

Engineering Education Working Group (EEWG) Presentation to the CAETS COUNCIL

in Brisbane

on September 9th, 2025

EEWG Summary for the CAETS Council Meeting

- The CAETS Engineering Education Working Group (EEWG) was reconstituted in **March 2023**.
- The EEWG includes 22 active academies and another 11 that have expressed some interest (usually 12-15 members attend the quarterly meetings of EEWG); **11 meetings** held so far
- The EEWG has **22 registered Member-Academies**, though not all are regular attendees: Argentina, Australia, Canada, China, Denmark, France, Germany, India, **Ireland**, Japan, the Republic of Korea, Mexico, the Netherlands, Nigeria, **Pakistan**, **Serbia**, South Africa, Spain, **Switzerland**, the United Kingdom, the United States, and Uruguay
- **Three** meetings were held in **2023** (27Apr23, 27Jul23, 27Oct23)
- **Five** meetings were held in **2024** (15Feb24, 9May24, 01Jul24 (Helsinki), 20Aug24, 22Nov24, and
- **Three** (27Feb25, 29May25, 15Aug2025) in **2025**, all virtually

Themes covered: Post-pandemic education challenges, Gender parity and mobility, Accreditation practices, Intellectual property, Integration of AI & ML, Ethics, Medium of instruction, and Quality and quantity of engineers

Overall (long-term) objectives of our EEWG are:

- i. to create a community across the academies to be able to ***determine common points of interest concerning status updates on the current framework and priority areas in Engineering Education,***
- ii. to create reports of ***best practices and policy recommendations to address the concerns and challenges*** perceived by our member academies in Engineering Education,
- iii. to author specific reports related to ***education delivery methods*** (physical, virtual, simulation, hybrid), ***sustainable developmental goals*** (e.g., energy, water, etc.), ***engineering ethics, technology forecasting,*** and ***engineering pipeline/demographics,***
- iv. to develop a virtual platform for networking to ***facilitate cooperation and collaboration on engineering education*** among the member academies.

Immediate goals:

- To learn from one another (***best practices***)
- To create advisory and policy guidance to assist our member countries, and potentially at an international level, to ***improve the engineering education ecosystem***
- Our discussions may include topics on ***pedagogy, technology, equity/diversity/inclusion, ethics, and international cooperation (mobility)***

EEWG Summary for the CAETS Council Meeting 2025 in Brisbane

SUMMARY of EEWG Activities to date: The EEWG met 11 times (3 times in 2023, 5 times in 2024, and 3 times in 2025)

- **1st meeting on 27th April 2023** – 15 Academies participated (22 experts present)
 - Focused on the *effects of COVID-19* on the engineering education ecosystem in each country and the ongoing influence of those changes
- **2nd meeting on 27th July 2023** – 15 Academies participated (17 experts present)
 - Focused on efforts to improve *the effectiveness of engineering education* in each country
- **3rd meeting on 27th October 2023** – 11 Academies participated (18 experts present)
 - Focused on issues around *gender parity, international protocols, accreditations, and ethics* in engineering education.
- **4th meeting on 15th February 2024 and 5th meeting on 9th May 2024:**
 - Focused on the *Medium of Instruction and Artificial Intelligence (A/I)* in engineering education
 - Approved a work plan and outline for the A/I paper
- **6th meeting on 1st July 2024** – 10 Academies participated (13 experts present)
 - Focused on the *Medium of Instruction* and *Application of Artificial Intelligence* in engineering education

EEWG Summary for the CAETS Council Meeting 2025 in Brisbane

- **7th meeting on 20th August 2024** – 11 Academies participated (19 experts present)
 - Focused on the **Intellectual Property Rights (IPR)** related issues (e.g., protection, sharing, cost, rate of translation, efficacy, etc.) and **Accreditation of Teaching Course-curriculum and Processes** - the need for global cooperation and uniform standards
- **8th meeting on 22nd November 2024** – 6 Academies participated (15 experts present)
 - Focused on **Academic Accreditation and Intellectual Property Rights**
- **9th meeting on 27th February 2025** - 10 Academies participated (14 experts present)
 - Focused on **Academic Accreditation, Intellectual Property Rights and Top Ten Issues in Engineering Education** (or the Top Ten issues in Engineering, where education can play a role)
- **10th meeting on 29th May 2025** - 12 Academies participated (17 experts present)
 - Focused on the **Top 10 Issues in Engineering Education**
- **11th meeting on 18th Aug 2025** - 15 Academies participated (21 experts present)
 - Focused on the **Challenges (quality and quantity)** and the **preferred domains** of engineering in the respective countries

