

**MEKANISME ASESMEN LUARAN PROGRAM
PROGRAM STUDI SARJANA
TEKNIK TENAGA LISTRIK**

**SEKOLAH TEKNIK ELEKTRO DAN INFORMATIKA
INSTITUT TEKNOLOGI BANDUNG
AGUSTUS 2018**

Lembar Pengesahan

Laporan Mekanisme Asesmen Program Studi Sarjana Teknik Tenaga Listrik ini disusun sebagai referensi dari analisis Capaian Pembelajaran di lingkungan Program Studi Sarjana Teknik Tenaga Listrik.

Disusun oleh Tim Gugus Kendali Mutu 2018

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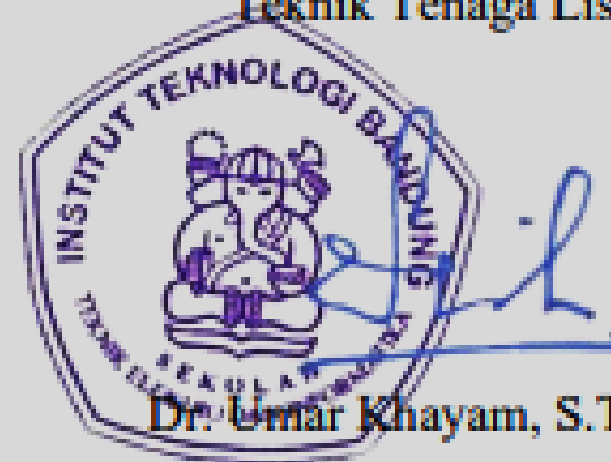
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Gugus Kendali Mutu
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Dr. Eng Arwindra Rizqiawan, S.T., M.T.

Mengetahui,
Ketua Program Studi Sarjana
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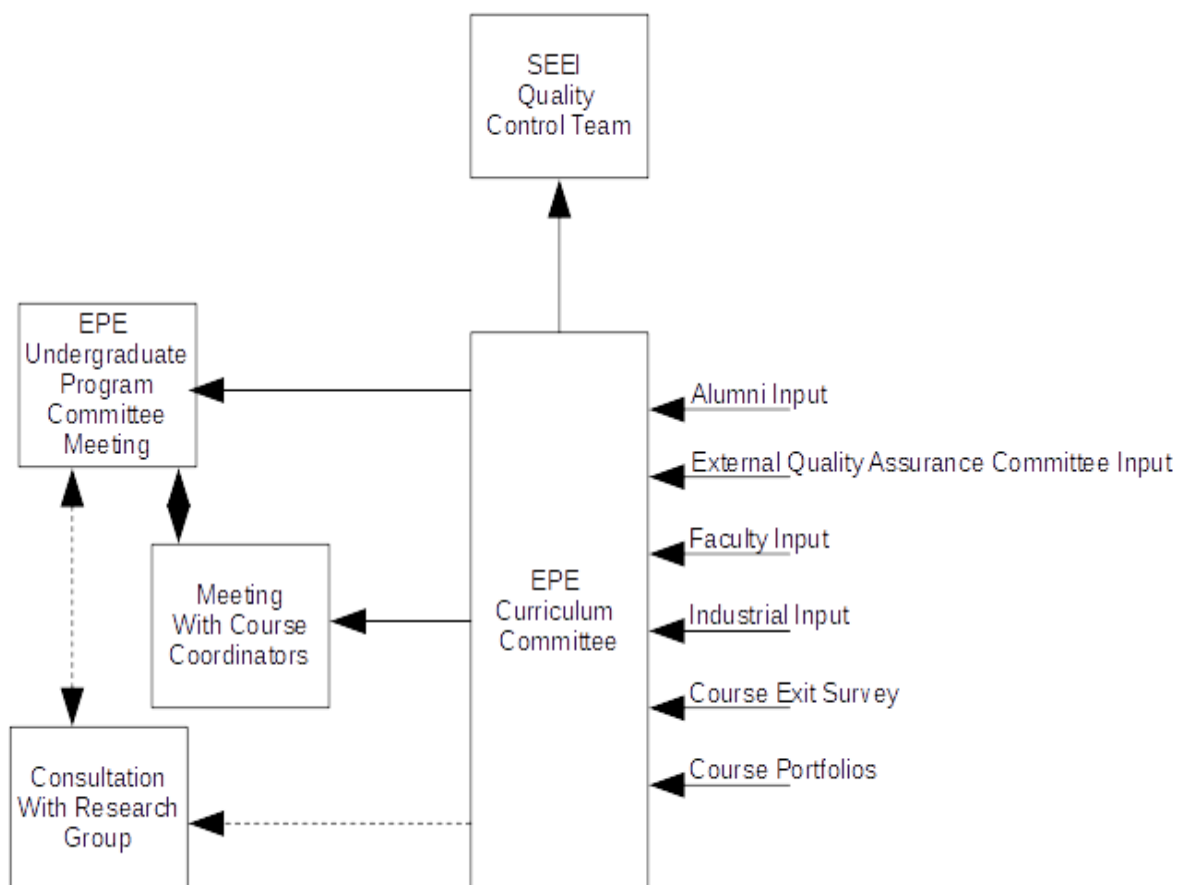
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B. Pendahuluan

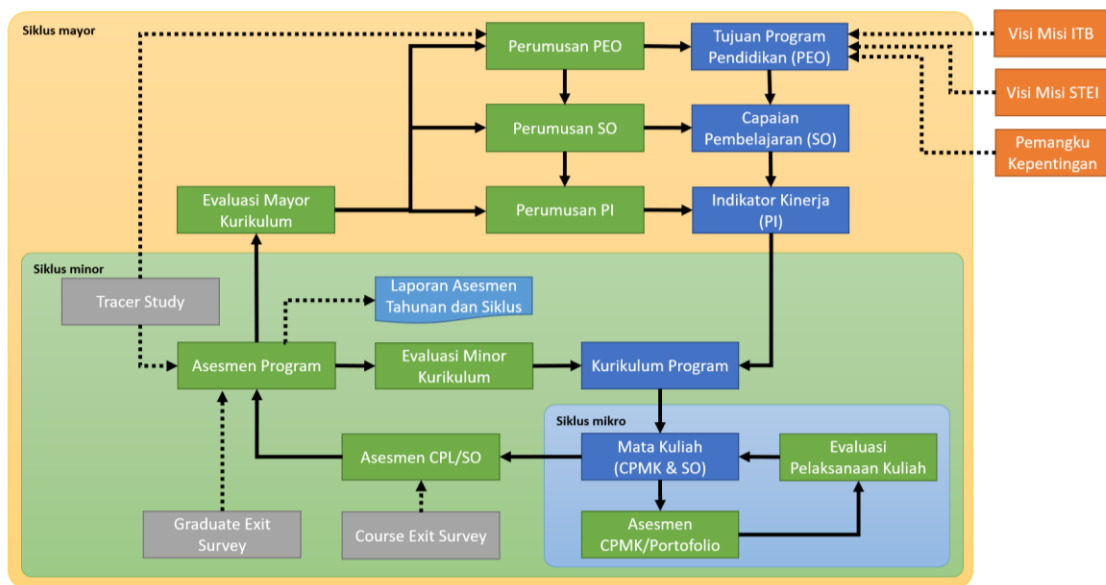
Struktur organisasi program studi pada proses pengambilan keputusan untuk kepentingan kurikulum program studi ditunjukkan pada Gambar 1 di bawah ini.

Seluruh input masuk ke dalam Komisi Kurikulum Teknik Tenaga Listrik (TTL) terlebih dahulu sebelum diteruskan ke pertemuan Tim Program Studi Teknik Tenaga Listrik, atau pada kasus – kasus tertentu melewati juga pertemuan dengan koordinator mata kuliah. Prodi TTL kemudian menyampaikan keputusan – keputusan tersebut kepada Kelompok Keahlian (KK) sebagai badan pemilik sumber daya dosen. Tim kurikulum Prodi TTL kemudian menyampaikan laporan hasil pengembangan berkelanjutan dalam proses edukasi ke unit Gugus Kendali Mutu (GKM) STEI.



