

# Outcomes Based Curriculum dan IABEE



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Workshop  
Musyawarah Nasional FORTEI 2018  
Batu-Malang, 11 Oktober 2018

# Personal Background



## Education & Training:

- Ir. (ITB,1990), MEngSc (UNSW, 1998), PhD (Univ. of Newcastle, 2005)
- Evaluator JABEE Training, Tokyo, 2015
- IDEAL ABET Training, New Orleans, 2017
- PEVC ABET Training (observer), Baltimore, 2017
- IPM PII, 2017

## Working Experience:

- Research Engineer PT IPTN, 1990-1992
- Kaprodi Teknik Elektro ITB, 2012-2014
- Wakil Ketua FORTEI (2012-2014) & Ketua FORTEI (2014-2016)
- Komisi Akademik FORTEI, 2016-2018
- Gugus Kendali Mutu STEI ITB, 2016-
- Koord.Prodi Teknik Elektro ITERA, 2016-
- Chair of EAC (Evaluation & Accreditation Committee) IABEE, 2018-

# Background [1]



- **Laporan UNESCO 1972:**
  - peran pendidikan dalam proses kematangan dan kemandirian individu
  - prinsip utama bagi pendidikan adalah kontribusi yang harus dilakukan untuk melepaskan diri dari ketergantungan.
- **Laporan UNESCO 1996:**
  - kematangan & otonomi merupakan karakteristik sumber daya manusia yang lebih dalam & harmonis.
  - Misi pendidikan adalah memungkinkan setiap orang untuk mengembangkan semua bakat sepenuhnya & untuk mewujudkan potensi kreatif, termasuk tanggung jawab hidup sendiri & pencapaian tujuan pribadi.

## Background [2]



- Pendidikan dapat dikatakan sebagai proses **pematangan sepanjang hayat** yang menuntun seseorang untuk **melepaskan diri dari ketergantungan & mengalami kemandirian.**
- Pendidikan, bila tidak dirancang dan diimplementasikan dengan benar, dapat menghambat pematangan dan kemandirian perorangan sebagai tujuan akhir sebuah pendidikan.

# Outcome Based Education



- Pendidikan berbasis luaran (OBE: *outcome based education*) adalah pembelajaran berpusat pada siswa (SCL: *student centered learning*)
- **Landasan** pendidikan berbasis luaran adalah **capaian pembelajaran** (program).
- Capaian pembelajaran (program) mewujudkan apa yang telah diketahui dan dipahami siswa serta keterampilan dan kompetensi mereka.

## Central of OBE



“Elemen-elemen sistemik, struktural, operasional, dan budaya dari pendidikan, serta kegiatan belajar mengajar, tugas dan alat penilaian, serta sistem penilaian harus ditentukan oleh, dirancang dari, dibangun di atas, terfokus pada, dan terorganisir **di seputar capaian pembelajaran** (program). “

# CP Program vs CP Matakuliah



- Capaian pembelajaran matakuliah (CPMK) mengacu pada apa yang seharusnya siswa telah pelajari di akhir kuliah, sementara capaian pembelajaran program (CPP) mengacu kepada apa yang seharusnya telah ditunjukkan siswa.
- CPMK mengacu pada maksud dari dosen/guru, sementara (CPP) mengacu pada kinerja para siswa.
- Capaian pembelajaran matakuliah (CPMK) ditulis dari perspektif dosen/guru sedangkan capaian pembelajaran program (CPP) ditulis dari perspektif siswa.

# OBE & SCL



Pendidikan berbasis luaran adalah bukan tentang apa yang diajarkan dosen, tetapi tentang apa yang dicapai para siswa.



