



NPU-FEIAP B&R Engineering Education

Training Centre (NFTC)

2nd Seminar 20th -22nd September 2020



Outcome Based Competence Assessment

**Professional Engineer
Registration and Examination**

Malaysian Experience

**Ir. Dr. Tan Yean Chin
FEIAP Secretary General**

This presentation referred to materials prepared by
Ir. Lee Boon Chong (IEM)

20th September 2020

Content Outline

- **Contextual Overview**
- **Registration of Engineers in Malaysia**
- **Route to PE via MIEM**
- **Assessment Standard**
- **Mobility & International Benchmarking**
- **Outcome Based Competence Assessment**
- **Assessment Process and Format**
- **OBA and OBE**



Contextual Overview



Time Point	Remarks
Between A and B	Pursue accredited Engineering Programme.
At B	Graduate with 12 Programme Outcomes – OBE.
Between B and C	Acquire work-based training and experience for N years.
At C	Sit for Professional Competence Assessment – OBA.
Beyond C	Qualified as Professional Engineer for independent practice.

The Act and Regulation

- Engineering practice in Malaysia is governed by the **Registration of Engineers Act 1967 (the Act)** and the Registration of Engineers Regulations 1990. Latest amendments took effect on 31 July 2015.
- Under the Act, any qualified person can be registered with the **Board of Engineers Malaysia (BEM or the Board)** based solely on his/her qualification irrespective of citizenship.
- Only those qualified persons registered with BEM are allowed to practice engineering in Malaysia.



PE Registration in Malaysia

- **The Board of Engineers Malaysia (BEM)** is the **regulatory body** set up by the Malaysian Government under the Registration of Engineers Act (1967) to regulate engineering practice in Malaysia through administering the Act and its provisions to protect public interest.
- A person who meets the stipulated requirements of the Act shall be entitled to register with the Board (BEM) as **Professional Engineer (PE)** in Malaysia.



Registration of Engineers

Register with BEM as GE after gaining an accredited engineering degree.

Graduate Engineer (GE)

Register with BEM as PE after having gained at least three years of practical training & experience and passed the professional assessment.


Professional Engineer (PE)

Registered PE who pass the Professional Competency Examination (PCE).
Only PEPC is eligible to set up Engineering Consultancy Practice (ECP)

Professional Engineer with Practicing Certificate (PEPC)

MIEM as a Route to PE

Under the Act, a registered Graduate Engineer has **three routes** to be assessed and registered as PE:

1. Has passed a **professional assessment examination (PAE)** conducted by the Board;
2. Holds a **professional qualification** which the Board considers to be **equivalent** to the PAE conducted by the Board;
3. Is a **Corporate Member of the Institution of Engineers, Malaysia (MIEM)**. 