Gambar 1. Struktur Organisasi Level Program Studi

C. Siklus *Plan-Do-Check-Action* (PDCA)



Gambar 2. Siklus *Plan-Do-Check-Action* (PDCA) Program Studi Teknik Tenaga Listrik

Gambar di atas menunjukkan siklus *Plan-Do-Check-Action* (PDCA) Program Studi Teknik Tenaga Listrik. Siklus tersebut terdiri dari beberapa sub-siklus antara lain siklus mikro, siklus minor, dan siklus mayor. Pada siklus mikro, terdapat pengukuran dan evaluasi antara Capaian Pembelajaran Mata Kuliah (CPMK) dan Capaian Pembelajaran Lulusan/*Student Outcome* (SO). Pada setiap siklus mikro yang dijadwalkan setiap tahun, akan ada pelaporan dalam bentuk Laporan Asesmen Tahunan. Siklus minor merupakan evaluasi beberapa siklus mikro pada satu siklus. Pada setiap siklus minor yang dijadwalkan setiap dua tahun sekali, akan ada pelaporan dalam bentuk Laporan Siklus. Setiap Laporan Siklus akan ditampilkan hasil evaluasi pada siklus sebelumnya dan rencana Program Studi Teknik Tenaga Listrik pada siklus berikutnya. Siklus mayor merupakan evaluasi beberapa siklus minor. Pada setiap siklus mayor yang dijadwalkan setiap lima tahun sekali, akan ada evaluasi PEO atau Profil Profesional Mandiri dan SO.

D. Profil Profesional Mandiri (*Profile of Autonomous Professionals*)

Profil Profesional Mandiri adalah pernyataan luas yang menggambarkan apa yang diharapkan lulusan dalam beberapa tahun kelulusan. Profil Profesional Mandiri didasarkan pada kebutuhan dari konstituen program.

Profil Profesional Mandiri Program Studi Sarjana Teknik Tenaga Listrik adalah:

1. Keberhasilan karir profesional di bidang rekayasa terutama bidang teknik tenaga listrik (*Our graduates will have successful careers in his/her profession, especially in the field of electrical power engineering*).
2. Keberhasilan menyelesaikan studi lanjut atau pengembangan diri secara profesional (*Our graduates will pursue higher education or professional development*).
3. Kemampuan kepemimpinan aktif dan menjadi pelopor di komunitasnya (*Our graduates will have active leadership and become pioneer for serving his/her community*).

E. Capaian Pembelajaran (*Learning Outcomes*)

Dari Profil Profesional Mandiri, Prodi TTL memilih 7 (tujuh) Capaian Pembelajaran mahasiswa yang mengacu pada akreditasi IABEE sejak tahun 2018 untuk mulai dilakukan pengukuran pada tahun 2019. Capaian Pembelajaran ini merupakan penyederhaan dari 11 capaian pembelajaran ABET sebelumnya, yang ditunjukkan pada Tabel 1.

Tabel 1. Capaian Pembelajaran Mahasiswa Prodi TTL

No.	Capaian Pembelajaran (Sebelum 2018)	No.	Capaian Pembelajaran (Setelah 2018)
a.	<i>An ability to apply knowledge of mathematics, science, and engineering</i>		
e.	<i>An ability to identify, formulate, and solve engineering problems</i>	1.	<i>An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</i> (Kemampuan untuk mengidentifikasi, merumuskan, dan memecahkan masalah-masalah rekayasa yang kompleks dengan mengaplikasikan prinsip-prinsip rekayasa, sains, dan matematika.)
c.	<i>An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</i>	2.	<i>An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</i> (Kemampuan mengaplikasikan desain rekayasa untuk menghasilkan solusi yang memenuhi kebutuhan-kebutuhan tertentu dengan pertimbangan faktor kesehatan, keselamatan, dan kesejahteraan masyarakat, serta faktor global, budaya, sosial, lingkungan, dan ekonomi.)
g.	<i>An ability to communicate effectively</i>	3.	<i>An ability to communicate effectively with a range of audiences.</i> (Kemampuan untuk berkomunikasi secara efektif pada berbagai macam situasi.)

No.	Capaian Pembelajaran (Sebelum 2018)	No.	Capaian Pembelajaran (Setelah 2018)
f.	<i>An understanding of professional and ethical responsibility</i>	4.	<i>An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (Kemampuan untuk mengenali tanggung jawab etika dan keprofesian pada situasi kerekayasaan dan melakukan penilaian berdasarkan informasi yang tersedia, yang harus mempertimbangkan dampak solusi kerekayasaan dalam konteks global, ekonomi, lingkungan, dan sosial.)</i>
h.	<i>The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</i>		
j.	<i>A knowledge of contemporary issues</i>		
d.	<i>An ability to function on multi-disciplinary teams</i>	5.	<i>An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goal, plan tasks, and meet objectives. (Kemampuan untuk berperan secara efektif pada tim yang anggotanya bersama-sama menerapkan nilai kepemimpinan, menciptakan lingkungan yang kolaboratif dan inklusif, menetapkan tujuan, merencanakan tugas, dan mencapai tujuan.)</i>
b.	<i>An ability to design and conduct experiments, as well as to analyse and interpret data</i>	6.	<i>An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions. (Kemampuan untuk mengembangkan dan melakukan eksperimen yang sesuai, menganalisis dan menafsirkan data, dan menggunakan penilaian berdasarkan kerekayasaan untuk menarik kesimpulan.)</i>
k.	<i>An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</i>		

No.	Capaian Pembelajaran (Sebelum 2018)	No.	Capaian Pembelajaran (Setelah 2018)
i.	A recognition of the need for, and an ability to engage in life-long learning	7.	<i>An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.</i> (Kemampuan untuk memperoleh dan menerapkan pengetahuan baru sesuai kebutuhan dengan menggunakan strategi pembelajaran yang tepat.)

F. Keterkaitan Profil Profesional Mandiri dan Capaian Pembelajaran

Adapun pemetaan antara Profil Profesional Mandiri dan Capaian Pembelajaran ditunjukkan pada Tabel 2.

Tabel 2. Pemetaan Profil Profesional Mandiri dan Capaian Pembelajaran

No	Capaian Pembelajaran	Profil Profesional Mandiri		
		1	2	3
1	Kemampuan untuk mengidentifikasi, merumuskan, dan memecahkan masalah-masalah rekayasa yang kompleks dengan mengaplikasikan prinsip-prinsip rekayasa, sains, dan matematika.	X	X	X
2	Kemampuan untuk mengaplikasikan desain rekayasa untuk menghasilkan solusi yang memenuhi kebutuhan-kebutuhan tertentu dengan pertimbangan faktor kesehatan, keselamatan, dan kesejahteraan masyarakat,	X	X	-

No	Capaian Pembelajaran	Profil Profesional Mandiri		
		1	2	3
	serta faktor global, budaya, sosial, lingkungan, dan ekonomi.			
3	Kemampuan untuk berkomunikasi secara efektif pada berbagai macam situasi.	X	X	X
4	Kemampuan untuk mengenali tanggung jawab etika dan keprofesian pada situasi kerekayasaan dan melakukan penilaian berdasarkan informasi yang tersedia, yang harus mempertimbangkan dampak solusi kerekayasaan dalam konteks global, ekonomi, lingkungan, dan sosial.	X	X	X
5	Kemampuan untuk berperan secara efektif pada tim yang anggotanya bersama-sama menerapkan nilai kepemimpinan, menciptakan lingkungan yang kolaboratif dan inklusif, menetapkan tujuan, merencanakan tugas, dan mencapai tujuan.	X	X	X
6	Kemampuan untuk mengembangkan dan melakukan eksperimen yang sesuai, menganalisis dan menafsirkan data, dan menggunakan penilaian berdasarkan kerekayasaan untuk menarik kesimpulan.	X	X	-
7	Kemampuan untuk memperoleh dan menerapkan pengetahuan baru sesuai kebutuhan dengan menggunakan strategi pembelajaran yang tepat.	X	X	X

G. Indikator Kinerja (*Performance Indicators*) pada Setiap Capaian Pembelajaran (*Learning Outcomes*)

Masing – masing dari Capaian Pembelajaran tersebut memiliki beberapa turunan yang disebut dengan Indikator Kinerja atau *Performance Indicator* (PI), yang ditunjukkan pada Tabel 3 berikut ini.

