	Kontrol Performansi Projek		
14	Implementasi Perencanaan, Monitoring dan Kontrol	Kontrol finansial projek		
15	Implementasi Perencanaan, Monitoring dan Kontrol	Klaim dalam pelaksanaan projek, pengorganisasi projek (TUGAS)		
16	<i>Ujian Akhir Semester</i>			

Kode Matakuliah: EP4079	Bobot sks: 3	Semester: 7/8	KK / Unit Penanggung Jawab: KK Teknik Ketenagalistrikan	Sifat: Pilihan
Nama Mata Kuliah	Proteksi Rele			
	Protection Relay			
Silabus Ringkas	Sistem proteksi, rele dan sistem rele, perhitungan hubung singkat, proteksi arus lebih, proteksi jarak, proteksi differensial, komponen simetris, gangguan tidak seimbang, scada, instrumentasi ukur, wide area protection, proteksi adaptif, pembumian			
	System protection, relays and relay systems, short circuit calculation, over current protection, distance protection ,differential protection, symmetrical components, unbalanced faults, scada, instrumentation and measurement, wide area protection, adaptive protection, earthing systems.			
Sylabus lengkap	Sistem proteksi, rele dan sistem rele, perhitungan hubung singkat, proteksi arus lebih, proteksi jarak, proteksi differensial, komponen simetris, gangguan tidak seimbang, scada, instrumentasi ukur, wide area protection, proteksi adaptif, pembumian. Proteksi Cyber komunikasi sistem tenaga, proteksi cyber sistem scada, penggunaan peralatan peralatan baru dibidang proteksi. Kuliah termasuk contoh contoh berbagai masalah operasional seperti overload dan voltage colapse pada jaringan interkonekdi. Pekerjaan rumah diberikan dengan maksud agar mahasiswa dapat melakukan identifikasi model yang tepat dan teknik perhitungan dalam menyelesaikan permasalahan gangguan di sistem tenaga.			
	System protection, relays and relay systems, short circuit calculation, over current protection, distance protection ,differential protection, symmetrical components, unbalanced faults, scada, instrumentation and measurement, wide area protection, adaptive protection, earthing systems. Cyber vulnerability of a power substation communication, substation SCADA system, application of existing knowledge and technology to make system safer.The class includes various examples of power system operational problems such as system overload and voltage collapse in interconnected system. Homework problems require the students to identify the proper models and calculation techniques for power system problems.			
Tujuan instruksional umum	Pada akhir kuliah , diharapkan mahasiswa akan mampu:			
	<ol style="list-style-type: none"> 1. Memahami dasar dasar konstruksi dan peralatan proteksi sitem tenaga listrik. 2. Mampu memecahkan persoalan peroalan terkait dengan proteksi sistem tenaga. 3. Mampu melakukan perhitungan perhitungan arus hubung singkat dalam sisem tenaga. 			
	At the end of the course, the students should be able to			
	<ol style="list-style-type: none"> 1. Understand basic structure and apparatus electrical power system protection 2. Solve electrical power system protection problems 4. Calculate sort circuit current. 			
Outcome Coverage	<ol style="list-style-type: none"> 1. <i>Penggunaan maematika sains dan teknologi.</i> Model matematik dari komponen terintegrasi dalam sitem . Mahasiswa dilatih untuk menggunakan teknik analisa rangkaian untuk menghitung arus tegangan dan daya yang mengalir dalam sistem tenaga. 2. <i>Disain sistem proteksi.</i> Mahasiswa mempelajari karakteristik peralatan proteksi dan mampu melakukan koordinai dan seting peralatan secara teori dalam sistem. 3. <i>Identifikasi, rumus dan solusi masalah masalah keteknikan.</i> . Termasuk berbagai contoh permasalahan operasi sistem tenaga listrik seperti over load feeder dan tegangan lebih. 4. <i>Penggunaan perangkat lunak.</i> Mahasiswa menggunakan state-of-the-art perangkat lunak perhitungan arus hubung singkat , aliran daya . 			
Mata kuliah terkait	Proteksi Sistem Tenaga Prerequisite Analisis Sistem Tenaga Prerequisite			
Pustaka	<ol style="list-style-type: none"> 1. Analysis of Faulted power systems .Paul Anderson 2. Electrical Instalation Hand Book . Gunter G.Seip 3. J. L. Blackburn, Protective Relaying, principles and application, Marcel Dekker, Inc., 1998 			