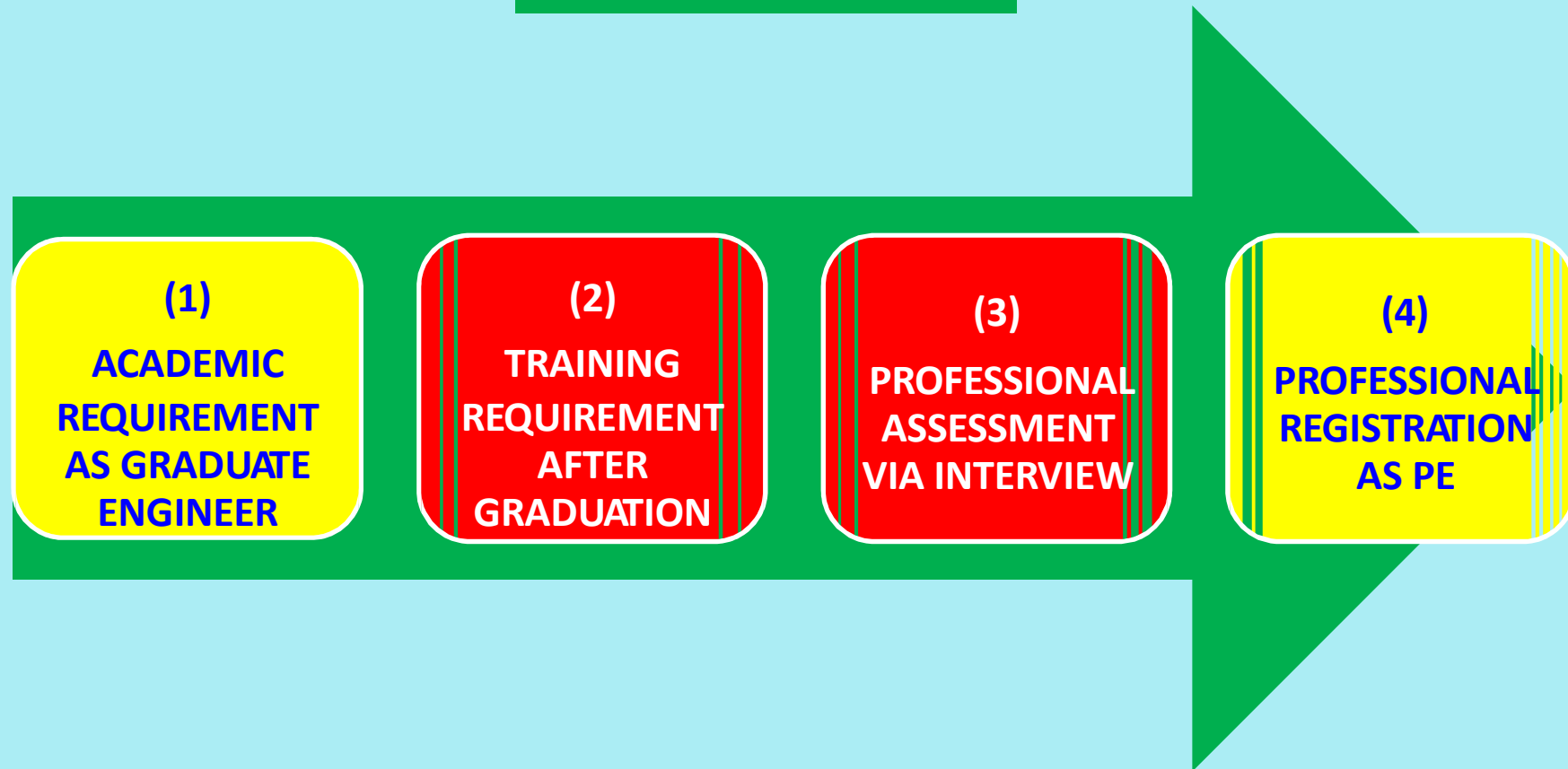
MIEM as a Route to PE

- **The Institution of Engineers Malaysia (IEM)** is a **learned institution** for practicing engineers in Malaysia, set up as a professional group to promote and advance engineering as well as to facilitate networking, learning and socializing.
- A registered graduate engineer who, on application, is a **Corporate Member of IEM (MIEM)** shall be entitled to register with the Board as PE in Malaysia.
- To be qualified as MIEM, the graduate engineer must have sat and passed the **Professional Interview (PI)** conducted by IEM.



Route to MIEM / PE (BEM)

The Overview



Academic Requirement

- The Registration of Engineers Act (REA) mandates engineering graduates to register with the Board as a **Graduate Engineer** after completing an engineering programme.
- The academic requirement for registration as graduate engineer is the engineering programme (typically 4 years) that has been accredited by the **Engineering Accreditation Council (EAC) Malaysia**.



Engineering Accreditation Council

- Engineering Accreditation Council (EAC) is the body delegated by BEM for accreditation of engineering degrees offered by universities (both public and private) in Malaysia ;
- The objective of accreditation by EAC is to ensure that graduates of the accredited engineering programmes satisfy the minimum academic requirements for registration with the Board as a graduate engineer.
- EAC is a Full Signatory of the Washington Accord (WA).



Practical Experience

A Graduate Engineer must obtain **at least three (3) years of relevant practical training and experience** before he can apply to sit for professional assessment.