Tabel 3. Indikator Kinerja pada Setiap Capaian Pembelajaran

Capaian Pembelajaran (<i>Learning Outcomes</i>)		Indikator Kinerja (<i>Performance Indicators</i>)
1	<i>An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</i>	<i>1a Understanding the fundamental concept of mathematics and science</i>
		<i>1b Ability to formulate the engineering strategies for solving the problems and provide the proper solutions</i>

Capaian Pembelajaran (Learning Outcomes)		Indikator Kinerja (Performance Indicators)	
		1c	Ability to identify the problem objectives and provide correct mathematical models with design constraints
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	2a	Ability to identify design objectives and constraints
		2b	Ability to implement final design to realize system component or process
3	An ability to communicate effectively with a range of audiences	3a	Students must demonstrate the ability in written communication
		3b	Student must demonstrate the ability in oral communication
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	4a	Behaving professionally with regards to attendance, assignments, and relationship among peers
		4b	Student must be able to identify current trends and development in engineering, science, and technology
		4c	Recognizing of the impact of engineering technologies on societies
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	5a	Have contribution to the work of the team
		5b	Communicates with team members
		5c	Ability to establish plan tasks to achieve goals and objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions	6a	Ability to design and conduct experiments
		6b	Ability to gather information or data
		6c	Ability to interpret and analyze data to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	7a	Students must recognize ways in which information is gathered and learned including electronic, printed, web based platforms

Capaian Pembelajaran (<i>Learning Outcomes</i>)	Indikator Kinerja (<i>Performance Indicators</i>)
	7b <i>Independent learning of an engineering concept or mastery of other skills</i>

H. Rubrik Asesmen Indikator Kinerja & Capaian Pembelajaran

Capaian Pembelajaran diukur melalui rubrik mata kuliah untuk pengukuran langsung dan survei akhir studi untuk pengukuran tidak langsung. Pengukuran melalui rubrik mata kuliah dilakukan di setiap akhir semester berdasarkan penjadwalan asesmen per mata kuliah yang telah disusun sebelumnya, sedangkan survei akhir studi dilakukan setiap tahun. Survei akhir studi tidak mengukur langsung Capaian Pembelajaran, namun masukan dari lulusan dapat dijadikan umpan balik untuk pengembangan berkelanjutan.

Dalam proses asesmen mata kuliah menggunakan rubrik, diberikan 4 (empat) tingkatan capaian untuk setiap Indikator Kinerja sebagai berikut.

1. *Unsatisfactory* (Tidak Memuaskan).

Kategori ini diberikan kepada mahasiswa yang dianggap tidak dapat mencapai luaran yang ditargetkan. Bobot yang diberikan pada kategori sebesar '1' poin.

2. *Developing* (Cukup).

Kategori ini diberikan kepada mahasiswa yang dianggap mencapai luaran yang ditargetkan pada level minimum-nya. Bobot yang diberikan pada kategori ini sebesar '2' poin.

3. *Satisfactory* (Memuaskan).

Kategori ini diberikan kepada mahasiswa yang mencapai level memuaskan dari suatu capaian pembelajaran. Bobot yang diberikan pada kategori ini sebesar '3' poin.

4. *Exemplary* (Sangat Memuaskan).

Kategori ini diberikan kepada mahasiswa yang menunjukkan pencapaian yang sangat memuaskan dari suatu capaian pembelajaran. Bobot yang diberikan pada kategori ini sebesar '4' poin.

Rubrik asesmen untuk setiap Indikator Kinerja dan Capaian Pembelajaran ditunjukkan pada Tabel 4. Batas keberhasilan tercapainya Capaian Pembelajaran ditetapkan adalah sebesar 75% dari populasi mencapai kategori *satisfactory* (cukup) dan *exemplary* (baik).

Tabel 4. Rubrik Asesmen untuk Setiap Indikator Kinerja (PI) dan Capaian Pembelajaran

Learning Outcomes	1.	<i>An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</i>
PI	1a.	<i>Understanding the fundamental concept of mathematics and science</i>

	<i>Assessment Level</i>	<i>Unsatisfactory</i>	<i>Student fails to show good understanding of fundamental concepts and their relations to mathematical and science properties</i>
		<i>Developing</i>	<i>Student is able to show good understanding of fundamental concepts, but fails to understand their relations to mathematical and science properties</i>
		<i>Satisfactory</i>	<i>Student is able to show good understanding of fundamental concepts, but cannot fully comprehend their relations to mathematical and science properties</i>
		<i>Exemplary</i>	<i>Student is able to show good understanding of fundamental concepts and their relations to mathematical and science properties</i>
	PI	1b.	<i>Ability to formulate the engineering strategies for solving the problems and provide the proper solutions</i>
	<i>Assessment Level</i>	<i>Unsatisfactory</i>	<i>Student fails to show proper engineering workflow and fails to provide correct solutions</i>
		<i>Developing</i>	<i>Student shows less proper engineering workflow and fails to provide correct solutions</i>
		<i>Satisfactory</i>	<i>Student is able to show proper engineering workflow, but fails to provide correct solutions</i>
		<i>Exemplary</i>	<i>Student is able to provide the solutions of the problems correctly by showing proper engineering workflow</i>
	PI	1c.	<i>Ability to identify the problem objectives and provide correct mathematical models with design constraints</i>
	<i>Assessment Level</i>	<i>Unsatisfactory</i>	<i>Student fulfills none of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints</i>
		<i>Developing</i>	<i>Student is able to fulfill 1 of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints</i>
		<i>Satisfactory</i>	<i>Student is able to fulfill 2 of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints</i>
		<i>Exemplary</i>	<i>Student is able to fulfill all of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints</i>

Student Outcomes	2.	<i>An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors</i>
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	PI	2a.	<i>Ability to identify design objectives and constraints</i>	
	Assessment Level	Unsatisfactory	<i>Student fails to identify design objectives and constraints</i>	
		Developing	<i>Student is able to identify both design objectives and constraints partially</i>	
		Satisfactory	<i>Student is able to identify design objectives, but partially identify design constraints</i>	
		Exemplary	<i>Student is able to identify design objectives and constraints</i>	
	PI	2b.	<i>Ability to implement final design to realize system component or process</i>	
	Assessment Level	Unsatisfactory	<i>Student fails to implement final design and provide realistic result</i>	
		Developing	<i>Student is able to implement final design but provide unrealistic result</i>	
		Satisfactory	<i>Student is able to implement final design but provide partially realistic result</i>	
		Exemplary	<i>Student is able to implement final design and provide realistic result</i>	

Student Outcomes	3.	<i>An ability to communicate effectively with a range of audiences</i>		
	PI	3a.	<i>Students must demonstrate the ability in written communication</i>	
	Assessment Level	Unsatisfactory	<i>Student makes the lab report by fulfilling 1 or none of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.</i>	
		Developing	<i>Student makes the lab report by fulfilling 2 of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.</i>	
		Satisfactory	<i>Student makes the lab report by fulfilling 3 of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.</i>	
		Exemplary	<i>Student makes the lab report by fulfilling all of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.</i>	
	PI	3b.	<i>Student must demonstrate the ability in oral communication</i>	
	Assessment Level	Unsatisfactory	<i>Student fails to present his/her final project by not performing these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.</i>	
		Developing	<i>Student present his/her final project by fulfilling 1 of these factors: describe general idea systematically, use</i>	

			<i>the allocated time properly, and use appropriate language and gestures.</i>
		<i>Satisfactory</i>	<i>Student present his/her final project by fulfilling 2 of these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.</i>
		<i>Exemplary</i>	<i>Student present his/her final project by fulfilling all of these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.</i>

