Dokumen Kurikulum 2013-2018

Program Studi : Teknik Elektro

Sekolah Teknik Elektro & Informatika

Institut Teknologi Bandung

	Bidang Akademik dan Kemahasiswaan **Institut Teknologi Bandung**	**Kode Dokumen**		**Total Halaman**
		Kur2013-S1-EL		[*22*]
		Versi	[*4*]	07 September 2013

KURIKULUM ITB 2013-2018 – PROGRAM SARJANA
Program Studi Teknik Elektro
Sekolah Teknik Elektro dan Informatika

1 Deskripsi Umum

1.1 *Body Of Knowledge*

The bachelor's degree in electrical engineering is designed to prepare graduates for responsible engineering positions in design, development, applications, and operation in the fields of communications, control systems, digital signal processing, electromagnetics, digital and analog electronic circuits, biomedical, computer and power systems. The curriculum is built around a strong basic core of mathematics, physics and engineering science.

The body of knowledge in electrical engineering represented in the curriculum is listed in the table below.

Body of Knowledge
EE-DIG Digital Systems
EE-ELE Electronics and Microelectronics
EE-CSG Circuits and Signals
EE-PRF Programming and Problem Solving
EE-ELM Electromagnetic & Optics
EE-POW Power Systems
EE-TLM Telecommunication System
EE-CAO Computer Architecture and Organization
EE-DSP Digital Signal Processing
EE-MES Microprocessor & Embedded Systems
EE-MTE E\lectrical Engineering Materials
EE- ICS Instrumentation and Control
EE-SYE System Engineering
EE-SPR Social and Professional Issues
EE-HWI Hardware Implementation
EE-MET Modern Engineering Tools

1.2 Tantangan yang Dihadapi

The field of Electrical Engineering has been evolving and expanding that makes its frontiers with other disciplines more obscured. Nowadays, students have been familiar in manipulating “codes” but not “devices”, in the computer’s virtual world rather than the physical world (hardware).

As in any other engineering or science disciplines in Indonesia, most advance technologies related to Electrical Engineering have been developed abroad, which has minimal considerations on national needs of Indonesia. Consequently, the development of Electrical Engineering discipline in Indonesia is mostly driven not by Indonesia’s real needs.

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1.3 Akreditasi atau Standar Kurikulum Acuan

Organisasi profesi yang menjadi rujukan adalah IEEE (Institute of Electrical and Electronics Engineers) dan ACM (Association for Computeing Machinery) untuk akreditasi nasional BAN PT dan akreditasi internasional ABET- Engineering Accreditation Commission (EAC).

1.4 Referensi

1. Accreditation Policy and Procedure Manual, ABET, 2012
2. Criteria for Accrediting Engineering Programs, ABET EAC, 2011.
3. EE ITB International Accreditation Team, *Self Study Report: Electrical Engineering Undergraduate Program*, ITB, 2010.
4. James Roberts, Ken Demarest, Glenn Prescott, "What is Electrical Engineering Today and What is it Likely to Become?", 38th ASEE/IEEE Frontiers in Education Conference, October 22–25, 2008, Saratoga Springs, NY.
5. Frederick C. Berry, Philip S. DiPiazza, Susan L. Sauer, "The Future of Electrical and Computer Engineering Education", IEEE Transaction on Education, Vol. 46, No. 4, , November 2003, pp. 467-476.
6. Daniel J. Moore, and David R. Voltmer,"Curriculum for an Engineering Renaissance", IEEE Transaction on Education, Vol. 46, No. 4, November 2003, pp. 452-455.
7. http://www.abet.org/DisplayTemplates/DocsHandbook.aspx?id=3143, 20 Februari 2013, 20:15WIB.
8. http://www.abet.org/DisplayTemplates/DocsHandbook.aspx?id=3136, 21 Februari, 7:42WIB
9.

2 Tujuan Pendidikan dan Capaian Lulusan

2.1 Tujuan Pendidikan (PEO: Program Educational Objectives)

The objective of the study program of Electrical Engineering is to produce graduates who possess:

1. Our graduates will have successful careers in their engineering professions.
2. Our graduates are capable to be admitted in and successfully complete their graduate studies.
3. Our graduates will have leadership and an active role in industry, government or education sectors in Asia Pacific region especially Indonesia.

2.2 Capaian (*Outcome*) Lulusan (SO: Student Outcomes)

Kurikulum Program Studi Sarjana Teknik Elektro merupakan kurikulum berbasis outcome bagi mahasiswa (student outcomes). Selama mengikuti Program Studi Sarjana Teknik Elektro, kurikulum ditujukan agar mahasiswa dapat memenuhi student outcomes yang ditetapkan. Seluruh student outcomes ini telah tercakup dalam matakakuliah di Program Studi Sarjana Teknik Elektro (lihat bagian 4.2).

Program Studi Sarjana Teknik Elektro mengadopsi student otcomes berdasarkan ABET criterion 3 (General Engineering) sebagai berikut:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively

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(h) an understanding of the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Specific Criteria for Electrical Engineering:

(l) breadth of knowledge over all areas within electrical engineering (eg. electromagnetic, power, electronics, signals and systems, control, biomedical and computer engineering)
(m) depth of knowledge in at least one area
(n) knowledge of probability and statistics, including applications to electrical and computer systems
(o) knowledge of mathematics through differential and integral calculus
(p) knowledge of basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components
(q) knowledge of advanced mathematics, linear algebra, complex variables, and discrete mathematics
(r) background for graduate study

Tabel kaitan capaian lulusan dengan tujuan program studi

Program Educational Objective	Student Outcome
Our graduates will have successful careers in their engineering professions	a,b,c,e,g,h,i,j,k,l,m,n,o,p,q,r
Our graduates are capable to be admitted in and successfully complete their graduate studies.	c,d,f,h,i,j,k,l,m,n,o,p,q,r
Our graduates will have leadership and an active role in industry, government or education sectors in Asia Pacific region especially Indonesia.	c,d,e,f,h,i,j,k,l,m,n,o,p,q,r

3 Struktur Kurikulum

Program Sarjana

3.1 Program Major

Untuk dapat mengikuti Program Studi Sarjana Teknik Elektro dengan baik, mahasiswa perlu memiliki latar belakang kemampuan setara lulusan SMA IPA. Mahasiswa dengan latar belakang pendidikan kejuruan jurusan Teknik Elektro dengan prestasi baik juga dapat diterima.