- ✓ At least two years of general training that will provide a sound basis for professional development.
- ✓ At least one year of professional career development and training providing wide exposure to the various managerial and technical expertise in engineering practice.



Practical Experience

- At least one (1) year of the practical training and experience must be obtained in Malaysia under the supervision of a Professional Engineer in the same or allied branch of engineering as that practiced by the Graduate Engineer.
- In case that the experience is obtained outside Malaysia, the supervision must be under an engineer acceptable to the Board.
- The Supervising PE preferably comes from the same organisation. What if there is no PE of the same discipline within the organization?



Log Book Training Scheme

For Graduate Engineer **NOT** having a Professional Engineer of same discipline **within the organization.**

- ✓ Arrange a Mentor of the same discipline with IEM. Graduate Members have access to a pool of MIEMs / PEs who are qualified and willing to be a Mentor.
- ✓ Nominate a Mentor, who is typically a PE / MIEM of the same discipline from another organization (preferably same industry BUT not mandatory). Ask the Mentor to register with IEM under the Log-Book Training Scheme.



Professional Interview

A graduate engineer is eligible to apply to sit for the **Professional Interview (PI)** conducted by IEM after meeting the following requirements:

- ✓ Has graduated with an accredited engineering degree;
- ✓ Has registered with the Board as graduate engineer;
- ✓ Has obtained at least three years of practical training & experience.



Professional Interview

- The **Professional Interview (PI)** conducted by IEM is a form of **professional assessment** by which an applicant is assessed whether his professional engineering competence has reached a level that underpins qualification to become MIEM, and subsequently to register as PE.
- The structure of professional interview is mainly comprised of the following:
 - ✓ **Standard**
 - ✓ **Process**



Past Assessment Standard

- In the past, the professional assessment of IEM represents a qualitative assessment that requires a **high degree of judgment** about Candidate's training and experience on all areas listed in the Assessment Report.
- Moreover, the assessment method is tailored more towards engineering consultancy practices.
- Based on the information obtained in documentation and the verification made during Oral Interview, Interviewers will judge and award each area in one of **three levels** - Good (G), Satisfactory (S), Not Satisfactory (NS).
- The Candidate can only pass the Professional Interview if **all areas** are assessed to be either satisfactory or good.



Current Assessment Standard

Important considerations

- Compliance with the **IEM Constitution** on professional interview.
- In line with the **Registration of Engineers Act** on professional assessment.
- A good basis to assess professional engineering competence objectively – **Best Practice**.
- An international acceptance for the person so qualified to provide cross border professional engineering services - **Mobility**.



Mobility of Professional Engineers

- Movement of **professionally qualified engineers** who are capable of independent practice.
- Enabling them to provide **cross-border** professional engineering services.
- Recognition of their **professional competence** to give confidence to clients who engage their service.
- **Mutual recognition** of substantial equivalence to an international standard agreed vis multi-national agreement among engineering organisations in member countries/jurisdictions.



Mobility Agreements

- Examples of agreement on mutual recognition of professionally qualified engineers for cross border mobility include:
 - ✓ ASEAN Chartered Professional Engineers (ACPE) Register.
 - ✓ International Professional Engineers Agreement (IPEA) - formerly known as Engineers Mobility Forum (EMF)
 - ✓ APEC Engineers Agreement / Register
- Malaysia is a member of all the above-mentioned three agreements.



International Best Practice

- IEM is a **Full Member** of both the APEC Engineer Agreement and the International Professional Engineer Agreement under the purview of the International Engineering Alliance (IEA).
- The professional interview conducted by IEM for MIEM / PE is an integral part of the competence assessment **review process** conducted by IEA for mutual recognition.
- The IPEA and APEC Engineers Agreement are moving towards an **Outcome Based Competence Assessment** for mutual recognition.