CP Prodi: mahasiswa mampu mengaplikasikan matematika (*student centered*)

CP Matakuliah: Mahasiswa mampu menentukan kestabilan sistem LTI (*teacher centered*)



# Outcome Based Education (OBE)



Sistem pendidikan berbasis luaran mencakup dua aspek penting yaitu

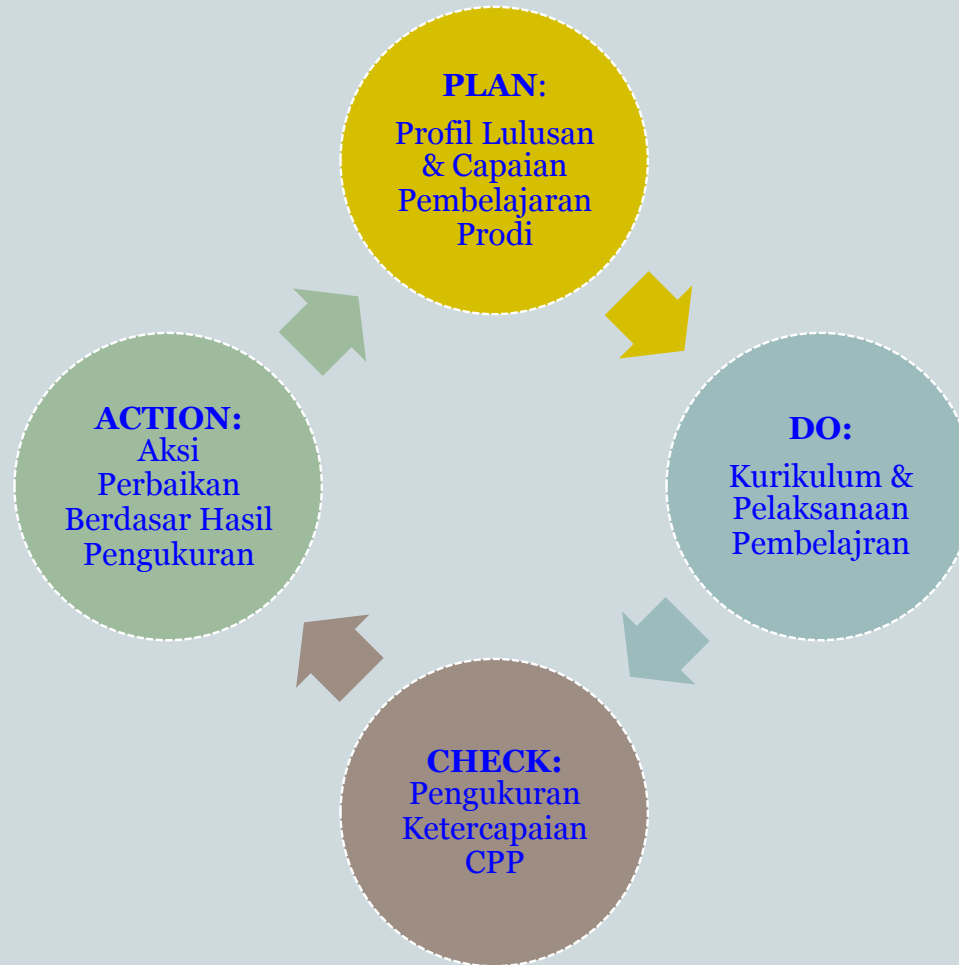
1. mengembangkan sekumpulan capaian pembelajaran (*learning outcomes*) yang jelas
2. memfokuskan semua komponen sistem serta menetapkan kondisi & peluang dalam sistem yang memungkinkan & mendorong semua siswa untuk mencapai capaian pembelajaran yang penting

# Continuous Improvement: PDCA Cycle



- Capaian pembelajaran program studi adalah sentral dalam paradigma **pembelajaran berbasis luaran** (*outcome-based education*) dalam kerangka **perbaikan kualitas berkelanjutan** (*continuous quality improvement*).
- Pendidikan berbasis luaran melibatkan sebuah siklus perbaikan berkelanjutan yang melibatkan 4 (empat) kegiatan utama: **P** (*plan*), **D** (*do*), **C** (*check*), dan **A** (*action*).