Secara garis besar, Kurikulum 2013 Program Studi Sarjana Teknik Elektro terbagi atas dua tahap, yakni:

Tahun Pertama Bersama : 2 semester, 36 sks

Tahap Sarjana : 6 semester, 108 sks
Wajib : 88 sks
Pilihan bebas: 20 sks (5 sks dari luar; 15 sks dari dalam)

Total : 8 semester, 144 sks
Wajib : 124 sks
Pilihan bebas: **20 sks** (5 sks dari luar; 15 sks dari dalam)

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Aturan kelulusan:

Program	Tahap	sks Lulus			IP minimal	Lama studi maksimum
		W	P	Total		
Sarjana	TPB	36	0	36	2.00[1]	2 tahun
	Sarjana*	88	20	108	2.00[2]	6 tahun

*Kumulatif; [1] Nilai minimal D; [2] Nilai minimal C.

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Tabel 1 – Struktur Matakuliah TPB

Semester I				Semester II			
	Kode	**Nama Mata Kuliah**	sks		**Kode**	**Nama Mata Kuliah**	sks
1	MA1101	Matematika IA	4	1	MA1201	Matematika IIA	4
2	FI1101	Fisika Dasar IA	4	2	FI1201	Fisika Dasar IIA	4
3	KI1102	Kimia Dasar IB	2	3	KI1202	Kimia Dasar IIB	2
4	KU1101	Intro. Engineering Design I	2	4	KU1201	Intro. Engineering Design II	2
5	KU1072	Pengantar Teknologi Informasi B	2	5	KU1011	Tata Tulis Karya Ilmiah	2
6	KU102X	Bahasa Inggris	2	6	EL1200	Pengantar Analisis Rangkaian	2
7	KU1001	Olah Raga	2	7	IF1210	Pengantar Pemrograman	2
		Total	18			Total	18

Tabel 2 – Struktur Matakuliah Program Studi
2a - Matakuliah Wajib

Semester III				Semester IV			
	Kode	**Nama Matakuliah**	sks		**Kode**	**Nama Matakuliah**	sks
1	EL2001	Rangkaian Elektrik	4	1	EL2005	Elektronika	3
2	EL2101	Praktikum Rangkaian Elektrik	1	2	EL2205	Praktikum Elektronika	1
3	EL2002	Sistem Digital	4	3	EL2006	Medan Elektromagnetik	3
4	EL2102	Praktikum Sistem Digital	1	4	MA2074	Matematika Teknik II	3
5	MA2072	Matematika Teknik I	3	5	EL2007	Sinyal dan Sistem	3
6	EL2003	Struktur Diskrit	3	6	EL2008	Pemecahan Masalah dengan C	3
7	EL2004	Probabilitas dan Statistik	3	7	EL2208	Praktikum Pemecahan Masalah dengan C	1
		Jumlah	19			Jumlah	17

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Semester V				Semester VI			
	Kode	Nama Matakuliah	sks		Kode	Nama Matakuliah	sks
1	EL3009	Elektronika II	3	1	EL3013	Sistem Instrumentasi	3
2	EL3109	Praktikum Elektronika II	1	2	EL3014	Sistem Mikroprosesor	3
3	EL3010	Pengolahan Sinyal Digital	3	3	EL3214	Praktikum Sistem Mikroprosesor	1
4	EL3110	Praktikum Pengolahan Sinyal Digital	1	4	EL3015	Sistem Kendali	3
5	EL3011	Arsitektur Sistem Komputer	3	5	EL3215	Praktikum Sistem Kendali	1
6	EL3111	Praktikum Arsitektur Sistem Komputer	1	6	EL3016	Sistem Komunikasi	3
7	EL3012	Material Teknik Elektro	3	7	EL3216	Praktikum Sistem Komunikasi	1
8	XXxxxx	MK Pilihan Non Prodi (Bebas)	3	8	EL3017	Sistem Tenaga Elektrik	3
				9	EL3217	Praktikum SistemTenaga Elektrik	1
		Jumlah	18			Jumlah	19

Semester VII				Semester VIII			
	Kode	Nama Matakuliah	sks		Kode	Nama Matakuliah	sks
1	EL4018	Etika Profesi dan Rekayasa	2	1	EL4091	Tugas Akhir II (Capstone Design)	3
2	EL4090	Tugas Akhir I (Capstone Design)	3	2	EL4092	Kerja Praktek	2
3	EL4xxx	MK Pilihan Prodi T.Elektro	9	3	EL4xxx	MK PilihanProdi T. Elektro	6
4	XXxxxx	MK Pilihan Non Prodi (Sains Dasar)	2	4	KU2071	Pancasila dan Kewarganegaraan	2
5	KU206X	Agama dan Etika	2	5		Pilihan Matakuliah Manajemen	2
				6		Pilihan Matakuliah Lingkungan	2
		Jumlah	18			Jumlah	17

Jumlah sks Matakuliah Major (Wajib Program studi) : 80 sks

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2b - Matakuliah Wajib ITB

	Kode	Nama Matakuliah	sks
1	KU206X	Agama dan Etika	2
2	KU2071	Pancasila dan Kewarganegaraan	2
3		Pilihan Matakuliah Manajemen	2
4		Pilihan Matakuliah Lingkungan	2
		Jumlah	8

Jumlah SKS Matakuliah Wajib ITB: **8 sks**

2b.1 Daftar Matakuliah Pilihan Manajemen

	Kode	Nama Matakuliah	sks
1	TI4004	Manajemen Industri	2
2	MR4004	Manajemen Rekayasa Industri	2
3	TI3005	Organisasi & Manajemen Perusahaan Industri	2
4	MR2101	Pengantar Manajemen Rekayasa	2
5	TI4109	Manajemen Keuangan	3
6	TI4203	Manajemen Pemasaran	3
7	TI4204	Manajemen Sumber Daya Manusia	3
8	MR3002	Manajemen Teknologi	3
9	MR3005	Manajemen Proyek	3
10	MR4107	Manajemen Kontrak	3
11	MB4045	Manajemen Investasi	3
12	MB4052	Manajemen Perubahan Strategis	3
13	MB4054	Manajemen Kualitas	3
14	MB4055	Manajemen Proyek	3

2b.2 Daftar Matakuliah Pilihan Lingkungan

	Kode	Nama Matakuliah	sks
1	BI2001	Pengetahuan Lingkungan	2
2	IL2205	Kesehatan Lingkungan	2
3	TL2105	Kesehatan Lingkungan	3
4	TL4002	Rekayasa Lingkungan	3
5	TL4201	Analisis Mengenai Dampak Lingkungan	3

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Matakuliah Pilihan Tahap Sarjana

Matakuliah Pilihan Bebas

Total bobot matakuliah pilihan bebas adalah **20 sks**.