International Benchmarking

- In tandem with the **international best practice**, IEM has benchmarked the **Outcome Based Competence Assessment (OBA)** for professional assessment.
- The OBA refers to **IEA Professional Competency Profiles** that consist of competency elements necessary for competent performance that the PE is expected to be able to demonstrate in a holistic way at the stage of attaining registration.
- Using the **professional engineering competence** as a basis for assessment, IEM professional assessment measures the **outcome** of practical training and development for independent practice.



Reference Standard

- In line with the IEA Professional Competency Profiles, IEM has adopted and adapted the **UK Standard for Professional Engineering Competence (UK-SPEC) for Chartered Engineers** as the reference standard for its professional competence assessment.
- The IEM Competency Standard consists of broad areas of professional competency called **Competency Categories**.
- Each Competency Category comprises a group of **Competency Elements** that describe a specific area of professional competency against which the PI Candidate is assessed.



What is Assessed in PI

The professional interview will assess **Competence**.

What is Competence?

The ability to carry out a task to an effective standard, of which the achievement requires the necessary level of knowledge, understanding and skill, as well as a professional attitude. It is part of the requirement that must be demonstrated in order for an Applicant to be admitted as a Corporate Member of IEM. The formation process of professional competence generally involves a combination of formal education and practical training and experience.



Competency Categories – Oral Interview

A -- Knowledge and Understanding

B -- Design & Development of Process, System, Service & Product

C -- Responsibilities, Management and Leadership

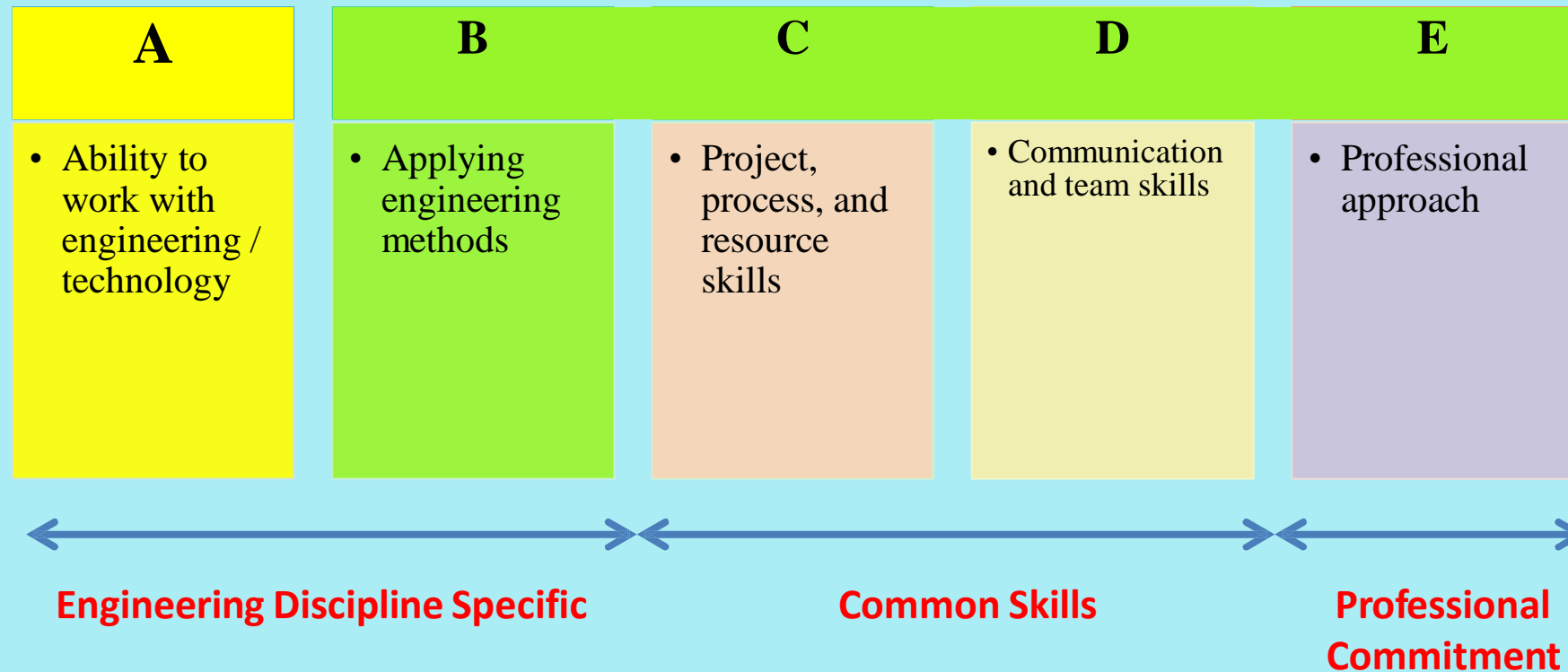
D -- Communication and Inter-personal Skills