Mg#	Topik	Sub Topik	Tujuan Instruksional	Pustaka yang relevan
1	Pengantar	Pengertian Sistem Proteksi	Setelah mengikuti kuliah ini mahasiswa memahami tujuan dan silabus kuliah. Mampu menjelaskan maksud penggunaan sistem proteksi, pengertian <u>Availability</u> , <u>Reliability</u> , <u>Safety</u> , <u>Integrity</u> , <u>Maintainability</u> . Mengenal dan dapat menghitung nilai reliability sistem berdasarkan reliability komponen.	Wikipedia, protective relays C.W arrington
2	Sumber sumber gangguan listrik	Gangguan pasif, gangguan aktif, tembus isolasi, gangguan arus lebih. Pengertian instalasi Hazard Area.	Mengenal jenis jenis gangguan pada sistem tenaga listrik dan penyebabnya. Mengenal kategori ruangan sesuai dengan ketentuan IEC dan PUIL 2000. Instalasi pada explosion area.	C.W arrington
3	Parameter jaringan dan komponen Sistem	Impedansi Sistem Tenaga listrik.	Mengenal Impedansi saluran transmisi, impedansi dalam perunit sistem dan dalam ohm, impedansi sub sinkron, hubungan resistansi dan reaktansi peralatan berdasarkan VDE	Electrical Instalation Hand Book Gunter.G.Seip Siemens.
4	Parameter jaringan dan komponen Sistem	Perhitungan arus hubung singkat berdasarkan VDE	Dapat menghitung besar arus hubung singkat saluran ditribusi berdasarkan petunjuk VDE 0102. Dapat memilih dan menentukan koordinai proteksi arus lebih, koordinasi pemutus daya dan pemutus daya lain atau dengan sekering.	VDE
5	Koordinasi proteksi arus lebih.	Karakteristik saluran transmisi, saluran transmisi radial, ring, interkoneksi.	Mengenal karakteristik hubung singkat sistem tenaga dan komponen simetris. Infeed current dari generator sinkron, motor sinkron, motor induksi dan power kapasitor.	Electrical Instalation Hand Book Gunter.G.Seip Siemens.
6	Koordinasi proteksi arus lebih.	Aplikasi teori komponen simetris	Perhitungan arus hubung singkat dengan metoda ohm, metoda perunit, metoda point to point, menggunakan perangkat lunak.	IEC publication
7	Proteksi saluran transmisi	Jenis dan karakteristik sistem proteksi	Proteksi arus lebih, proteksi rele impedansi, rele arah dan rele pilot, pengaruh impedansi gangguan.	Protective relays and their theory and practice. C. Warrington
8	UTS		Ujian Tengah Smestert	
8	Proteksi saluran transmisi	Jenis dan karakteristik sistem proteksi	Proteksi rele arah, zona proteksi. Pilot cable differential, pengenalan rele digital dan rele adaptiv.	Protective relays and their theory and practice. C. Warrington
9	Proteksi busbar	Jenis dan karakteristik sistem proteksi	Single busbar, double busbar, satu setengah pemutus daya, ring busbar, proteksi arus lebih, proteksi differential	Protective relays and their theory and practice. C. Warrington
10	Proteksi busbar	Jenis dan karakteristik sistem proteksi	Zona proteksi busbar, type proteksi, proteksi daya balik, koordinasi proteksi busbar.	Protective relays and their theory and practice. C. Warrington
12	Proteksi generator	Jenis dan karakteristik sistem proteksi	Pembumian generator Karakteristik pembebanan generator	Protective relays and their theory and practice. C. Warrington
13	Proteksi generator	Jenis dan karakteristik sistem proteksi	Gangguan rotor dan gangguan stator, proteksi beban lebih, proteksi daya balik generator. Proteksi daya tidak seimbang, proteksi kehilangan eksitasi, proteksi generator paralel.	Protective relays and their theory and practice. C. Warrington
14	Scada	Arsitektur SCADA	<u>real-time control</u> , <u>real time</u> , <u>automated control system</u> . Scada <u>Industrial processes</u> , <u>manufacturing</u> , <u>production</u> , <u>power generation</u> , <u>fabrication</u> . Power system scada.	Scada ids GmbH

15	WAPS	Wide Area Proteksion System	Tugas clipping dan diskusi	internet
16	UAS		Ujian akhir smester	

Catatan:

Silabus dan SAP matakuliah EP5xyz tidak dicantumkan di Lampiran I ini karena merupakan matakuliah program Magister Teknik Elektro Opsi Teknik Tenaga Elektrik