Tabel 4a - Daftar Matakuliah Pilihan Prodi Teknik Elektro

No	Kode	Nama Matakuliah	sks	PT/P	No	Kode	Nama Matakuliah	sks	PT/P
1	EL4120	Jaringan Komputer	3	P	1	EL4233	Dasar Sistem dan Kendali Cerdas	3	P
2	EL4121	Perancangan Sistem Embedded	3	P	2	EL4234	Sistem Kendali Multivariabel	3	P
3	EL4122	Praktikum Perancangan Sistem Embedded	1	P	3	EL4235	Arsitektur Sistem Komputer II	3	P
4	EL4123	Sistem Kendali Digital	3	P	4	EL4236	Perancangan Perangkat Lunak Jaringan	3	P
5	EL4124	Praktikum Sistem Kendali Digital	1	P	5	EL4237	Teknologi IC	3	P
6	EL4125	Pengolahan Citra Digital	3	P	6	EL4138	Perancangan Sistem VLSI	3	P
7	EL4126	Robotika	3	P	7	EL4239	Fenomena Transpor di Biomedika	3	P
8	EL4127	Arsitektur dan Komputasi Paralel	3	P	8	EL4240	Pengukuran Biosinyal	3	P
9	EL4128	Perancangan Sistem Operasi	3	P	9	EL4241	Mikroelektronika RF & Mixed Signal	3	P
10	EL4129	Devais Semikonduktor	3	P	10	EL4093	Pengembangan Keprofesian & Komunitas	3	P
11	EL4230	Analisis dan Perancangan IC Digital	3	P	11	EL4113	Praktikum Sistem Instrumentasi	1	P
12	EL4131	Anatomi dan Fisiologi	3	P	12	EL4019	Sistem Penggerak Elektrik	3	P
13	EL4132	Teknik Biomedika	3	P		EL4094	Magang di Industri	9	P

P: matakuliah pilihan bebas

Tabel 4b - Daftar Matakuliah Pilihan Luar Prodi yang Dianjurkan

No	Kode	Nama Matakuliah Non Prodi (Sains Dasar)	sks	No	Kode	Nama Matakuliah Non Prodi (Bebas)	sks
1	FI2151	Biofisika	2	1	XXxxxx	MK Wajib/Pilihan/Layanan dari Prodi Lain di ITB	3
2	TK2081	Termodinamika Dasar B	2	2	TI3004	Ekonomi Teknik	2
3	TK2204	Mikrobiologi Industri	2	3			
4	MS2041	Rekayasa Termal & Mekanika Fluida	3				
5	MS2130	Termodinamika Teknik I	3				
6	MS2231	Mekanika Fluida I	3				
7	SI2131	Mekanika Fluida & Hidraulika	3				
8	TL2202	Kimia Lingkungan	3				
9	KL2101	Mekanika Fluida	3				
10	FI2204	Fisika Moderen	3				
11	FI2112	Pengantar Teori Relativitas Einstein	3				
12							

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Tabel 4c - Daftar Matakuliah Layanan untuk Prodi Lain

No	Kode	Nama Matakuliah	sks	Nama Prodi/Fakultas	Keterangan
1	EL2142	Sistem Digital dan Mikroprosesor	4	• Teknik Tenaga Elektrik/STEI • Sistem & Teknologi Informasi/STEI	MK Wajib
2	EL2043	Elektronika Industri	3	Teknik Material/FITB	MK Pilihan
3	EL2244	Sistem & Arsitektur Komputer	3	Sistem & Teknolgi Informasi/STEI	MK Wajib
4	EL4113	Praktikum Sistem Instrumentasi	1	Teknik Mesin (Mekatronika)/FTMD	MK Wajib
5	EL4019	Sistem Penggerak Elektrik	3	Teknik Mesin (Mekatronika)/FTMD	MK Wajib

3.2 Program Minor

Program minor Teknik Elektro disediakan untuk mahasiswa program sarjana dari program studi lain. Peserta program diharuskan mengambil dan lulus 7 matakuliah dengan bobot 18 sks seperti tertera pada Tabel 7.

Untuk dapat mengikuti program minor, mahasiswa dari luar Program Sarjana Teknik Elektro harus memenuhi semua persyaratan berikut:

1. lulus semua matakuliah TPB di fakultas/sekolah asal dengan IPK minimal 3.00,
2. memiliki nilai minimal B pada semua matakuliah Fisika Dasar dan Kalkulus di TPB,
3. lulus matakuliah EL1200 Pengantar Analisis Rangkaian dengan nilai minimal B.

Tabel 7 – Paket Matakuliah Minor Program Studi Teknik Elektro

	Kode	Nama Matakuliah	sks
1	EL1200	Pengantar Analisis Rangkaian	2
2	EL2001	Rangkaian Elektrik	4
3	EL2101	Praktikum Rangkaian Elektrik	1
4	EL2002	Sistem Digital	4
5	EL2005	Elektronika I	3
6	EL3014	Sistem Mikroprosesor	3
7	EL3114	Praktikum Sistem Mikroprosesor	1
		Jumlah	18

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4 *Roadmap* Matakuliah dan Kaitan dengan Capaian Lulusan

4.1 *Roadmap* Matakuliah

Pada dasarnya, sejumlah matakuliah memiliki pasangan co-requisite matakuliah praktikum, yaitu matakuliah yang diawali dengan nama "Praktikum" (lihat tabel di bawah). Namun demikian, matakuliah praktikum yang sudah lulus tidak perlu diambil kembali, jika matakuliah pasangannya diambil kembali.

No	Kode	Nama Matakuliah
1	EL2001	Rangkaian Elektrik
	EL2101	Praktikum Rangkaian Elektrik
2	EL2002	Sistem Digital
	EL2102	Praktikum Sistem Digital
3	EL2005	Elektronika
	EL2205	Praktikum Elektronika
4	EL2008	Pemecahan Masalah dengan C
	EL2208	Praktikum Pemecahan Masalah dgn C
5	EL3009	Elektronika II
	EL3109	Praktikum Elektronika II
6	EL3010	Pengolahan Sinyal Digital
	EL3110	Praktikum Pengolahan Sinyal Digital
7	EL3011	Arsitektur Sistem Komputer
	EL3111	Praktikum Arsitektur Sistem Komputer
8	EL3014	Sistem Mikroprosesor
	EL3214	Praktikum Sistem Mikroprosesor
9	EL3015	Sistem Kendali
	EL3215	Praktikum Sistem Kendali
10	EL3016	Sistem Komunikasi
	EL3216	Praktikum Sistem Komunikasi
11	EL3017	Sistem Tenaga Elektrik
	EL3217	Praktikum SistemTenaga Elektrik
12	EL4121	Perancangan Sistem Embedded
	EL4122	Praktikum Perancangan Sist.Embedded
13	EL4123	Sistem Kendali Digital
	EL4124	Praktikum Sistem Kendali Digital