E -- Professional Commitment



Competency Categories – Oral Interview

Interviewers will probe the five competency categories and commitment statements as follows:



Competency Elements – Oral Interview

- There are **18 Competency Elements** under the **5 Competency Categories**.
- The professional Interview will **directly assess** PI Candidates on all the 18 Competency Elements.
- There are **four (4) levels** for assessing Candidate's attainment of each competency element.



Assessment Rubrics

Level	Generic Statement of Attainment
1	Little or no evidence of competency
2	Some evidence of competence identified
3	Fully acceptable level of competency
4	Exceptionally strong level of competency

Objective Assessment

- Each of the 18 Competency Elements has four **thresholds** representing four **levels of assessment**.
- The **competence level** awarded by PI Interviewers for each Competency Element will be based on the **evidence demonstrated** by Applicant / Candidate in the document submitted and also during oral interview.
- Each threshold has a **threshold statement** that gives a **standard interpretation** of the threshold, guiding the differentiation between levels ... hence **minimising individual subjectivity** in assessment.



Competency Category A

A	Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology.
A1	Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology and other relevant developments.
A2	Engage in the creative and innovative development of engineering technology and continuous improvement systems.
A3	Apply engineering knowledge related to local practices, codes, standards, specifications, materials, products, environmental plans and other requirements; and where appropriate, apply engineering knowledge contributed by others including suppliers, consultants, contractors, manufacturers, technologists, researchers and independent experts.



Competency Category B

B	Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems
B1	Identify potential projects and opportunities
B2	Conduct appropriate research and undertake design and development of engineering solutions.
B3	Implement design solutions, and evaluate their effectiveness.

Note that the **design and site experience** is generally covered in Competency Category B

Competency Category C

C	Provide technical and commercial management.
C1	Plan for effective project implementation.
C2	Plan, budget, organise, direct and control tasks, people and resources.
C3	Lead teams and develop staff to meet changing technical and managerial needs.
C4	Bring about continuous improvement through quality management.

Competency Category D

D	Demonstrate effective interpersonal skills
D1	Communicate in English or Malay Language with other at all levels.
D2	Present and discuss proposals.
D3	Demonstrate personal and social skills



Competency Category E

E	Demonstrate a personal commitment to professional standards, recognizing obligations to society, the profession and the environment
E1	Comply with relevant codes of conduct (ethics).
E2	Manage and apply safe systems of work.
E3	Undertake engineering activities in a way that contributes to sustainable development.
E4	Carry out continuing professional development necessary to maintain and enhance competence in own area of practice.
E5	Understand the legal matters pertaining to engineering profession and be able to communicate with legal personnel on these issues.



Holistic Assessment

Instead of focusing mainly on technical aspects, this method has a more holistic approach to assessing professional competence:

- Underpinning knowledge & understanding of a branch or sub-branch of engineering.
- Skills in design and development of solution to engineering problem – problem solving.
- People Skills - management, leadership as well as communication and interpersonal skills
- Professional Commitment –safety, sustainability, ethics, continuing development, etc.



Addressing Concerns

- ✓ Each Candidate has unique work experience because of the nature of job.
- ✓ Most Candidates are able to develop an acceptable level of attainment in the majority of Competency Elements.
- ✓ Sometimes, candidates may be strong either in technical or non-technical areas, but they can use their strengths in certain areas to compensate their weaknesses in other areas.
- ✓ Nature of work sometimes makes Candidates lacking in a few Competency Elements; but they can still pass PI if they are good in most of the other Elements.