Student Outcomes	4.	<i>An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts</i>	
	PI	4a.	<i>Behaving professionally with regards to attendance, assignments, and relationship among peers</i>
	Assessment Level	Unsatisfactory	<i>Student fails to behave professionally according to rules regarding attendance or assignments and relationship among peers</i>
		Developing	<i>Student fails to behave professionally according to rules regarding attendance or assignments, but shows good relationship among peers</i>
		Satisfactory	<i>Student is able to behave professionally according to rules regarding attendance or assignments, but fails to show good relationship among peers</i>
		Exemplary	<i>Student is able to behave professionally according to rules regarding attendance or assignments and show good relationship among peers</i>
	PI	4b.	<i>Student must be able to identify current trends and development in engineering, science, and technology</i>
	Assessment Level	Unsatisfactory	<i>Student fulfills none of these factors: identify current trends and development, provide example, and provide future opportunities in engineering, science, and technology</i>
		Developing	<i>Student is able to fulfill 1 of these factors: identify current trends and development, provide example, and provide future opportunities in engineering, science, and technology</i>
		Satisfactory	<i>Student is able to fulfill 2 of these factors: identify current trends and development, provide example, and provide future opportunities in engineering, science, and technology</i>
		Exemplary	<i>Student is able to fulfill all of these factors: identify current trends and development, provide example, and</i>

			<i>provide future opportunities in engineering, science, and technology</i>
	PI	4c.	<i>Recognizing of the impact of engineering technologies on societies</i>
	Assessment Level	Unsatisfactory	<i>Student is able to recognize the impact of engineering technologies on societies toward none of these factors: economy, environment, and social condition</i>
		Developing	<i>Student is able to recognize the impact of engineering technologies on societies toward 1 of these factors: economy, environment, and social condition</i>
		Satisfactory	<i>Student is able to recognize the impact of engineering technologies on societies toward 2 of these factors: economy, environment, and social condition</i>
		Exemplary	<i>Student is able to recognize the impact of engineering technologies on societies toward all of these factors: economy, environment, and social condition</i>

Student Outcomes	5.	<i>An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goal, plan tasks, and meet objectives</i>	
	PI	5a.	<i>Have contribution to the work of the team</i>
	Assessment Level	Unsatisfactory	<i>Student fails to contribute to the work of team actively, provide significant contribution, and to give ideas or solve the problems</i>
		Developing	<i>Student is able to contribute to the work of team actively, but fails to provide significant contribution, and to give ideas or solve the problems</i>
		Satisfactory	<i>Student is able to contribute to the work of team actively, provide significant contribution, but fails to give ideas or solve the problems</i>
		Exemplary	<i>Student is able to contribute to the work of team actively, provide significant contribution, and give ideas or solve the problems</i>
	PI	5b.	<i>Communicates with team members</i>
	Assessment Level	Unsatisfactory	<i>Student fails to communicate with team members actively and effectively, as well as appreciate other's opinions</i>
		Developing	<i>Student fails to communicate with team members actively and effectively, but shows appreciation to other's opinions</i>
		Satisfactory	<i>Student is able to communicate with team members actively and effectively, but fails to appreciate other's opinions</i>
		Exemplary	<i>Student is able to communicate with team members actively and effectively as well as appreciate other's opinions</i>

	PI	5c.	<i>Ability to establish plan tasks to achieve goals and objectives</i>
	Assessment Level	Unsatisfactory	<i>Student is able to perform good understanding to none of these factors: work objectives, procedure, and timeline</i>
		Developing	<i>Student is able to perform good understanding to 1 of these factors: work objectives, procedure, and timeline</i>
		Satisfactory	<i>Student is able to perform good understanding to 2 of these factors: work objectives, procedure, and timeline</i>
		Exemplary	<i>Student is able to perform good understanding to all of these factors: work objectives, procedure, and timeline</i>

Student Outcomes		6.	<i>An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgement to draw conclusions</i>
	PI	6a.	<i>Ability to design and conduct experiments</i>
	Assessment Level	Unsatisfactory	<i>Student fails to design and conduct experiments according to the standard procedure and safety requirement as well as to complete it within allocated time</i>
		Developing	<i>Student is able to design and conduct experiments according to the standard procedure, but fails to fulfill safety requirement and to complete it within allocated time</i>
		Satisfactory	<i>Student is able to design and conduct experiments according to the standard procedure and safety requirement, but fails to complete it within allocated time</i>
		Exemplary	<i>Student is able to design and conduct experiments according to the standard procedure and safety requirement, as well as to complete it within allocated time</i>
	PI	6b.	<i>Ability to gather information or data</i>
	Assessment Level	Unsatisfactory	<i>Student fails to gather information or data completely, correctly, and systematically</i>
		Developing	<i>Student is able to gather information or data completely, but not correctly and systematically</i>
		Satisfactory	<i>Student is able to gather information or data completely, correctly, but not systematically</i>
		Exemplary	<i>Student is able to gather information or data completely, correctly, and systematically</i>
	PI	6c.	<i>Ability to interpret and analyze data to draw conclusions</i>
		Unsatisfactory	<i>Student fails to interpret and analyze data correctly to draw a correct conclusion</i>

	<i>Assessment Level</i>	<i>Developing</i>	<i>Student is able to interpret data, but fails to analyze data correctly and draw a correct conclusion</i>
		<i>Satisfactory</i>	<i>Student is able to interpret and analyze data correctly, but fails to draw a correct conclusion</i>
		<i>Exemplary</i>	<i>Student is able to interpret and analyze data correctly to draw a correct conclusion</i>

Student Outcomes	7.	<i>An ability to acquire and apply new knowledge as needed, using appropriate learning strategies</i>	
	PI	7a.	<i>Students must recognize ways in which information is gathered and learned including electronic, printed, web based platforms</i>
	<i>Assessment Level</i>	<i>Unsatisfactory</i>	<i>Student shows less than 10 references in his/her essays and majorities are published more than 5 years ago.</i>
		<i>Developing</i>	<i>Student shows less than 10 references in his/her essays and majorities are published in the last 5 years.</i>
		<i>Satisfactory</i>	<i>Student shows more than 10 references in his/her essays and majorities are published more than 5 years ago.</i>
		<i>Exemplary</i>	<i>Student shows more than 10 references in his/her essays and majorities are published in the last 5 years.</i>
	PI	7b.	<i>Independent learning of an engineering concept or mastery of other skills</i>
	<i>Assessment Level</i>	<i>Unsatisfactory</i>	<i>Student fails either to explain his/her idea, give proper examples, or present it as an engineering solution.</i>
		<i>Developing</i>	<i>Student is able to explain his/her idea, but failed to give proper examples and present it as an engineering solution.</i>
		<i>Satisfactory</i>	<i>Student is able to explain his/her idea, give proper examples, but failed to present it as an engineering solution.</i>
		<i>Exemplary</i>	<i>Student is able to explain his/her idea, give proper examples, and present it as an engineering solution.</i>

I. Pemetaan Capaian Pembelajaran & Indikator Kinerja terhadap Mata Kuliah

Asesmen Capaian Pembelajaran dan Indikator Kinerja kemudian dipetakan untuk setiap mata kuliah Program Studi Teknik Tenaga Listrik (TTL) dengan setiap mata kuliah dapat ditentukan untuk mengukur rata – rata Indikator Kinerja (PI) sebagaimana ditunjukkan pada Tabel 5.

Tabel 5. Pemetaan Capaian Pembelajaran dan Indikator Kinerja (PI) terhadap Mata Kuliah Prodi TTL

1. Semester Ganjil

No.	Kode Kuliah	Student Outcomes	1			2		3		4			5			6			7		Total PI
		PI Mata Kuliah	1a	1b	1c	2a	2b	3a	3b	4a	4b	4c	5a	5b	5c	6a	6b	6c	7a	7b	
1	EP2091	Probabilitas dan Statistik	X	X				X	X							X	X	X			7
2	EP3071	Mesin – Mesin Listrik		X	X					X	X										4
3	EP3073	Analisis Numerik Tenaga Listrik	X	X						X										X	4
4	EP3095	Material Elektroteknik									X	X							X	X	4
5	EP3075	Analisis Sistem Tenaga		X	X														X	X	4
6	EP3171	Praktikum Tenaga Listrik I						X	X	X			X	X	X	X	X	X			9
7	EP4096	Tugas Akhir I & Seminar	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	16
8	EP4071	Pemanfaatan Energi Listrik				X	X						X	X	X						5
9	EP4073	Kapita Selektif Tenaga Listrik									X	X							X		3
10	EP4077	Sistem Distribusi Tenaga Listrik	X	X	X	X	X					X							X	X	8
		Total Mata Kuliah per PI	4	6	4	3	3	3	3	4	4	4	2	2	3	3	3	3	5	5	64