# Continuous Quality Improvement



# PDCA Cycle: Plan (P)



Kegiatan pertama adalah P (*plan*) yg terdiri dari :

- **Penetapan Profil Lulusan** yang diharapkan setelah 3 s/ d 5 tahun kelulusan & sesuai dengan visi-misi institusi penyelenggara prodi dan kebutuhan pemangku kepentingan. Profil lulusan mesti ditinjau secara berkala agar selalu relevan terhadap kebutuhan terkini dari institusi & kebutuhan pemangku kepentingan.
- **Penetapan Capaian Pembelajaran Prodi (CPP)** yang dapat terukur tingkat pemenuhannya. CPP tersebut dapat dirumuskan sendiri oleh prodi dengan syarat semua butir rumusan CPP FORTEI 2016 sudah terwakili, yang dapat ditunjukkan melalui pemetaan hubungan keduanya.

# PDCA Cycle: Do (D) [1]



Kegiatan D (*do*) terkait dengan **penyusunan kurikulum** sbb:

- Penetapan bidang kajian prodi (BK) dapat menggunakan rujukan Rekomendasi Kurikulum Inti (rumpun) Teknik Elektro 2014. Persyaratan berupa kriteria kurikulum umum keteknikan maupun pada disiplin Teknik Elektro untuk keperluan akreditasi (semisal IABEE) juga boleh dirujuk pada langkah ini. Patut dicatat bahwa bidang kajian yang disebutkan pada rumusan CPP FORTEI 2016 pada aspek pengetahuan haruslah tercakup.

## PDCA Cycle: Do (D) [2]



- Penyusunan dan penetapan sejumlah Capaian Pembelajaran Matakuliah (CPMK) atau *course learning outcomes* pada setiap Bidang Kajian. Untuk setiap CPMK, tentukan tingkat kognitif taksonomi Bloom tertentu yang diharapkan serta jumlah jam pembelajaran yang diperlukan (yang akan menentukan bobot SKS).
- Pengelompokan sejumlah CPMK untuk penetapan nama matakuliah (MK) sebagai wadah suatu kelompok CPMK tersebut dengan bobot SKS yang sesuai. Untuk setiap mata kuliah, susun silabus lengkap matakuliah beserta pemetaan semua CPMK nya terhadap butir CPP yang relevan. Total SKS untuk semua MK dalam kurikulum hendaknya mencapai 144 SKS dan pastikan bahwa semua butir CPP telah terwakili.

# PDCA Cycle: Check (C)



Proses asesmen dan evaluasi tingkat pemenuhan Capaian Pembelajaran Prodi adalah kegiatan C (*check*) sbb:

- Pembuatan pemetaan keterkaitan CPP dengan CPMK sebagai rujukan asesmen terhadap tingkat pemenuhan CPP.
- Pembuatan rubrik sebagai alat ukur tingkat pemenuhan setiap butir CPP.
- Lakukan asesmen ketercapaian secara berkala pada setiap butir CPP yang tercakup pada sejumlah MK terpilih menggunakan alat ukur rubrik.
- Lakukan evaluasi tingkat pemenuhan CPP pada data hasil asesmen terhadap standar kualitas internal yang ditetapkan prodi.

# PDCA Cycle: Action (A)



Kegiatan akhir dalam siklus perbaikan berkelanjutan PDCA adalah kegiatan A (*action*) sbb:

- Pengusulan dan pelaksanaan aksi untuk perbaikan berdasarkan hasil pengukuran pemenuhan setaip butir CPP yang dianggap kurang/tidak memenuhi standar internal. Sebagai contoh, silabus mata kuliah dan/atau CPMK dapat direvisi berdasarkan hasil pengukuran pemenuhan CPP yang dilakukan secara berkala.
- Dokumentasi bukti dan hasil kegiatan asesmen, evaluasi, dan aksi perbaikan yang terpelihara dan dapat dijangkau oleh pihak yang berkepentingan.



# IABEE



## Indonesian Accreditation Board for Engineering Education

- Quality & relevance of engineering higher education are paramount
- Quality within a framework of an internationally recognized standards & practices.
  - IEA (Internat. Eng. Alliance) Graduate Attributes
  - IEA Agreement: Washington Accord

# SCOPE OF ACCREDITATION



- Evaluation & accreditation by IABEE are aimed at 4 year Bachelor-level programs in engineering disciplines with a bachelor degree *Sarjana Teknik* and a minimum course load of 144 credits.
- IABEE does not evaluates & accredits Program Operating Institutions (POI), such as Faculty, School, University, Institute, or equivalent units
- A program is also evaluated based on chosen engineering discipline criteria which best describe its body of knowledge
- A program must meet all eligibility requirements

# CATEGORIES OF ACCREDITATIONS



IABEE offers

- **General Accreditation**, intended for programs with that have implemented outcome-based education system and at the time of the evaluation process has produced graduates with the system,
- **Provisional Accreditation**, intended for programs with at least its first year students have completed learning with outcome-based education system. Provisional Evaluation measures the potential for compliance of the Program to the Accreditation Criteria and RPEA.