Assessment – Key Features

This **assessment** method is both **competence-based** and **evidence-based** with the following features:

- ✓ Measure the knowledge, understanding, skills and professional attitude necessary for the PI Candidates to perform effectively – **Competence.**
- ✓ Use standard competency descriptors as the only assessment yardsticks – **one common ruler.**
- ✓ Use rubrics to assess the competence level, and minimize individual subjectivity – **more objective.**
- ✓ Ask PI Interviewer to base assessment on the evidence demonstrated by PI Candidates – **evidence based.**



IEM PI - Process

IEM PI Process has the following two stages:

Stage 1 : **Documentary review** of competency evidence to assess Applicant's eligibility and readiness to sit for Professional Interview.

Stage 2 : **In-person assessment** of Candidate that consists of a face-to-face oral interview as well as writing two essays.



**Professional
Interview (PI)**

Stage 1 - Documentary Review

- Why do we need documentary review?
- What if there is no documentary review?
- What information is needed for documentary review?
- **Document Assessors** will do a qualitative assessment of the application document to determine whether the *evidence* demonstrated therein shows that PI Applicant is eligible or ready to sit for the professional interview.
- Applicant shall be informed in writing of his *eligibility* to attend the **Professional Interview** if he is assessed to be eligible and ready.



Stage 2 - Professional Interview

- Professional Interview is a **peer review**, a process by which a Candidate is checked by MIEMs (the would-be peers of Candidate) in the same engineering discipline to ensure that he meets the necessary standards before he is admitted as MIEM (one of the peers).
- At the end of professional interview, the Interviewers must determine if the evidence demonstrates that the Candidate has attained **the range of competencies** at a level appropriate to be admitted as MIEM.



Professional Interview Format

- All eligible Candidates should proceed to sit for the **Professional Interview**.
- The **format** of Professional Interview shall consist of two parts:
 - ✓ **The Oral Interview**
 - ✓ **The Written Examination**
- Candidate must complete the two parts in order to satisfy the Professional Interview's requirements.



Appointing Interviewers

- IEM shall appoint two (2) suitably qualified and trained interviewers (MIEM / FIEM / PE) to conduct the professional interview for the Candidate.
- At least one Interviewer shall have substantial experience in the **same or similar or allied** engineering discipline as that of the Candidate.
- Attempts should be made to select two Interviewers who will complement each other.
- The Interviewers should have substantial experience; preferably at least 10 years as MIEM/PE.



Conflict of Interest

Watch out for **conflict of interest** when appointing Interviewers.



Appointed Interviewers should confirm the acceptance of appointment and declare no conflict of interest by returning the signed **Acceptance and Declaration Form**.

Conflict of Interest

Interviewers should not be selected from:

- ✘ The Supporters of Candidate's application.
- ✘ A person employed in the same or related organization as the Candidate.
- ✘ A person who is a close family member of Candidate.
- ✘ A person who is a close friend of the Candidate.
- ✘ A person who might have conflict of interest in PI.
- ✘ A PI Board Member who is directly involved in appointing Interviewers for the Candidate.
- ✘ A PI Assessor who is directly involved in assessing the Candidate's eligibility to sit for the PI.



Oral Interview

- Allocate typically about **one hour thirty minutes** for the oral interview for each Candidate.
- While there is a need to be flexible, it is recommended that the Interviewers should agree on a **general format**:
 - ✓ *Introduction*
 - ✓ *15 Minute Presentation by Candidate*
 - ✓ *60 Minute Q&A Session*
 - ✓ *Opportunity for Final Evidence*
 - ✓ *Conclusion*



Oral Interview

60-Minute Q&A Session

- May use career history in the Application Form as a guide.
- Encourage the Candidate to talk about his work in chronological order to draw out evidence of competence during discussion.
- Probe further specific competence areas including those highlighted in the Assessor Summary Form.
- Ensure to cover full range of competencies by assessing all the five competence and commitment statements.