Roadmap matakuliah lain adalah sebagai berikut:

Struktur Diskrit→(**co-req**)→Sistem Digital
Matematika1→Matematika2→Matematika TeknikI→ Matematika TeknikII
Matematika TeknikII→(**co-req**)→Sinyal & Sistem
Matematika1→Peng.Analisis Rangkaian→Sistem Digital
Kimia1→Kimia2→Material Teknik Elektro
Fisika1→Fisika2→Medan Elektromagnetik→Elektronika RF & Mixed Signal
Matematika1→Matematika2→Matematika TeknikI→Medan Elektromagnetik→Elekt. RF&Mixed Sig.
Matematika1→Matematika2→Probabilitas & Statistik→Sistem Komunikasi
Pengantar Teknologi Informasi B →Problem Solving with-C→ Sistem Mikroprosesor
Struktur Diskrit→Problem Solving with-C→ Sistem Mikroprosesor
Peng.Analisis Rangkaian→Sistem Digital→Arsitektur Sistem Komputer
Fisika1→Peng.Analisis Rangkaian→Rangkaian Elektrik→Sistem Tenaga Elektrik
Peng.Analisis Rangkaian→Rangkaian Elektrik→Sinyal & Sistem→Pengolahan Sinyal Digital
Peng.Analisis Rangkaian→Rangkaian Elektrik→Sinyal & Sistem→Sistem Kendali
Peng.Analisis Rangkaian→Rangkaian Elektrik→Sinyal & Sistem→Sistem Komunikasi

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Peng.Analisis Rangkaian→Rangkaian Elektrik→Elektronika→Sistem Instrumentasi
Peng.Analisis Rangkaian→Rangkaian Elektrik→Elektronika→ElektronikaII
Peng.Analisis Rangkaian→Rangkaian Elektrik→Elektronika→Sistem Mikroprosesor
Sistem Mikroprosesor→Peranc.Sistem Embedded
Pengolahan Sinyal Digital→Pengolahan Citra Digital
Sistem Komunikasi→Jaringan Komputer→Peranc.Per.Lunak Jaringan
Arsitektur Sistem Komputer→Arsitektur & Komputasi Paralel
Problem Solving with-C →Peranc.Sist.Operasi
Arsitektur Sistem Komputer→Peranc.Sist.Operasi
Problem Solving with-C →Arsitektur Sistem KomputerII
Arsitektur Sistem Komputer→Arsitektur Sistem KomputerII
Sistem Kendali→Robotika
Sistem Kendali→Sistem Kendali Digital
Pengolahan Sinyal Digital→ Sistem Kendali Digital
Sistem Kendali→Sistem Kendali Multivariabel
Sistem Kendali→Dasar Sistem & Kendali Cerdas
Sistem Mikroprosesor→Dasar Sistem & Kendali Cerdas
Elektronika→Pengembangan Keprofesian & Komunitas
Elektronika→Sistem Penggeral Elektrik
Elektronika→Devais Semikonduktor
Material Teknik Elektro→Devais Semikonduktor→Teknologi IC
Sistem Digital →Peranc.Sistem VLSI
Sistem Digital →Analisis & Peranc. IC Digital
Medan Elektromagnetik→Elektronika RF&Mixed
Sinyal & Sistem→Elektronika RF&Mixed
Sistem Instrumentasi→Teknik Biomedika
Pengolahan Sinyal Digital→Pengukuran Biosinyal
Kimia Dasar IIB→Anatomi & Fisiologi→Pengukuran Biosinyal
Matematika Teknik II→Fenomena Transpor di Biomedika

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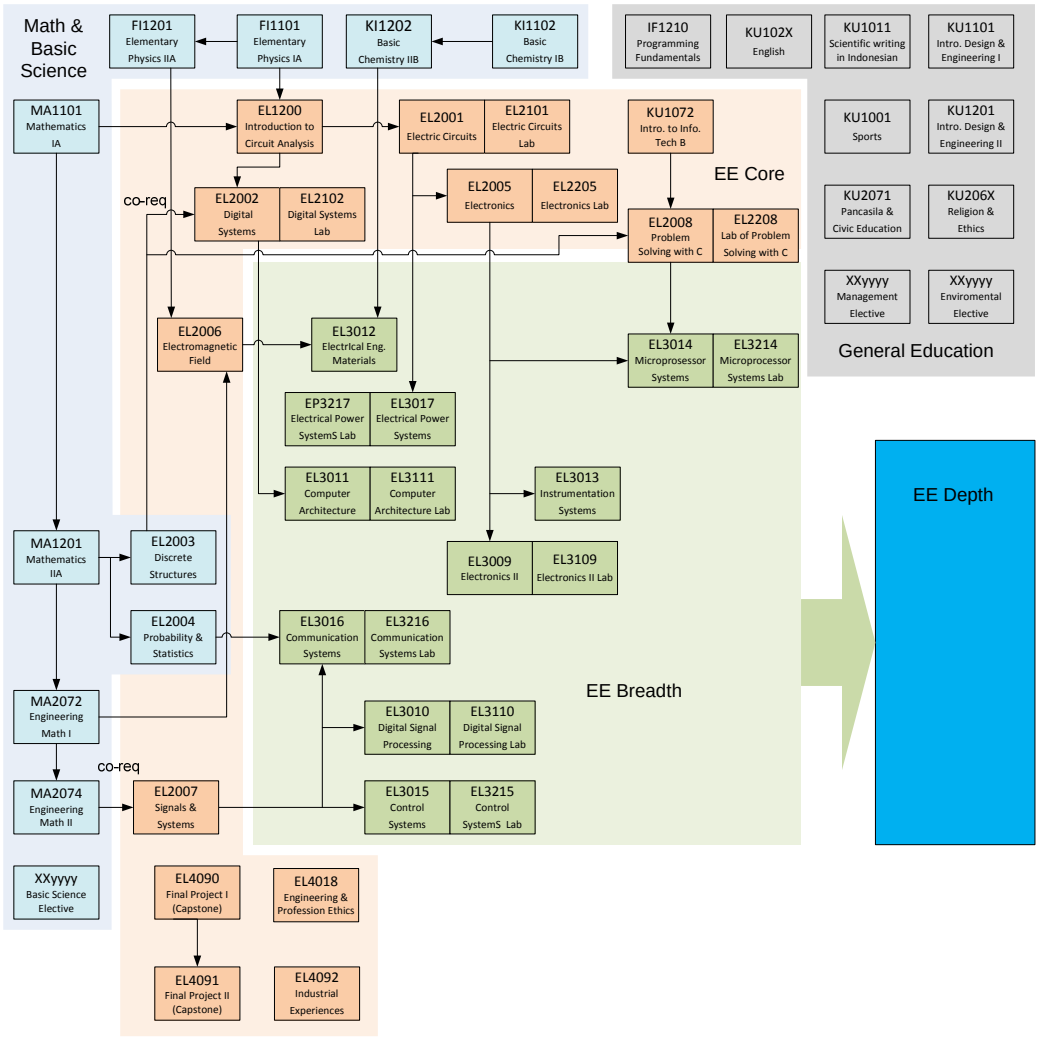