# EVALUATION PROCESS



- An approved Evaluation Team evaluates the compliance of an eligible Program to **RPEA, Accreditation Criteria (AC)**, i.e. **Common Criteria & Criteria Guide**, and **Discipline criteria** by reviewing & verifying the Program Profile, Self-Evaluation Report (SER), relevant evidences submitted by the Program through IABEE On-line Evaluation System, and On-site evaluation.

# ELIGIBILITY REQUIREMENTS



The **program** has

- its **university** with a minimum rank accreditation of '**B**' from Indonesian National Accreditation (**BAN PT**).
- a minimum rank accreditation of '**A**' for **General Evaluation** OR of '**B**' for **Provisional Evaluation** from Indonesian National Accreditation (BAN PT).
- implemented outcome-based curriculum within at min. the last 3 years continuously & ongoing for **General Evaluation**, OR a minimum of 1 year & ongoing for **Provisional Evaluation**.
- established & publicized the **Autonomous Professional Profile** statement formulated as its educational objectives.
- established & publicized the **Program Learning Outcomes**, as the basis for developing its curriculum and learning methods

# TYPES OF EVALUATION [1]



IABEE implements 4 (four) types of program evaluation

- 1. General Evaluation (GE)** measures the compliance of an eligible Program to RPEA, Accreditation Criteria (AC) items, and Discipline Criteria.
- 2. Provisional Evaluation (PE)** measures the potential for compliance of the Program to RPEA, Discipline Criteria and a portion of the evaluation items in AC.

# TYPES OF EVALUATION [2]



- 3. Interim Evaluation without On-Site Visit** is for program with one or more weaknesses that will require a progress report to evaluate corrective actions taken by the program. It measures the compliance to RPEA, Discipline Criteria and a portion of the evaluation items in AC.
- 4. Interim Evaluation with On-Site Visit** is for program with one or more weaknesses that will require on-site evaluation for corrective actions taken by the program. It measures the compliance to a portion of the evaluation items in AC and RPEA.

# DEGREE OF COMPLIANCE [1]



For General Evaluation, the degree of compliance to each criterion:

- **Acceptable** (abbreviated as ‘A’), which means that the evaluated item complies to an associated AC or RPEA item.
- **Concern** (abbreviated as ‘C’), which means that the evaluated item complies to an associated AC or RPEA item, but with a possibility of changes in the future that may compromise the compliance.
- **Weakness** (abbreviated as ‘W’), which means that the evaluated item indicates an insufficiently strong compliance to an associated AC or RPEA item. This shortcoming requires corrective actions to strengthen the compliance of the specific evaluation item to the appropriate AC or RPEA item.
- **Deficiency** (abbreviated as ‘D’), which means that the Program is unable to comply to a particular AC or RPEA item.



# ACCREDITATION STATUS



The accreditation status determined by IABEE Accreditation Council are:

- Accredited with
  - **5 year validity**
  - **Maximum 3 years validity**
    - ✦ Interim Evaluation with visit required
    - ✦ Interim Evaluation without visit required
- Not Accredited

# Accreditation Criteria



Engineering Programs must meet all accreditation criteria consisting of

- **Common Criteria,**
  - All engineering programs must meet the Common Criteria
  - Common Criteria is structured with a PDCA cycle approach with a total of 12 elements
- **Criteria Guide,**
  - The elements in Common Criteria are described further in Criteria Guide.
- **Discipline Criteria**
  - Discipline Criteria are additional criteria developed by professional member societies within the relevant engineering
- **Category Criteria**
  - Currently, there is only one Category Criteria, i.e. 4 year undergraduate level engineering program with minimum a of 144 credits