2. Semester Genap

No.	Kode Kuliah	Student Outcomes	1			2		3		4			5			6			7		Total PI
		PI Mata Kuliah	1a	1b	1c	2a	2b	3a	3b	4a	4b	4c	5a	5b	5c	6a	6b	6c	7a	7b	
1	EP2076	Sistem Pengukuran				X	X									X	X	X			5
2	EP2094	Sinyal dan Sistem	X		X					X									X	X	5
3	EP3070	Pembangkit Tenaga Listrik	X	X	X	X	X					X									6
4	EP3072	Elektronika Daya		X	X	X	X				X	X									6
5	EP3074	Teknik Tegangan Tinggi									X		X	X	X				X	X	6
6	EP3076	Proteksi Sistem Tenaga						X	X		X	X									4
7	EP3172	Praktikum Tenaga Listrik II						X	X	X			X	X	X	X	X	X			9
8	EP4091	Kerja Praktek	X	X	X			X	X	X					X		X	X			9
9	EP4099	Tugas Akhir II	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	16
10	EP4070	Desain Sistem Tenaga Listrik				X	X					X					X	X			5
		Total Mata Kuliah per PI	4	4	5	5	5	4	4	4	4	5	2	2	4	3	5	5	3	3	71

J. Metode Pengukuran dan Kriteria Pemenuhan

Setiap Capaian Pembelajaran diukur dengan satu instrument pengukuran yang spesifik. Metode pengukuran dan kriteria pemenuhan pada capaian pembelajaran untuk setiap indikator sebagai berikut.

1. (SO 1) Kemampuan untuk mengidentifikasi, merumuskan, dan memecahkan masalah-masalah rekayasa yang kompleks dengan mengaplikasikan prinsip-prinsip rekayasa, sains, dan matematika.
 - a. Memahami konsep dasar matematika dan sains.
 - Metode Pengukuran: Tugas besar / Laporan berbasis proyek rekayasa/Kuis/UTS/UAS
 - Kriteria Pemenuhan: Mahasiswa mampu menunjukkan pemahaman yang baik tentang konsep-konsep dasar, meskipun belum dapat sepenuhnya memahami hubungannya dengan sifat-sifat matematika dan sains.
 - b. Kemampuan untuk merumuskan strategi rekayasa untuk memecahkan masalah dan memberikan solusi yang tepat.
 - Metode Pengukuran: Tugas besar / Laporan berbasis proyek rekayasa/Kuis/UTS/UAS
 - Kriteria Pemenuhan: Mahasiswa mampu menunjukkan alur kerja teknik yang tepat, meskipun belum mampu sepenuhnya memberikan solusi yang benar.
 - c. Kemampuan untuk mengidentifikasi tujuan dari permasalahan dan memberikan model matematika yang tepat dengan batasan-batasan desain.
 - Metode Pengukuran: Tugas besar / Laporan berbasis proyek rekayasa/Kuis/UTS/UAS
 - Kriteria Pemenuhan: Mahasiswa mampu memahami masalah rekayasa yang kompleks, menentukan tujuan masalah, meskipun belum dapat memberikan model matematika yang sepenuhnya tepat.
2. (SO 2) Kemampuan untuk mengaplikasikan desain rekayasa untuk menghasilkan solusi yang memenuhi kebutuhan-kebutuhan tertentu dengan pertimbangan faktor kesehatan, keselamatan, dan kesejahteraan masyarakat, serta faktor global, budaya, sosial, lingkungan, dan ekonomi.
 - a. Kemampuan untuk mengidentifikasi tujuan dan batasan desain.
 - Metode Pengukuran: Kuis/UTS/UAS terkait desain rekayasa dan solusinya
 - Kriteria Pemenuhan: Mahasiswa mampu mengidentifikasi tujuan desain, namun baru mampu mengidentifikasi sebagian kendala desain.
 - b. Kemampuan untuk mengimplementasikan desain akhir untuk mewujudkan komponen atau proses sistem.
 - Metode Pengukuran: Kuis/UTS/UAS terkait desain rekayasa dan solusinya
 - Kriteria Pemenuhan: Mahasiswa mampu menerapkan desain akhir, namun memberikan hasil yang belum sepenuhnya realistis dengan mempertimbangkan kesehatan, keselamatan, dan kesejahteraan masyarakat, serta faktor global, budaya, sosial, lingkungan, dan ekonomi.
3. (SO 3) Kemampuan untuk berkomunikasi secara efektif pada berbagai macam situasi.
 - a. Mahasiswa harus menunjukkan kemampuan komunikasi tertulis.
 - Metode Pengukuran: Presentasi, Seminar, dan Laporan
 - Kriteria Pemenuhan: Mahasiswa membuat laporan praktikum dengan memenuhi 3 faktor berikut: struktur lengkap, penggunaan tabel dan grafik dengan benar, bahasa yang tepat, dan terorganisir dengan baik.
 - b. Mahasiswa harus menunjukkan kemampuan komunikasi lisan.

- Metode Pengukuran: Presentasi, Seminar, dan Laporan
 - Kriteria Pemenuhan: Mahasiswa mempresentasikan tugas akhirnya dengan memenuhi 2 faktor berikut: mendeskripsikan ide umum secara sistematis, menggunakan waktu yang dialokasikan dengan tepat, dan menggunakan bahasa dan gerak tubuh yang tepat.
4. (SO 4) Kemampuan untuk mengenali tanggung jawab etika dan keprofesian pada situasi kerekayasaan dan melakukan penilaian berdasarkan informasi yang tersedia, yang harus mempertimbangkan dampak solusi kerekayasaan pada konteks global, ekonomi, lingkungan, dan sosial.
- a. Berperilaku secara profesional terkait kehadiran, tugas, dan hubungan antar kolega.
 - Metode Pengukuran: Tugas/PR, Laporan
 - Kriteria Pemenuhan: Mahasiswa mampu berperilaku profesional sesuai aturan tentang kehadiran atau tugas, namun belum sepenuhnya menunjukkan hubungan yang baik antar teman sebaya.
 - b. Mahasiswa harus mampu mengidentifikasi tren dan perkembangan terkini di bidang rekayasa, sains, dan teknologi.
 - Metode Pengukuran: Tugas/PR, Laporan
 - Kriteria Pemenuhan: Mahasiswa mampu memenuhi 2 faktor berikut: mengidentifikasi tren dan perkembangan saat ini, memberikan contoh, dan memberikan peluang masa depan di bidang teknik, sains, dan teknologi.
 - c. Mengenali dampak teknologi rekayasa terhadap masyarakat.
 - Metode Pengukuran: Tugas/PR, Laporan
 - Kriteria Pemenuhan: Mahasiswa mampu mengenali dampak rekayasa teknologi terhadap masyarakat terhadap 2 faktor berikut: ekonomi, lingkungan, dan kondisi sosial.
5. (SO 5) Kemampuan untuk berperan secara efektif pada tim yang anggotanya bersama-sama menerapkan nilai kepemimpinan, menciptakan lingkungan yang kolaboratif dan inklusif, menetapkan tujuan, merencanakan tugas, dan mencapai tujuan.
- a. Memiliki kontribusi dalam kerja tim.
 - Metode Pengukuran: Tugas/Proyek berkelompok, Praktikum
 - Kriteria Pemenuhan: Mahasiswa mampu berkontribusi pada kerja tim secara aktif, memberikan kontribusi yang signifikan, namun belum banyak berkontribusi dalam memberikan ide atau memecahkan masalah.
 - b. Berkomunikasi dengan anggota tim.
 - Metode Pengukuran: Tugas/Proyek berkelompok, Praktikum
 - Kriteria Pemenuhan: Mahasiswa mampu berkomunikasi dengan anggota tim secara aktif dan efektif, namun belum sepenuhnya menunjukkan sikap menghargai pendapat orang lain.
 - c. Kemampuan untuk menetapkan rencana tugas untuk mencapai tujuan dan sasaran.
 - Metode Pengukuran: Tugas/Proyek berkelompok, Praktikum
 - Kriteria Pemenuhan: Mahasiswa mampu melakukan pemahaman yang baik terhadap 2 faktor ini : tujuan kerja, prosedur, dan timeline.
6. (SO 6) Kemampuan untuk mengembangkan dan melakukan eksperimen yang sesuai, menganalisis dan menafsirkan data, dan menggunakan penilaian berdasarkan kerekayasaan untuk menarik kesimpulan.
- a. Kemampuan untuk mendesain dan melakukan eksperimen.
 - Metode Pengukuran: Praktikum