4.2 Peta Kaitan Matakuliah dengan Capaian Lulusan

Basic Science and Mathematics Courses

	Basic Science and Math	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
MA1101	Mathemathics IA	H														H			H
FI1101	Elementary Physics IA	H	H																H
KI1102	Basic Chemistry IB	H	H																
MA1201	Mathematics IIA	H														H			H
FI1201	Elementary Physics IIA	H	H																H
KI1202	Basic Chemistry IIB	H	H																
MA2072	Engineering Mathematics I	H														H		H	H
EL2003	Discrete Structures	H																H	H
MA2074	Engineering Mathematics II	H														H		H	H
EL2004	Probability & Statistics	H													H				H

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	Basic Science Elective (Select One)	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
MS2130	Engineering Thermodynamics I	H				M													
MS2231	Fluid Mechanics I	H				M													
MS2041	Rekayasa Termal & Mekanika Fluida	H				M													
SI2131	Fluid Mechanics and Hydraulics	H																	
KL2101	Fluid Mechanics	H																	
TK2081	Thermodynamics Fundamental B	H				M													
TK2204	Industrial Microbioloy	H																	
FI2112	Introduction to Einstein's Relativity Theory	H																	
FI2151	Biophysics	H																	
FI2204	Modern Physics	H																	
TL2202	Environmental Chemistry	H																	

Electrical Engineering Core Courses

	EE Core	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
KU1072	Introduction to Information Technnogy B						M		M			H					L		
EL1200	Introduction to Circuit Analysis	H				L						M				L		L	
EL2008	Problem Solving with C		H	H		H	L	H			L	H		H					
EL2208	Problem Solving with C Lab		H				L	H				M			L				
EL2001	Electric Circuits	H				M						M				M		M	H
EL2101	Electric Circuits Lab		H				L	H				M			L				
EL2002	Digital Systems	L		M		M						M							
EL2102	Digital System Lab		H				L	H				M			L				
EL2005	Electronics	H		H		M						M					H	M	H
EL2105	Electronics Lab		H				L	H				M			L		L		
EL2006	Electromagnetics	H				M						M						H	H
EL2007	Signals and Systems	H	M			M						M				H		H	H
EL4092	Industrial Experience				H	H	H	H	H	H									
EL4090	Final Project I (Capstone Design)		H	H	H		H	H	H	H	H	H	H	H					
EL4091	Final Project II (Capstone Design)		H	H	H		H	H	H	H	H	H	H	H	L				H
EL4018	Profession & Engineering Ethics						H		H	L	L								

Electrical Engineering Breadth Courses

	EE Breadth	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
EL3013	Instrumentation Systems	M		H		H					L	M		H					
EL3015	Control Systems	H		H								M	H			H		H	L
EL3215	Control Systems Lab		H					H				M	H		L				
EL3009	Electronics II	L		H		M						M	H						L
EL3109	Electronics II Lab		H				L	H				M			L		L		
EL3016	Communication Systems	M				M						M	H		H		H	M	L
EL3216	Communication Systems Lab		H					H				M	H		L				
EL3011	Computer Architecture	L		H		M						M	H				H		M
EL3111	Computer Architecture Lab		H					H				M	H		L		L		
EL3017	Electrical Power Systems	L				M						M	H						L
EL3217	Electrical Power Systems Lab		H					H				M	H		L				
EL3010	Digital Signal Processing	H				M						M	H				H	M	M
EL3110	Digital Signal Processing Lab		H			M		H				M	H		L		L		
EL3014	Microprocessor Systems	L	H	H		M		H				M	H		L		H		M
EL3214	Microprocessor Systems Lab																		
EL3012	Electrical Engineering Materials	L											H						M

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General Education Courses

	General Education	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
KU1011	Scientific/Technical Writing							H											
KU1101	Introduction to Design & Engineering I	L					H		L	H	L								
KU102X	English							H			L								
KU1001	Sports				H		H												
KU1201	Introduction to Design & Engineering I	L							L		L								
KU206X	Religion and Ethics						H			H	M								
KU2071	Pancasila and Civics						H				M								
IF1210	Programming Fundamentals						H		M			L							
	Environmental Science Elective			M					H										
	Management Elective			M					H										
	Non-EE Elective						H	H	H										
EL-4093	Professional/Community Development						H		H	L	L								
EL-4094	Industry Internship				H	H	H	H	H	H									

Electrical Engineering Depth Courses

	EE Depth	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
EL4132	Biomedical Engineering	H					L					M							
EL4131	Anatomy and Physiology	H																	
EL4240	Biosignal Measurements	L		M		H						M		H					M
EL4239	Transports Phenomena in Biomedics	H				M													
EL4125	Digital Image Processing	M	L	M		H					M	H		H					M
EL4241	RF and Mixed Signals Eelctronics	M		H		H	L	H				H		H					
EL4129	Semiconductor Devices	L		H		H					L	H		H					M
EL4138	VLSI System Design	L		H		H		H				H							
EL4121	Embedded Systems Design	L		H		H	L	H			M	H		H					M
EL4122	Embedded Systems Design Laboratory		H											H					
EL4237	IC Technology	L		H		H					M	H		H					M
EL4230	Analysis & Design of Digital IC			H		H	L	H			M	H		H					M
EL4123	Digital Control Systems	L		H		H					M			H					M
EL4124	Digital Control Systems Laboratory		H									H		H					
EL4234	Multivariable Control Systems	M		H		H					M			H					
EL4126	Robotics	L		H	H	H		H	L		H	H		H	L		H		
EL4233	Intelligent System & Control Fundamentals	M		H		H					M	H		H					
EL4127	Parallel Architecture & Programming		H	H		H	L	H			H	H		H					
EL4128	Operating System Design	L		H		H	L				M	M		H					M
EL4236	Network Software Engineering	L	H	H		H	L	H				H		H					
EL4120	Computer Networks	L		L		M					L	M		H					
EL4235	Computer Systems Architecture II	L	M			H	L				H	H		H	L				M
EL4019	Electric Drive Systems																		
EL4113	Instrumentation Laboratory		H											H					

Annotation:

H represents a high contribution of the course to the particular outcome (exam)
M represents a medium contribution (homework)
L represents a low contribution (in class works or discussions)

5 Atmosfer Akademik

Mahasiswa pada tahun ke-2, pada dasarnya, baru mengalami atmosfer akademik di program studi Teknik Elektro. Oleh karena itu, mereka dimaksudkan untuk mengambil matakuliah tidak lebih dari

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yang ditetapkan di kurikulum per semesternya. Peran dosen wali akademik sangat penting untuk memastikannya.