# Common Criteria



- **Criterion 1:** Orientation of the Graduate Competence (**Plan**)
- **Criterion 2:** Learning Implementation (**Do**)
  - Criterion 2.1. Curriculum
  - Criterion 2.2. Faculty
  - Criterion 2.3. Students and Academic Atmosphere
  - Criterion 2.4. Facility
  - Criterion 2.5. Institutional Responsibility
- **Criterion 3:** Assessment of the Expected Learning Outcomes (**Check**)
- **Criterion 4:** Continual Improvement (**Action**)

# Criterion 1

## Orientation of the Graduate Competence [1]



- Program shall define the profile of graduates to be envisaged as autonomous professionals by considering country's potential resources, cultures, needs and interests.
- Program shall inform its students and faculty with the envisaged **autonomous professional profile** and widely publicize it.

# Criterion 1

## Orientation of the Graduate Competence [2]

Program shall establish **its own** expected **learning outcomes** which consist of abilities to utilize knowledge, skills, resources and attitudes as described in the following (a) to (j) items to be acquired by the student at the time of completion of the study:

# Criterion 1

## Orientation of the Graduate Competence [3]



### Expected Learning Outcomes [1]

- a) an ability to apply knowledge of mathematics, natural and/or materials sciences, information technology and engineering to acquire comprehensive understanding of engineering principles.
- b) **an ability to design** components, systems, and/or processes **to meet desired needs within realistic constraints** in such aspects as law, economic, environment, social, politics, health and safety, sustainability as well as to recognize and/or utilize the potential of local and national resources with global perspective.
- c) an ability to design and conduct laboratory and/or field experiments as well as to analyze and interpret data to strengthen the engineering judgment.
- d) an ability to identify, formulate, analyze, and solve engineering problems.

# Criterion 1

## Orientation of the Graduate Competence [4]



### Expected Learning Outcomes [2]

- e) an ability to apply methods, skills and modern engineering tools necessary for engineering practices.
- f) an ability to communicate effectively in oral and written manners.
- g) an ability to plan, accomplish, and evaluate tasks under given constraints.,
- h) an ability to work in multidisciplinary and multicultural team.
- i) an ability to be accountable and responsible to the society and adhere to professional ethics in solving engineering problems.
- j) an ability to understand the need for life-long learning, including access to the relevant knowledge of contemporary issues.

# Criterion 2: Learning Implementation [1]



## 2.1 Curriculum

- Curriculum shall include the following subject areas:
  - **Mathematics** and discipline-specific **natural sciences**
  - **Discipline-specific engineering science and technology**
  - **Information and communication technology**
  - **Engineering design** and problem based experiments
  - **General education**, which includes morality, ethics, socio-culture, environment and management
- Curriculum development shall consider input from Program stakeholders.
- Curriculum shall indicate the **structural relationship & contributions of the subject courses to fulfill learning outcomes**. Procedures, including syllabus, shall be established and documented so that the expected learning process can be implemented in a controlled way.
- Curriculum shall ensure that the students are **exposed to engineering practices and major design project** experience using **engineering standards & multiple realistic constraints** based on knowledge and skills acquired in preceding course work.



# Criterion 2: Learning Implementation [2]



## 2.2 Faculty

- Program shall provide **necessary number, qualification and competence of faculty members** for performing learning process, including planning, delivering, evaluating, and continually improving its effectiveness in order to achieve the learning outcomes.
- Program shall ensure that the faculty members are **aware of the relevance & importance of their roles & contributions to the learning outcomes.**

# Criterion 2: Learning Implementation [3]



## 2.3 Students & Academic Atmosphere

- Program shall define and implement **an entry standard** for both new and transfer students, as well as transfer of credits.
- Program shall define and implement an **ongoing monitoring of student progress and evaluation of student performance**. Procedures of quality assurance shall be established to ensure that **adequacy of standards is achieved in all assessments**.
- Program shall create and maintain **good academic atmosphere** conducive to successful learning.
- Program shall **promote co-curricular activities** for character building and enhancing the students' awareness on the country's needs.