Oral Interview

60-Minute Q&A Session

- Ask questions in a clear and concise manner so that the Candidate can understand.
- Don't ask multiple questions as this often results in only one part being answered.
- Don't ask trick questions as this will make the Candidate feel uncomfortable.
- Allow Candidate to give answers uninterruptedly.
- Resist the temptation to air individual opinion or talk on a pet topic.



Written Examination

- At the end of the Oral Interview, Interviewers should proceed to the second part of the Professional Interview, namely the Written Examination.
- Candidate must complete both the oral interview and the written examination in order to satisfy the Professional Interview's requirements.
- Written Examination consists of two
 - sections. Section A is on technical topics.
 - Section B is on Code of Professional Conduct.

Written Examination

Section A

- Interviewers will typically set two questions, of which the candidate chooses one to answer.
- The set questions are typically related to the technical report or portfolio of evidence on Competency Categories A and B submitted by the Candidate.
- It is intended to test candidate's technical knowledge on the technical subjects on which he has gained substantial experience.
- Time to complete Section A paper is 1.5 hours.



Written Examination

Section B

- Interviewers will typically set two questions, of which the candidate chooses one to answer.
- The set questions are typically chosen from the official list of printed questions related to the IEM Regulations on Professional Conduct.
- It is intended to test how the Candidate thinks about the role of the engineer in society vis-à-vis the Regulations on Professional Conduct.
- Time to complete Section B paper is 1.5 hours.



From MIEM to PE

- ➔ **Passing the Professional Interview, namely the Outcome Based Competence Assessment, will earn the status of Corporate Membership of IEM viz. MIEM.**
- ➔ **Becoming MIEM will be eligible to register with the Board as Professional Engineer (PE).**



PE with Practicing Certificate

To qualify as a **Professional Engineer with Practicing Certificate (PE with PC)**, the Candidate must :

- Be a **Professional Engineer (PE)** in good standing.
- Pass the **Professional Competency Examination (PCE)**, which is conducted by BEM.

Only PE with practicing Certificate can set up Engineering Consultancy Practice and submit plans and drawings.