- Kriteria Pemenuhan: Mahasiswa mampu mengembangkan dan melakukan eksperimen sesuai dengan prosedur standar dan persyaratan keselamatan, namun belum dapat menyelesaikannya dalam waktu yang ditentukan.
 - b. Kemampuan untuk mengumpulkan informasi atau data.
 - Metode Pengukuran: Praktikum
 - Kriteria Pemenuhan: Mahasiswa mampu mengumpulkan informasi atau data secara lengkap, benar, tetapi tidak sistematis.
 - c. Kemampuan untuk menafsirkan dan menganalisis data untuk menarik kesimpulan.
 - Metode Pengukuran: Praktikum
 - Kriteria Pemenuhan: Mahasiswa mampu menafsirkan dan menganalisis data dengan benar, belum mampu sepenuhnya menarik kesimpulan yang benar
7. (SO 7) Kemampuan untuk memperoleh dan menerapkan pengetahuan baru sesuai kebutuhan dengan menggunakan strategi pembelajaran yang tepat.
- a. Mahasiswa harus mengenali cara-cara di mana informasi dikumpulkan dan dipelajari, termasuk platform berbasis elektronik, cetak, maupun web.
 - Metode Pengukuran: PR/Tugas, Laporan, Materi Presentasi
 - Kriteria Pemenuhan: Mahasiswa menunjukkan lebih dari 10 referensi dalam esainya namun mayoritas referensi diterbitkan lebih dari 5 tahun yang lalu.
 - b. Mempelajari secara mandiri suatu konsep rekayasa atau penguasaan keterampilan lain yang terkait.
 - Metode Pengukuran: PR/Tugas, Laporan, Materi Presentasi
 - Kriteria Pemenuhan: Mahasiswa mampu menjelaskan idenya, memberikan contoh yang tepat, belum mampu mempresentasikan sepenuhnya sebagai solusi rekayasa.

K. Rencana Pengukuran

Pengukuran Indikator Kinerja untuk setiap Capaian Pembelajaran pada setiap mata kuliah Program Studi Teknik Tenaga Listrik yang diampu sebagaimana ditunjukkan pada Tabel 5, dapat dilakukan melalui UTS, UAS, tugas, dan kuis pada setiap mata kuliah dengan standar rubrik asesmen yang telah dicontohkan. Proses pengukuran Indikator Kinerja ini dilakukan pada semester 1 dan 2 untuk setiap Tahun Ajaran dengan daftar mata kuliah seperti yang ditunjukkan pada Tabel 6.

Tabel 6. Mata Kuliah Prodi TTL yang Mendapat Asesmen Indikator Kinerja (PI) di Semester 1 dan 2 Tahun Ajaran 2018/2019.

No.	Kode Kuliah	Nama Mata Kuliah	Nama Dosen
1.	EP2091	Probabilitas dan Statistik	Prof. Dr. Ir. Ngapuli I. Sinisuka
2.	EP3071	Mesin – Mesin Listrik	Dr. Ir. Agus Purwadi
3.	EP3073	Analisis Numerik Tenaga Listrik	Dr. -Ing. Deny Hamdani
4.	EP3095	Material Elektroteknik	Prof. Dr. Ir. Suwarno
5.	EP3075	Analisis Sistem Tenaga	Dr. Ir. Muhammad Nurdin

6.	EP3171	Praktikum Tenaga Listrik I	Dr. Ir. Tri Desmana Rachmilda
7.	EP4096	Tugas Akhir I & Seminar	Dr. -Ing. Deny Hamdani
8.	EP4071	Pemanfaatan Energi Listrik	Dr. Ir. Agus Purwadi
9.	EP4073	Kapita Selektta Tenaga Listrik	Prof. Dr. Ir. Pekik Argo Dahono
10.	EP4077	Sistem Distribusi Tenaga Listrik	Dr. Ir. Bambang Anggoro / Dr. Eng. Arwindra Rizqiawan
11.	EP2076	Sistem Pengukuran	Dr. Ir. Syarif Hidayat
12.	EP2094	Sinyal dan Sistem	Dr. -Ing. Deny Hamdani
13.	EP3070	Pembangkit Tenaga Listrik	Burhanuddin Halimi, Ph.D.
14.	EP3072	Elektronika Daya	Prof. Dr. Ir. Pekik Argo Dahono
15.	EP3074	Teknik Tegangan Tinggi	Dr. Eng. Umar Khayam
16.	EP3076	Proteksi Sistem Tenaga	Prof. Dr. Ir. Reynaldo Zoro
17.	EP3172	Praktikum Tenaga Listrik II	Dr. Ir. Tri Desmana Rachmilda
18.	EP4091	Kerja Praktik	Burhanuddin Halimi, Ph.D.
19.	EP4099	Tugas Akhir II	Dr. -Ing. Deny Hamdani
20.	EP4070	Desain Sistem Tenaga Listrik	Dr. Ir. Syarif Hidayat

Rencana pengukuran Indikator Kinerja dan Capaian Pembelajaran pada mata kuliah ditampilkan pada Tabel 7 sampai Tabel 13 berikut ini.

Tabel 7. Rencana Pengukuran PI 1(a), 1(b), dan 1(c) pada Mata Kuliah Prodi TTL

Kode Mata Kuliah \ Semester/ Tahun			2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 1(a)	PI 1(b)	PI 1(c)								
EP2091	EP2091		X		X		X		X	
EP2094		EP2094		X		X		X		X
	EP3071	EP3071	X		X		X		X	
	EP3072	EP3072		X		X		X		X
	EP3075	EP3075	X		X		X		X	

Tabel 8. Rencana Pengukuran PI 2(a) dan 3(b) pada Mata Kuliah Prodi TTL

Kode Mata Kuliah \ Semester/ Tahun		2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 2(a)	PI 2(b)								
EP2076	EP2076		X		X		X		X
EP3070	EP3070		X		X		X		X
EP4071	EP4071	X		X		X		X	

Tabel 9. Rencana Pengukuran PI 3(a) dan 3(b) pada Mata Kuliah Prodi TTL

Semester/ Tahun Kode Mata Kuliah		2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 3(a)	PI (3b)								
EP3076	EP3076		X		X		X		X
EP4096	EP4096	X		X		X		X	
EP4099	EP4099		X		X		X		X

Tabel 10. Rencana Pengukuran PI 4(a), 4(b), dan 4(c) pada Mata Kuliah Prodi TTL

Semester/ Tahun Kode Mata Kuliah			2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 4(a)	PI 4(b)	PI 4(c)								
		EP3070		X		X		X		X
EP3073			X		X		X		X	
	EP3076			X		X		X		X
	EP3095	EP3095	X		X		X		X	
EP3171			X		X		X		X	
EP3172				X		X		X		X
		EP4070		X		X		X		X
	EP4073	EP4073	X		X		X		X	

EP4091				X		X		X		X
		EP4099		X		X		X		X

Tabel 11. Rencana Pengukuran PI 5(a), 5(b), dan 5(c) pada Mata Kuliah Prodi TTL

Semester/ Tahun Kode Mata Kuliah			2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 5(a)	PI 5(b)	PI 5(c)								
EP3171	EP3171	EP3171	X		X		X		X	
EP3172	EP3172	EP3172		X		X		X		X
		EP4096	X		X		X		X	

Tabel 12. Rencana Pengukuran PI 6(a), 6(b), dan 6(c) pada Mata Kuliah Prodi TTL

Semester/ Tahun Kode Mata Kuliah			2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 6(a)	PI 6(b)	PI 6(c)								
EP3171	EP3171	EP3171	X		X		X		X	
EP3172	EP3172	EP3172		X		X		X		X
	EP4091	EP4091	X		X		X		X	

Tabel 13. Rencana Pengukuran PI 7(a) dan 7(b) pada Mata Kuliah Prodi TTL

Semester/ Tahun Kode Mata Kuliah		2018/2019 Sem I	2018/2019 Sem II	2019/2020 Sem I	2019/2020 Sem II	2020/2021 Sem I	2020/2021 Sem II	2021/2022 Sem I	2021/2022 Sem II
PI 7(a)	PI 7(b)								
	EP3073	X		X		X		X	
P3074	EP3074		X		X		X		X
EP4077	EP4077	X		X		X		X	

L. Lampiran I. Contoh SO & PI Mata Kuliah Electric Machines & TA

Adapun contoh pemetaan Indikator Kinerja (PI) dan Capaian Pembelajaran (SO) pada mata kuliah Prodi TTL yaitu untuk mata kuliah Mesin – Mesin Listrik dan mata kuliah Tugas Akhir I ditunjukkan di bawah ini.