# Criterion 2: Learning Implementation [4]



## 2.4. Facility

- Program shall ensure the **availability and accessibility of facilities for effective functioning** of the learning process and attainment of the learning outcomes.
- Program shall provide appropriate guidance regarding the use of tools etc & other physical facilities to **enable a safe & appropriate use** of them

## 2.5. Institutional Responsibility

- **Program** shall define and **manage the process for the provision of the educational service**, including education design, curriculum development and delivery, and assessment of learning.
- **Institution** shall **make efforts to establish resource, supporting service and cooperation** with stakeholders on research, education and/or service to community with due consideration to existing local resources.

## Criterion 3: Assessment of the Expected Learning Outcomes



- Program shall ensure that an **effective assessment process of learning outcomes** based on established **performance indicators** is implemented and maintained at planned intervals using **appropriate methods**.
- Program shall ensure that **graduates of the program achieve all expected learning outcomes**.

# Criterion 4: Continual Improvement



- Based on the assessment results, Program shall perform an evaluation **at planned intervals** with output in the form of **decisions to improve** the **effectiveness** of the educational process, the **suitability** of the learning outcomes related to the needs of stakeholders, and resources.
- Program shall **maintain documents and records** related to the implementation of evaluation, the results and their follow-up.

# Criteria Guide: Curriculum [1]



- The program must ensure that the curriculum devotes **adequate attention & time** to each component, consistent with the learning outcomes, which include:
  - A **minimum** of **20% of a combination of college level mathematics and basic sciences** (some with experimental experience) appropriate to the discipline.
  - A **minimum** of **40% of engineering topics**, consisting of **engineering sciences & engineering design** appropriate to the student's field of study.
  - A **maximum** of **30% general education** components that complement the technical content of the curriculum and are consistent with the learning outcomes

# Criteria Guide: Curriculum [2]



- Program shall ensure that the curriculum meets the above mentioned **subject areas** appropriate to engineering **regardless the subject/course names**.
- Curriculum shall ensure that the students are exposed to engineering practices and **major design project experience** using **engineering standards** and **multiple realistic constraints** based on knowledge and skills acquired in preceding course work.

# Discipline Criteria



Electrical, Computer,  
Communications,  
Telecommunication And Similarly  
Named Engineering Programs



# EE Discipline Criteria: Curriculum [1]



- These program criteria apply to engineering programs that include “electrical”, “electronic(s),” “computer,” “communication(s),” “telecommunication(s),” or similar modifiers in their titles.
- The curriculum specifies subject areas appropriate to engineering and must include:
  - (a) **one year** of a combination of university level **mathematics & basic sciences (one with experimental experience)** appropriate to the discipline. (equivalent to 30 SKS)
  - (b) **one and one-half years** of **engineering topics**, i.e. engineering sciences and engineering design, appropriate to the title of the program. (equivalent to 45 SKS)

# EE Discipline Criteria: Curriculum [2]



- Students must be prepared for engineering practice through a curriculum **culminating in a major design experience** based on the knowledge and skills acquired in earlier course work to meet desired needs within realistic constraints.
- The structure of the curriculum must provide both **breadth & depth** across the range of **engineering topics** implied by the title of the program.

# EE Discipline Criteria: Curriculum [3]



- The curriculum must include **probability & statistics**, with applications appropriate to the program name; **mathematics** through **differential & integral calculus**; **basic sciences** and **engineering topics (including computing science)** necessary to analyze and design complex electrical/ electronic devices or systems containing hardware and/or software components.
- The curriculum for programs containing the modifier “electrical,” “electronic(s),” “communication(s),” or “telecommunication(s)” in the title must include **advanced mathematics**, such as **differential equations**, **linear algebra**, and **complex variables**.

# EE Discipline Criteria: Curriculum [4]



- The curriculum for programs containing the modifier “computer” in the title must include **discrete mathematics**.
- The curriculum for programs containing the modifier “communication(s)” or “telecommunication(s)” in the title must include topics in **communication systems**.
- The curriculum for programs containing the modifier “telecommunication(s)” must include **design & operation of telecommunication networks** for services such as but not limited to voice, data, image, and video transport.

TERIMA KASIH