PE Renewal - CPD

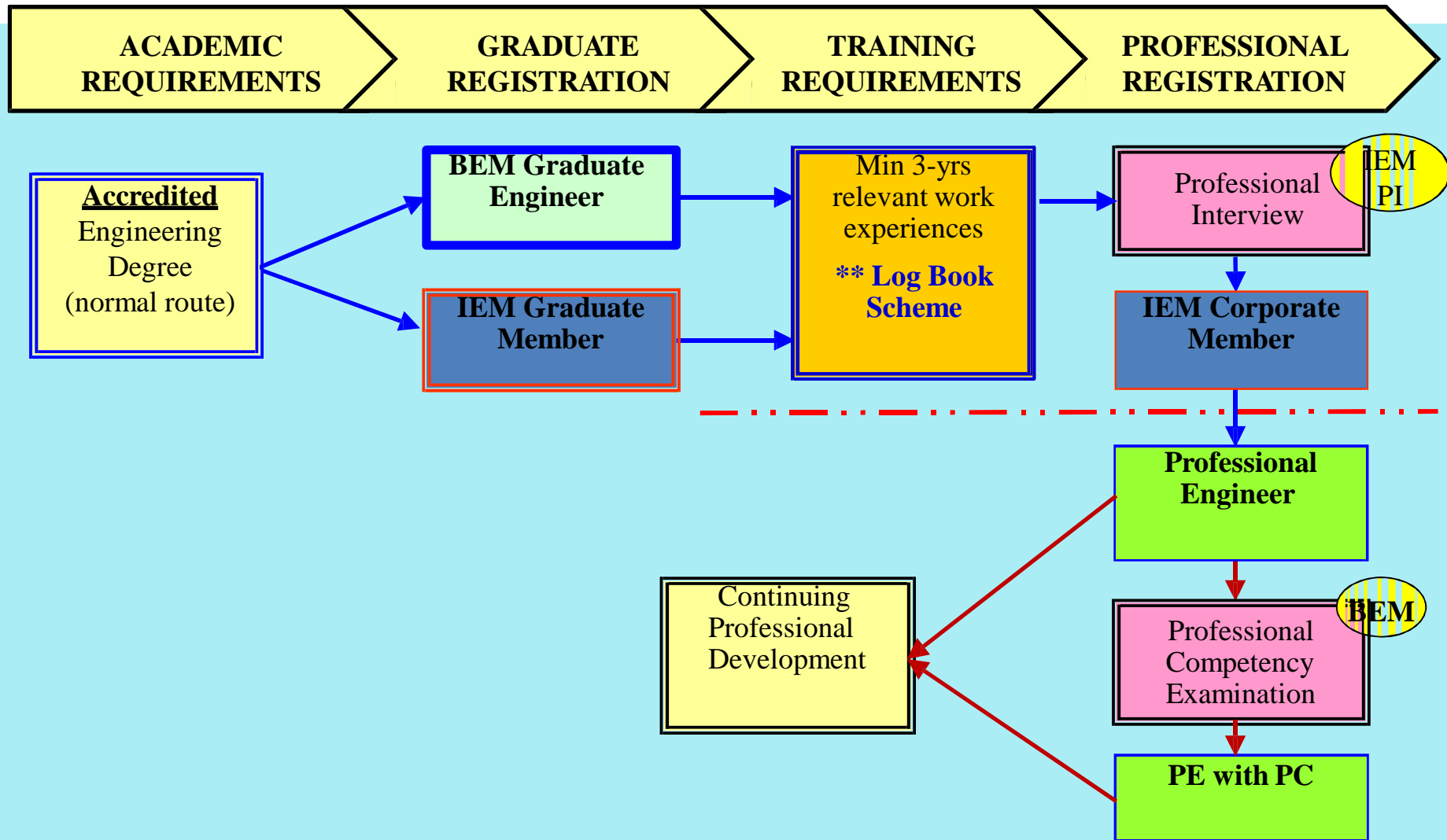
A registered PE desirous of renewing his registration has to satisfy Continuing Professional Development (CPD) hours required by the Board:

- ✓ **25 CPD hours per annum for PE**
- ✓ **50 CPD hours per annum for PE with PC**

besides submitting the renewal document and paying the renewal fee.



Route to MIEM / PE - Summary



APEC Engineers Register

IEM holds a separate **APEC Engineers Register**. **Applicant** must fulfil the following criteria:

- ✓ An engineering degree accredited by an organisation that either (i) holds full membership of **WA**; or (ii) uses best practice guidelines developed by **FEIAP**;
- ✓ Professional engineering competence for independent practice with a minimum period of **seven years** practical experience since graduation, including at least two years in responsible charge of significant engineering work.

IEM also holds an International PE Register



OBE and OBA Continuum

OBE -- 12 Program Outcomes

- (i) Engineering Knowledge
- (ii) Problem Analysis
- (iii) Design/Development of Solutions
- (iv) Investigation
- (v) Modern Tool Usage
- (vi) The Engineer and Society
- (vii) Environment and Sustainability
- (viii) Ethics
- (ix) Individual and Team Work
- (x) Communication
- (xi) Project Management and Finance
- (xii) Life Long Learning

OBA -- 5 Competence Categories

A – Underpinning Knowledge and Understanding

B -- Design & Development of solution to engineering problems

C -- Responsibilities, Management and Leadership

D -- Communication and Inter-personal Skills

E -- Professional Commitment – ethics, safety, sustainability, CPD, etc.

Contextual Overview



Outcome Based Education - OBE

Outcome Based Assessment - OBA

Next Sessions will discuss
How the **Outcome Based Education** at time point **B** produces engineering graduates for entry level of engineering practice

Just discussed
How the **Outcome Based Competence Assessment** at time point **C** produces professionally qualified engineers capable of independent practice



NPU-FEIAP B&R Engineering Education Training Centre (NFTC)



THANK YOU
FOR LISTENING

2nd SEMINAR of NFTC (20th to 22nd September 2020)