Kurikulum program studi Teknik Elektro mengandung sejumlah matakuliah yang pelaksanaannya mengacu kepada pradigma *learner centered learning*, yaitu pada semua matakuliah Praktikum, Kerja Praktek, dan Tugas Akhir (*Capstone Design*). Selain itu, sebagai bagian dari pelaksanaan kuliah, matakuliah lain didorong agar mengandung komponen penilaian dari tugas atau projek dengan tingkat kesulitan yang sesuai, terutama matakuliah bermuatan perancangan sistem.

Semua matakuliah dengan praktikum harus diambil bersamaan, kecuali bagi mahasiswa non Teknik Elektro yang hendak mengambil minor Teknik Elektro, atau jika sumber daya praktikum maupun ruangan menjadi pembatas. Selain itu, sejumlah matakuliah praktikum pada kurikulum semester yang sama, akan memiliki penjadwalan praktikum yang ketat dan tidak diperkenankan bentrok dengan jadwal semua mata kuliah (dalam maupun luar prodi) di semester tersebut. Oleh karena itu, penting menjaga pola pagi-praktikum dan sore-kuliah (atau sebaliknya) yang berselang untuk setiap tahun atau tingkat kurikulum prodi.

Semua matakuliah dengan kelas paralel dimaksudkan pelaksanaannya pada jadwal yang sama dan dikoordinasikan oleh seorang dosen koordinator untuk menjaga kebakuan dan sinkronisasi pada pengajaran materi kuliah maupun pembuatan bahan ujian.

Selain tutorial yang terjadwal waktu dan ruangnya pada sejumlah matakuliah wajib tertentu, sangat diperlukan adanya ruang-bersama (selain perpustakaan) yang cukup besar bagi para mahasiswa Teknik Elektro untuk dapat saling berinteraksi untuk menunjang kegiatan akademik dalam kampus.

Untuk efisiensi penggunaan sumber daya dosen pada kegiatan perkuliahan program studi secara keseluruhan, sebuah matakuliah pilihan dalam program studi hanya ditawarkan pada salah satu semester saja untuk jumlah peserta minimum tertentu.

Mahasiswa hendaknya memiliki kebiasaan membaca terlebih dahulu materi perkuliahan sebelum menghadiri kuliah tatap muka dan membaca kembali materi tersebut setelahnya. Tugas atau pekerjaan rumah adalah sarana latihan bagi mahasiswa untuk lebih memahami materi matakuliah. Matakuliah tanpa praktikum dapat menyertakan tugas atau pekerjaan rumah secara per kelompok yang bersifat praktek atau aplikasi nyata.

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6 Asesmen Pembelajaran

6.1 Organization Structure

The organizational structure for the decision making processes for curricular issues, at the program level, is shown in the block diagram in Figure 1.

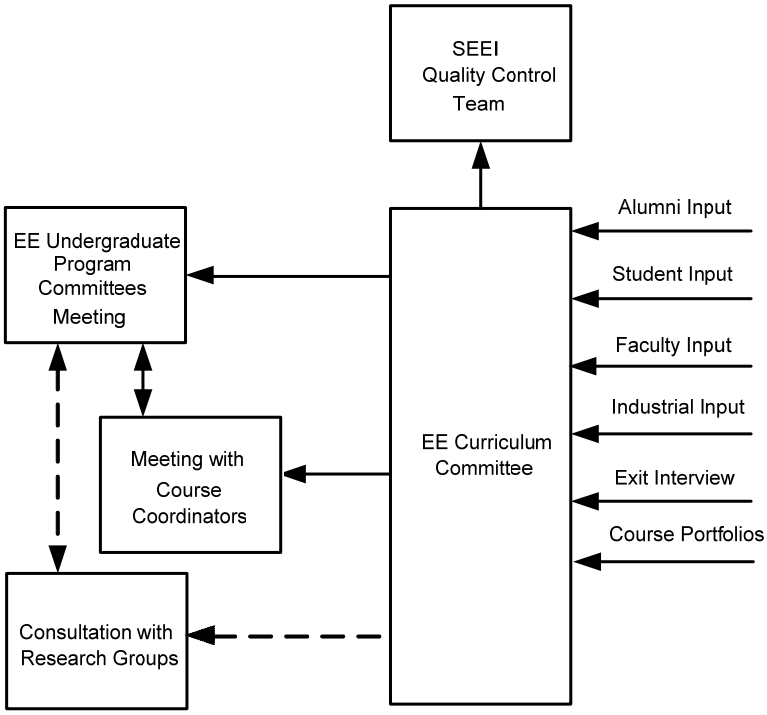

Figure 1 Organization Structure

As presented in Figure 1 above, all the data, comments and recommendations from all the processes are received, analyzed, tabulated and documented by the Curriculum Team. These materials constitute the basis for all curricular and course changes aiming to improve the program. The mechanisms involved in the evaluation of the materials, the decision making and the approval processes for curricular improvements will be discussed in the following sections.

6.2 EE Undergraduate Committees

The EE Undergraduate Committees are coordinated and headed by the current head of EE Undergraduate Program. The Committees are formed to assist some tasks of the head of EE program. The members of the committees are proposed by the head of EE program and formally appointed by SEEI.

There are 4 (four) EE Undergraduate Committees, i.e.

- Curriculum Committee
- Capstone Design Project Committee
- Internships Committe
- Teaching & Laboratory Assistant Committe

The Curriculum Committee has the responsibility to assess the EE program for continuous improvement and to prepare the EE Program for BAN national and ABET international accreditations. The assessment results are brought to the EE Undergraduate Program Committees Meeting for deciding the necessary changes or modification of courses to implement by the Undergraduate EE Program. If it is needed, the meeting's recommendations for changes in the organization, process, and management of the EE Program may be submitted to the Dean of SEEI through the Vice Dean of Academic & Student Affairs of SEEI.

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6.3 Meeting with Course Lecturer/Coordinators

Course coordinators are faculty members currently teaching that particular course. If a course is being taught in a multiple sections, a coordinator is selected by the head of the EE program. The head of the program usually conduct meeting with course lecturers and coordinators to ensure that all issues related to course or issues regarding curricula are addressed. One of important data needed for the meeting are course portofolios.