EEWG Summary for the CAETS Council Meeting 2025 in Brisbane

EEWG Summary of meetings that took place after the last Council Meeting held in Helsinki

- **7th meeting on 20th August 2024** – 11 Academies participated (19 experts present)
 - Focused on the Intellectual Property Rights (IPR) related issues (e.g., protection, sharing, cost, rate of translation, efficacy, etc.) and accreditation of teaching course-curriculum and processes - the need for global cooperation and uniform standards
- **Concluding remarks:**
 - A detailed survey on the two topics examined to capture specific inputs, alongside a broader baseline survey seeking each member's "Top Ten Topics in Engineering Education" for future planning.
 - The AI in Engineering Education and Language of Instruction working groups were reengaged to ensure strong progress reports at the next meeting, and **a questionnaire** was developed to gather data on **patenting and accreditation practices** across countries.

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- **8th meeting on 22nd November 2024** – 6 Academies participated (15 experts present)
 - Focused on Academic Accreditation and Intellectual Property Rights
- **Concluding remarks:**
 - Members were encouraged to submit additional survey responses, finalise the “Top Ten Issues in Engineering Education” lists, and determine the need for papers on the discussed topics, with an aim to close these items in the next meeting.
 - The group agreed to consider **recruitment and retention of engineering students**, as well as **international collaboration opportunities**, as priority themes for upcoming discussions.

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- **9th meeting on 27th February 2025** - 10 Academies participated (14 experts present)
 - Focused on Academic Accreditation, Intellectual Property Rights and Top Ten issues in engineering education" (or the Top Ten issues in engineering, where education can play a role)
- **Concluding remarks:**
 - Member academies were urged to submit their “Top Ten Issues in Engineering Education” and pending survey responses on IPR and accreditation, with the goal of consolidating findings into a concise document and finalizing the AI and Medium of Instruction papers.
 - The group agreed to continue **expanding engagement with more academies** to craft a session that addresses the **broader societal implications of engineering**; to refine the consolidated document and ensure it reflects diverse global perspectives.

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- **10th meeting on 29th May 2025** - 12 Academies participated (17 experts present)
 - Focused on Top 10 issues in Engineering educations
- **Concluding remarks:**
 - The group finalized the “Top Ten Themes in Engineering Education” , with a consolidated draft to be displayed before the CAETS Council Meeting in Brisbane, and members contributes to drafting theme-specific summaries.
 - Emphasis was placed on framing key topics such as **ethics, AI integration, and interdisciplinary learning as shared global priorities**, ensuring curriculum reforms preserve core engineering competencies while addressing emerging challenges.

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- **11th meeting on 15th August 2025** - 15 Academies participated (21 experts present)
 - Focused on challenges and preferred domain of engineering in the country

Concluding remarks:

- To compile rich deliberations into **a comprehensive document**
- Broader dissemination of insights encouraged (e.g., global deans councils)
- Next EEWG meeting planned for mid-November 2025

EEWG Summary on **Accreditation in Engineering Education**

- **Global Practices:**

- Program-level accreditation (USA, India, UK).
- Institution-level accreditation (Denmark, Netherlands).

- **Purpose:**

- Quality assurance, employability, global mobility (Washington Accord).

- **Challenges:**

- Variation across countries – outcome-based versus curriculum-focused.
- Risk of rigidity versus need for innovation.
- Balancing national contexts with international recognition.

- **Recommendations**

- Harmonise international frameworks while preserving flexibility
- Shift towards outcomes-based models and interdisciplinary integration

Accreditation – CONCLUSIONS:

- **Outcome-Based Global Framework:** Promote a CAETS-endorsed framework emphasizing graduate attributes and competencies rather than prescriptive course content.
- **Accreditation for Emerging Fields:** Develop adaptable criteria for accrediting interdisciplinary and technology-driven programs.
- **Mutual Recognition Expansion:** Encourage non-signatory nations to join existing international accords to facilitate student and professional mobility.
- **Accreditor Collaboration:** Foster structured dialogue between national accreditation agencies to share best practices and harmonize evaluation processes.