1. Mata Kuliah EP3071: Electric Machines (Mesin – Mesin Listrik)

Capaian Pembelajaran (Student Outcomes):

<i>1</i>	<i>An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics</i>
Performance Indicators (PI)	<i>1b) Ability to formulate the engineering strategies for solving the problems and provide the proper solutions</i>
	<i>1c) Ability to identify the problem objectives and provide correct mathematical models with design constraints</i>

Rubrik Asesmen:

PI	MATA KULIAH / LEVEL	DESKRIPSI
1b	EP3071	<i>Ability to formulate the engineering strategies for solving the problems and provide the proper solutions</i>
		Unsatisfactory Student fails to show proper engineering workflow and fails to provide correct solutions
		Developing Student shows less proper engineering workflow and fails to provide correct solutions
		Satisfactory Student is able to show proper engineering workflow, but fails to provide correct solutions
		Exemplary Student is able to provide the solutions of the problems correctly by showing proper engineering workflow
1c	EP3071	<i>Ability to identify the problem objectives and provide correct mathematical models with design constraints</i>
		Unsatisfactory Student fulfills none of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints
		Developing Student is able to fulfill 1 of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints
		Satisfactory Student is able to fulfill 2 of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints

Exemplary

Student is able to fulfill all of these factors: identify the problem objectives, provide correct mathematical models, and understand the design constraints

2. Mata Kuliah EP4096: Final Project I and Seminar (Tugas Akhir I)

Capaian Pembelajaran (Student Outcomes):

3	<i>An ability to communicate effectively with a range of audiences</i>
Performance Indicators (PI)	3a) Students must demonstrate the ability in written communication
	3b) Student must demonstrate the ability in oral communication
5	<i>An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goal, plan task, and meet objectives</i>
Performance Indicators (PI)	5c) Ability to establish plan tasks to achieve goals and objectives

Rubrik Asesmen:

PI	MATA KULIAH / LEVEL	DESKRIPSI
3a	EP4096	<i>Students must demonstrate the ability in written communication</i>
Unsatisfactory		Student makes the lab report by fulfilling 1 or none of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.
Developing		Student makes the lab report by fulfilling 2 of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.
Satisfactory		Student makes the lab report by fulfilling 3 of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.
Exemplary		Student makes the lab report by fulfilling all of these factors: complete structure, use tables and graphs properly, appropriate language, and well organized.
3b	EP4096	<i>Student must demonstrate the ability in oral communication</i>
Unsatisfactory		Student fails to present his/her final project by not performing these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.

PI	MATA KULIAH / LEVEL	DESKRIPSI
	Developing	Student present his/her final project by fulfilling 1 of these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.
	Satisfactory	Student present his/her final project by fulfilling 2 of these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.
	Exemplary	Student present his/her final project by fulfilling all of these factors: describe general idea systematically, use the allocated time properly, and use appropriate language and gestures.
5c	EP4096	<i>Ability to establish plan tasks to achieve goals and objectives</i>
	Unsatisfactory	Student is able to perform good understanding to none of these factors: work objectives, procedure, and timeline
	Developing	Student is able to perform good understanding to 1 of these factors: work objectives, procedure, and timeline
	Satisfactory	Student is able to perform good understanding to 2 of these factors: work objectives, procedure, and timeline
	Exemplary	Student is able to perform good understanding to all of these factors: work objectives, procedure, and timeline

M. Lampiran II. Contoh Asesmen PI & SO Mata Kuliah Analisis Sistem Tenaga

Contoh proses asesmen PI & SO untuk mata kuliah Analisis Sistem Tenaga ditunjukkan sebagai berikut.

Soal UTS No. 1 Mata Kuliah Analisis Sistem Tenaga sebagai Asesmen PI 1(c).

The bus impedance matrix of a power system is as follows:

$$\mathbf{Z}_{\text{bus}} = \begin{array}{c} \begin{array}{ccc} \textcircled{1} & \textcircled{2} & \textcircled{3} \end{array} \\ \begin{array}{|c|c|c|} \hline j0.16 & j0.08 & j0.12 \\ \hline j0.08 & j0.24 & j0.16 \\ \hline j0.12 & j0.16 & j0.34 \\ \hline \end{array} \end{array} \text{ per-unit}$$

If a bolted three-phase fault occurs at the bus-2 determine the sub-transient current in the fault, and the voltages at all buses during the fault. Take the pre-fault voltage at bus-2 $V_f = 1.0 \angle 0^\circ$ per-unit and neglect all pre-fault currents.

Contoh jawaban dengan level asesmen “**Exemplary**”:

“**Exemplary**” untuk PI (1c):

*Student is able to **fulfill all** of these factors:*

- 1. identify the problem objectives,*
- 2. provide correct mathematical models, and*
- 3. understand the design constraints*

a) Known :

$$Z_{bus} = \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} \text{ pu}$$

or Prefault voltage at bus 2 $V_f = 1,0 \angle 0^\circ \text{ pu}$

or A three phase voltage fault at the bus 2

Design constraint is provided ✓

b) Question

or Voltage at any bus during the fault?

or Subtransient current in the fault (I_f'')?

Problem Objectives are all identified ✓

c) Answer

$$\begin{aligned} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} &= \begin{bmatrix} V_f \\ V_f \\ V_f \end{bmatrix} + \begin{bmatrix} \Delta V_1 \\ \Delta V_2 \\ \Delta V_3 \end{bmatrix} \\ &= V_f + \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} \begin{bmatrix} 0 \\ -I_f'' \\ 0 \end{bmatrix} \\ &= V_f + \begin{bmatrix} j0,08 \\ j0,24 \\ j0,16 \end{bmatrix} - I_f'' \end{aligned}$$

$$\text{or } I_f'' = \frac{V_f}{Z_{22}} = \frac{1,0 \angle 0^\circ}{j0,24} = -j4,167 \text{ pu}$$

Therefore

$$\begin{aligned} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} &= 1 \angle 0^\circ + \begin{bmatrix} j0,08 \\ j0,24 \\ j0,16 \end{bmatrix} - j4,167 \\ &= \begin{bmatrix} 0,67 \\ 0 \\ 0,33 \end{bmatrix} \text{ pu} \end{aligned}$$

Mathematical Models are complete and correct ✓

100

Contoh jawaban dengan level asesmen “Satisfactory”:

“Satisfactory” untuk PI (1c):

Student is able to **fulfill 2** of these factors:

1. identify the problem objectives,
2. provide correct mathematical models, and
3. understand the design constraints

a) Known

01 $Z_{bus} = \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} pu$

02 Prefault voltage at bus 2 $V_f: 1.0 \angle 0 pu$

03 A three phase voltage fault at bus 2

b) Question

01 I_f ?

02 V_1, V_2, V_3 during the fault?

c) Answer

01 $I_f = \frac{V_f}{Z_{22}} = \frac{1.0 \angle 0}{j0,24} = j4,167 pu$

02 $\begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = V_f + \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} I_f$

$= \begin{bmatrix} 1 \angle 0 \\ 1 \angle 0 \\ 1 \angle 0 \end{bmatrix} + \begin{bmatrix} j0,08 \\ j0,24 \\ j0,16 \end{bmatrix} j4,167$

$= \begin{bmatrix} 1,33 \\ 2 \\ 1,67 \end{bmatrix} pu$

80

Design constraint is provided ✓

Problem Objectives are all identified ✓

Mathematical models are complete, but the solution is incorrect ✗

“Developing” untuk PI (1c):

Student is able to **fulfill 1** of these factors:

1. identify the problem objectives,
2. provide correct mathematical models, and
3. understand the design constraints

a) Known

07 $Z_{bus} = \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} pu$

07 Pre fault voltage at bus 2 $V_f = 1,0 \angle 0 pu$

07 A three phase voltage fault at bus 2

b) Question

07 I_f'' ?

c) Answer

07 $I_f = \frac{V_f}{Z_{22}} = \frac{1,0}{j0,24} = -j4,167 pu$

50

Design constraint is provided ✓

Problem Objectives are not all identified ✗

Mathematical models are incomplete ✗

Contoh jawaban dengan level asesmen “Unsatisfactory”:

“Unsatisfactory” untuk PI (1c) :

Student is able to **fulfill none** of these factors :

1. identify the problem objectives,
2. provide correct mathematical models, and
3. understand the design constraints

a) Known

$$\tau_{bus} = \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix} pu$$

b) Question

o) $V_f = 1,0 \angle 0$ —————→ Design constraint is written but not included in the calculation ✗

c) Answer

o) $V_1, V_2, V_3 ?$ —————→ Problem Objectives are not all identified ✗

o) $I_f'' = \frac{V_f}{\tau_{22}} = \text{---}$

o) $\begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = V_f + \tau_{bus} \cdot I_f''$

30

Mathematical models are unsolved ✗

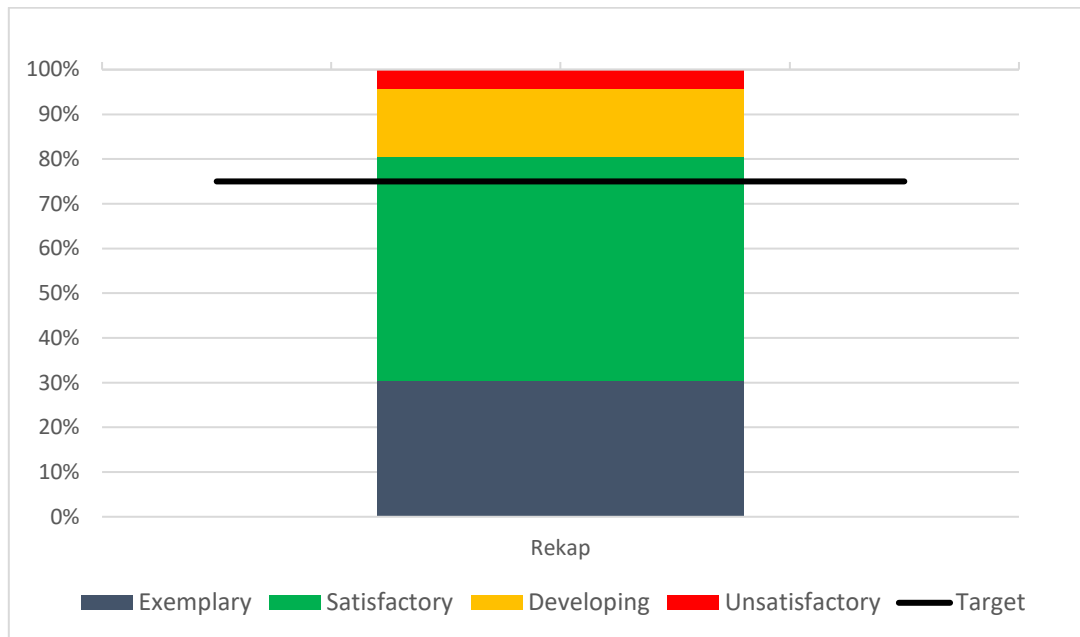
Contoh Hasil Skor Mahasiswa

No	NIM	NAMA	Nilai	Asesmen
1	18013047	Ervan Adiwijaya Haryadi	0	1
2	18014001	Fadhurrachman Al-ghifary	80	3
3	18014002	Naufal Fikri Pratama	75	3
4	18014003	Fakhrul Wadudi	80	3
5	18014004	Faris Luqman	90	4
6	18014005	Kurniawan Prasetya Nugroho	80	3
7	18014006	Hafidz Qadarullah	50	2
8	18014007	Syukron Miladi	80	3
9	18014008	Yulia Erina Sari	75	3
10	18014009	Haekal	90	4
11	18014010	Diaz Angga Permana	50	2
12	18014011	M Galibh F Aqdomani	70	3
13	18014012	Christopher Surya Gunarto	95	4
14	18014013	Miradz Hadi Ibrahim	80	3
15	18014014	Ayudhia Puspita Pohan	80	3
16	18014015	Hafild Widyaputera	80	3
17	18014016	Ghovindo Surya Teguh Siadari	95	4
18	18014017	M Irfan Akbar P	75	3
19	18014018	Fransiskus Hendri	95	4
20	18014019	Bobby Yudha Adhy Wibawa	90	4
...	...	...	...	...
25	18014025	Reza Andriansyah	50	2
26	18014026	Linmar Theodorus Yohannes Sira	90	4
27	18014027	Tjokorda Istri Diah Karisma De	80	3
28	18014028	Maulana Asyraf Gituri	95	4
29	18014029	Alexander Rudolf Aribowo	80	3
35	18014035	Taufiqurrahman Akmal	60	2
36	18014036	Danang Choirul Abdillah	75	3
37	18014037	Made Dimas Ganda Wijaya	95	4
38	18014038	Setiyawan Edi Prasetyo	80	3
39	18014039	Petra Hansel Siagian	85	4
40	18014040	Ahmad Naufal Afif	75	3
41	18014041	Mahardhika Adjie Kurniya	95	4
42	18014042	Jeanny Feramarta	75	3
43	18014043	Jhon Andreas Sipahutar	75	3
44	18014044	Hafizh Al Fikry	80	3
45	18014045	Garry Samuelson	95	4
46	18014046	Ryutaka Yudhistira	95	4

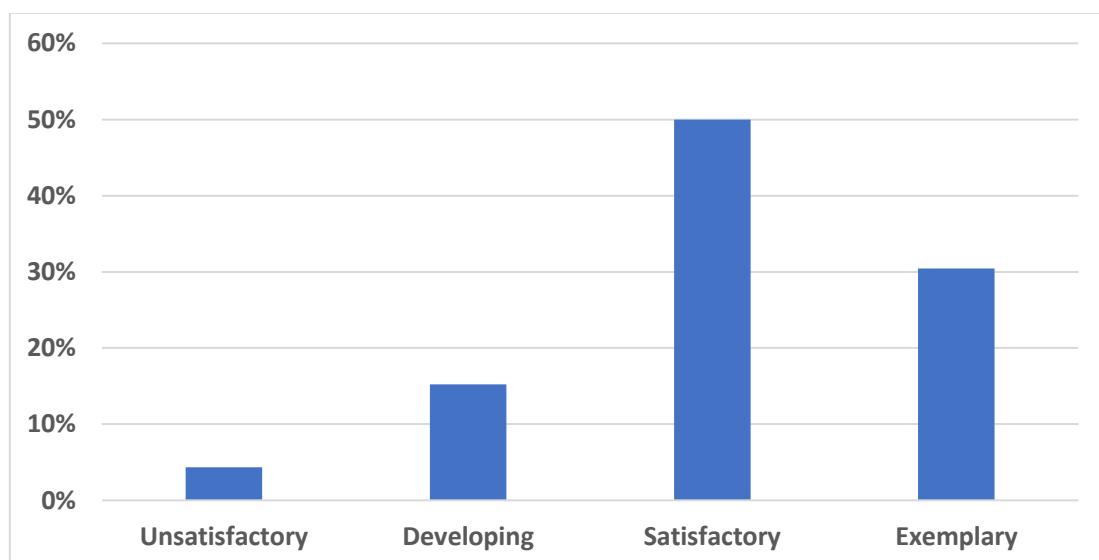
Asesmen

Tabel Rekap Asesmen

Level		Batas			Rekap		Jumlah	Target
Unsatisfactory	1	0	-	40	2	4%	46	75%
Developing	2	41	-	60	7	15%		
Satisfactory	3	61	-	80	23	50%		
Exemplary	4	81	-	100	14	30%		



Capaian PI 1c: Persentasi kelas yang mencapai level Satisfactory + Exemplary (target 75% pada garis hitam)



Capaian PI 1c: Persentasi setiap level capaian