The function of these meetings is also to address issues, in reference to course portfolios, regarding course content implementation, the course objectives and prerequisites. Meetings are usually conducted when an issue arises whether from students or faculty members. The results of these meeting is brought to the EE Program Committees Meeting for deciding the necessary changes or modification of courses to implement by the EE Program.

6.4 Consultation with Head of Research Group

The faculty is organized in research groups based on their expertise and interests. These research groups which relates to the EE program are:

- Biomedical Engineering
- Computer Engineering
- Control & Computer System
- Electronics Engineering
- Informatics
- Electrical Power Engineering
- Telecommunication Engineering

The main function of research groups are to develop and conduct research. This function is strongly related to masters and doctoral education program, and not to the EE undergraduate education. Therefore, the role of the research groups in the EE undergraduate education is mainly to have a consulation with EE Program Committees. The consulation is to make sure that the coordination and continuity between prerequisites and the courses that follow, and hence the material in the broad area, is covered in a coherent way by the different courses especially in the depth area (elective courses). Another area needs to be addressed in this consultation is to discuss faculty assignment for teaching load.

6.5 SEEI Quality Control Team (Gugus Kendali Mutu – GKM)

All result regarding achievement of undergraduate program within SEEI is reported to GKM. GKM will make recommendation of changes at SEEI level after consultation with the undergraduate program heads. GKM also reports to the ITB Quality Control Unit (Satuan Penjamin Mutu – SPM). The main function of GKM is to monitor and evaluate achievement of SEEI key performance indicator, including the achievement of EE Undergraduate Program, which is set by the university, Insitut Teknologi Bandung.

6.6 Information Used for Program Improvement

It has been a university wide practice that the curriculum of any study program in the university is updated every five year for program improvement. EE Program curricular changes is not based solely on faculty input on the state of the art of EE education. The EE Program also measure the program outcome using indirect measurement such as alumni surveys and exit surveys, which are indirect measurements. In addition, the EE Curriculum Committee will perform direct measurements of the program/students outcomes along with the indirect measurements.

Continuous improvement of the EE Program is part of the regular curriculum update activities. Figure 2 shows the cycle of assessment process for the EE Program.

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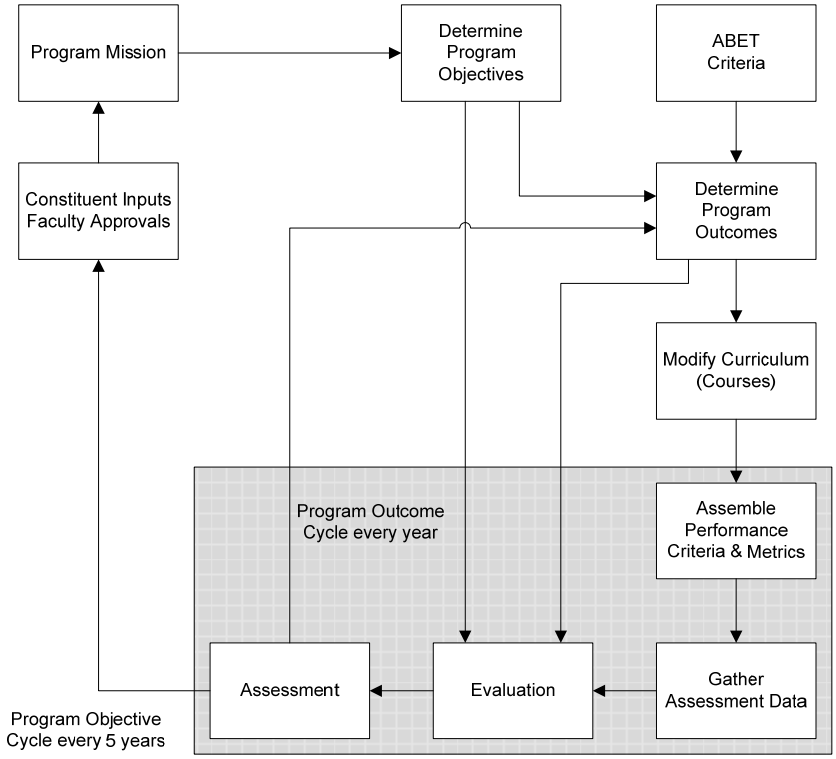

Figure 2 Process of Program Assessment

Referring to Figure 2, the EE **Program Educational Objective** is measured using indirect measurement which consists of alumni survey and exit interviews. Measurement of program educational objectives using alumni survey is conducted every year and exit interview is conducted every graduation (3 times a year). Evaluation and assessment of program educational objectives will be conducted in a 5 year cycle.

Program/Students Outcomes (PO/SO) are measured using course rubrics for the direct measurement and using course surveys for the indirect measurement. Measurement using course survey is being done every semester excluding the short semester (in other words summer semester between Fall and Spring even though we do not have four seasons). Measurement using rubric which requires more effort is only conducted in 3 years. The EE Curriculum Committee proposes a detailed timeline plan to spread of all outcomes measurement so that the measurement may conducted every year because we need the data of the previous academic year for the purpose of gaining some data before ABET accreditation process.

As an effort to measure and improve the program outcomes, the EE Curriculum Committee coordinate a direct measurement of each of the program outcome a set of courses that represents all of the program outcomes. This set of courses are proposed by the EE Curriculum Committee and approved by EE Undergraduate Teams Meeting for the evaluation period of 3 years. The EE Curriculum Committee proposes a detailed timeline plan to spread of all outcomes measurement. Therefore, the outcome measurements may be conducted every semester to collect some data for recommended improvement action at the end of 3 years period. Obviously, the data may be used for accreditation purposes, such as for ABET re-accreditation process.