EEWG Summary on **Intellectual Property Rights (IPR)**

Ownership & Practice:

- Universities commonly own patents (Bayh-Dole Act, US; similar in Denmark, India).
- Technology transfer offices enable commercialisation, but few patents are profitable.

•Patent activity trends:

- India: growth from ~6,000 (2014–15) to ~100,000 patents (2023–24).
- Spain: ~550 patents annually (350 national, 200 international).
- Denmark: 300 patents filed in 2022 (focus on pharma, quantum, wind).

•Challenges:

- High filing/maintenance costs.
- Limited enforcement, esp. for SMEs and developing nations.
- Need for global collaboration & flexible IP policies.

•Recommendations

- Support equitable access and reduce costs for academic institutions and SMEs.
- Promote cross-border cooperation to enhance technology transfer
- Encourage balance between open knowledge sharing and commercialisation

IPR – CONCLUSIONS:

- ❑ **IP Education for All Engineers:** Introduce mandatory modules on IP fundamentals, ethics, and commercialisation strategies in undergraduate engineering curricula.
- ❑ **Support for Early-Stage Innovators:** Provide subsidised legal and administrative support for students and faculty filing patents, especially in emerging economies.
- ❑ **International IP Cooperation:** Advocate for CAETS-led initiatives to harmonise aspects of patent recognition and enforcement across member nations.
- ❑ **Balanced IP Policies:** Develop frameworks that allow temporary relaxation of IP restrictions for humanitarian or sustainability-driven projects.
- ❑ **Data-Driven Policy:** Create an international CAETS database of IP activity in engineering education institutions to track trends and inform policy.

EEWG Summary on Top Ten Issues in Engineering Education

1. Student Enrolment & Preparation

- Weak foundations in mathematics and basic sciences – a major concern; Poor interest in engineering careers; High attrition rates (dropouts) in early years

2. Teaching & Learning Processes

- Need for experiential learning and laboratory practices; Revise/replace outdated curricula and methods; Integrate and lay greater emphasis on problem-solving capability, creativity and innovation

3. Graduation & Employability

- Low graduation rates in many regions; Limited professional readiness; Need for stronger industry–academia linkages; Greater career opportunities, including higher education and skilling needed

4. Quality & Accreditation

- Variability in standards across institutions; Rigid versus flexible accreditation models – uniformity desired; Need for global mobility frameworks

5. Integration of Emerging Technologies

- AI, ML, quantum computing, digital manufacturing; a new approach of balancing core with new areas

EEWG Summary on **Top Ten Issues in Engineering Education**

6. Ethics & Social Responsibility

- Professional conduct and accountability; Sustainability and societal relevance; Awareness and regulatory discipline – both needed

7. Faculty Development

- Shortage of trained faculty in advanced fields; Need for upskilling in AI, data, and pedagogy; Integration more important than new courses or degrees

8. Funding & Infrastructure

- Budget constraints and underfunded laboratories and workshops; Gaps between private and publicly funded institutions (uniform policy needed)

9. Diversity & Inclusion

- Gender imbalance persists globally; Need to widen participation of underrepresented groups

10. Lifelong Learning & Global Collaboration

- Engineers must continually upskill; Greater international cooperation and knowledge sharing desired

Publication of EEWG Recommendations as an e-Volume

Plans for 2025-2026:

❖ Topics covered so far:

1. How to enhance the quality and effectiveness of engineering education in the future?
2. How to ensure greater gender parity, uniformity, employability, mobility, and entrepreneurship across the countries.
3. Medium of instruction for engineering education. This is important for non-English speaking countries or countries like India, which speak several languages.
4. Application of AI (Artificial Intelligence) & ML (Machine Learning) in engineering practices and its influence on the future of engineering.
5. Intellectual Property Rights (IPR) related issues (e.g., protection, sharing, cost, rate of translation, efficacy, etc.)
6. Accreditation of teaching course-curriculum and processes - the need for global cooperation and uniform standards
7. Top Ten Issues in Engineering Education

❖ PROPOSAL: Compile all the RECORDS of the earlier meetings and create a volume from them for future reference and wider circulation.