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Table 1 Assesment of Student/Program Outcomes

	Student Outcomes	Assessment
a	An ability to apply knowledge of mathematics, science, and engineering	Rubrics of selected courses contributing to this outcome. Student exit interview
b	An ability to design and conduct experiments, as well as to analyze and interpret data	Rubrics of selected courses contributing to this outcome. Student exit interview
c	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	Rubrics of selected courses contributing to this outcome. Student exit interview
d	An ability to function on multi-disciplinary teams	Rubrics of selected courses contributing to this outcome. Student exit interview
e	An ability to identify, formulate, and solve engineering problems	Rubrics of selected courses contributing to this outcome. Student exit interview
f	An understanding of professional and ethical responsibility	Rubrics of selected courses contributing to this outcome. Student exit interview
g	an ability to communicate effectively	Rubrics of selected courses contributing to this outcome. Student exit interview
h	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	Rubrics of selected courses contributing to this outcome. Student exit interview
i	A recognition of the need for, and an ability to engage in life-long learning	Rubrics of selected courses contributing to this outcome. Student exit interview
j	A knowledge of contemporary issues	Rubrics of selected courses contributing to this outcome. Student exit interview
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Rubrics of selected courses contributing to this outcome. Student exit interview
l	breadth of knowledge over all areas within electrical engineering (electromagnetics, power, electronics, signals and systems, and computer engineering)	Rubrics of selected courses contributing to this outcome. Student exit interview
m	depth of knowledge in at least one area	Rubrics of selected courses contributing to this outcome. Student exit interview
n	knowledge of probability and statistics, including applications to electrical and computer systems	Rubrics of selected courses contributing to this outcome. Student exit interview
o	knowledge of mathematics through differential and integral calculus	Rubrics of selected courses contributing to this outcome. Student exit interview

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p	knowledge of basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components	Rubrics of selected courses contributing to this outcome. Student exit interview
q	knowledge of advanced mathematics, linear algebra, complex variables, and discrete mathematics	Rubrics of selected courses contributing to this outcome. Student exit interview
r	background for graduate study	Rubrics of selected courses contributing to this outcome. Student exit interview

Other information is collected from several informal gatherings between students and the Head of EE Program. The Head of EE Program is also occasionally received comments, complaints, and suggestion about EE Program and its academic implementation (lectures, lab works etc) from student or faculty members through e-mails or face-to-face meeting.

6.7 Actions to Improve the Program

The activity taken for major program improvement is implemented every 5 year and minor improvement every year as deemed necessary. The activity comprises several levels of actions as follows.

Firstly, based on the available surveys, the EE Program Objectives may need to be modified, added, or changed by the advisory board and executives of the school together with the head of EE Program. It is noted that the resulting objective should comply with the mission and goal of the school and within those of the university as well. The SEEI Advisory Board will hold a meeting with Head of EE Program and SEEI executives to decide tha changes (if any) of the previous EE Program Educational Objective.

A similar process is applied to set up or modify the EE Program Outcomes, but now using the alumni, employer, and student exit surveys. Based on those indirect measurements, revised program outcomes are proposed by the EE Curriculum Committee and the head of EE program. Having set up the new program outcomes, which is in-line with accreditation requirements (e.g. BAN or ABET), the curriculum is designed or modified by the EE Curriculum Committee and the Head of EE Program. The process is always brought to the EE Undergraduate Committees Meeting for formal approval.

Unlike the previous ones, the last level of improvement actions are taken by the Head of EE Program and are implemented every semester based on the course evaluation surveys and any information obtained from students through informal gatherings or e-mails to the head of EE Program. The actions may be in the form of re-appointing more suitable faculty member for particular courses, offering some courses in short semester or in two semesters in each academic year, modifying laboratory procedures and or materials, proposing new or more laboratory or teaching facilities to the school's dean.

The regular improvement effort has been done since the beginning of the academic year 2009/2010. Below is the history of recorded improvement from 2003 to 2008 EE program curricula and from 2008 to 2013 EE program curricula.

The curricular changes in the 2008 EE Program were:

- Eliminate the rigid concentration area requirement where a student can only select one concentration area to become a more flexible where a student can make a plan of study based on more than one concentration area.
- Introduce a breadth and depth approach where a student need to take a five out of nine selection of breadth courses which represents the EE fields and depth courses where a student can gain more in-depth knowledge on a particular concentration area.

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- Two new courses (Basic Electric Circuit and Introduction to Information Technology IA) were introduced for all new students in their second semester. The introduction was to equip the students in the school with basic electrical and programming knowledge earlier. Note that not all students in the school will choose to enter EE Program.
- Changes in how we conduct parallel section of a class. At the beginning of the semester, the head of EE Program asks the coordinator to ensure the same standard for all classes.
- Changes in teaching methods by making a course more interesting and hence increasing students learning rate, the usage of multimedia is encouraged and its related equipments are proposed to the school's dean.
- To increase the number of graduates, instead of waiting for one semester for non passing students, the EE Program now offered EE core courses in every semester.
- For several cases, faculty re-appointments have also been implemented based on student's complaints channeled through course evaluation surveys and or e-mails to the head of EE Program.
- Changes also conducted to improve several labs, such as changes in kit and experiment procedures of Electric Circuit and Digital System laboratory activities (EL2093 Electric Circuits and EL2095 Digital Systems courses) were done based on the results of limited students lab surveys.

In line with the SEEI Advisory Board Meeting in December 2012, there is no changes in Program Educational Objective nor the Student/Program Outcomes for the 2013 EE Undergraduate curricula. For the improvement of the 2013 EE Undergraduate Curricula, re-evaluaion of the 2008 EE curricula were then done by re-assesment of all learning objectives (LOs) for the EE ITB students. These LOs were derivated from the pre-determined Body of Knowledge of the EE Undergraduate Program of ITB. In addition, measurements of program outcomes and evaluation on the Capstone Design (Tugas Akhir) indicates that most EE students do not have necessary skills and knowledge to smoothly complete their Capstone project. This is due to most of the students merely take 5 out of 9 EE breadth courses in their 3rd year in the 2008 EE Curricula.

To address the evaluation and re-assessment results, the curricular changes in the new 2013 EE program are:

- The available breadth courses that represents the EE fields are now compulsory for every EE student in the 3rd year. Furthermore, all breadth courses are not from other undergraduate program but are now offered by EE program itself.
- A new breadth course EL3013 Instrumentation Systems, which has unified contents of previous 4 (four) instrumentation courses (EL3002, EL3012, EL3022, EL3044) in 2008 EE Curricula. This course replaces EL3000 Biomedical Engineering & Lab of 2008 EE Curricula that becomes a depth elective course in 4th year.
- Due to a new offered 1st year course on Basic Programming, which are compulsory for all 1st year SEEI students, the credits of Chemistry courses are now reduced from 6 to 4 credits in total in the 1st year. The 2 credits deficiency for Basic Science is then fulfilled in the 3rd year Basic Science course, which is a compulsory elective.
- Due to changes in its LOs, a new course EL2208 Problem Solving with C, wth its Labs, is introduced to replace IF3020 Algorithm & Data Structures (taken from other undergraduate program) in the 2008 EE Curricula.
- Aimed to expose the students with more hands-on experience, there are 4 new Laboratory course (4 credits in total) to cover necessary LOs related to some Core and Breadth Courses, i.e. Labs for Problem Solving with C, Electronics II, Microprocessor System, Communication System, and Power System.

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