CHEMICAL ENGINEERING CHALLENGE

THEME

Synergising Chemical Engineering and Sustainable Microelectronics for a Greener Future

THEME DESCRIPTION

The microelectronics industry is the foundation of modern technology, powering essential devices from smartphones to advanced computing systems. Nonetheless, this advancement has incurred considerable environmental expenses. As the demand for more powerful and efficient microelectronics increases, so too does the energy consumption, resource depletion, and development of electronic trash (e-waste) linked to their manufacturing.

Microelectronics manufacturing, particularly semiconductor fabrication and nanomaterial synthesis, is among the most resource-intensive industrial processes, consuming significantly more energy than conventional material processing. The business significantly relies on essential raw minerals like gallium and indium, which are at risk of supply constraints within the next two decades due to increased demand and limited natural reserves. The improper disposal of microelectronic components, including printed circuit boards and semiconductor chips, contributes to environmental pollution and potential emissions from hazardous substances, with global waste projections reaching 74.7 million metric tonnes by 2030.

The production of microelectronics has considerable environmental consequences, including resource extraction, high energy consumption, and toxic emissions. Semiconductor etching, an essential process, depends on fluorinated gases such as CF_4 and NF_3, which possess significant global warming potentials. It also generates wastewater pollutants, including PFAS, which threaten water quality and public health. The escalating problem of e-waste underscores the necessity for more sustainable procedures in microelectronics industries.

The theme, "Synergising Chemical Engineering and Sustainable Microelectronics for a Greener Future," underscores the vital contribution of chemical engineering to promoting sustainability in the microelectronics sector. This theme promotes the integration of chemical engineering concepts with advanced green technologies, urging participants to create new, environmentally friendly solutions that mitigate environmental damage, enhance resource circularity, and foster a sustainable, low-carbon future. By addressing these challenges, this theme aligns with key Sustainable Development Goals (SDGs), including SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and

SDG 13 (Climate Action), fostering a more sustainable and responsible future for the microelectronics industry.

Key focus areas include:

- Identifying and creating safer, sustainable alternatives to hazardous compounds in microelectronics manufacturing, thereby mitigating toxicity and environmental dangers.
- Developing and implementing energy-efficient and low-carbon manufacturing techniques that optimize resource utilization, minimize emissions, and enhance overall efficiency in microelectronics production..
- Implementing effective recycling and resource recovery systems to recover valuable materials, prolong the lifespan of microelectronic components, and advance towards a circular economy.

This theme utilises chemical engineering expertise to push participants to devise practical and significant ways that integrate sustainability with technological progress. By integrating chemical engineering with sustainable microelectronics, we can create a more environmentally responsible future for the microelectronics sector.

OBJECTIVES

1. To evaluate the participants' comprehensive knowledge, problem-solving abilities, time management proficiency and critical-thinking skills.
2. To assess the participants' theoretical understanding on both microelectronics and chemical engineering.
3. To raise the participants' awareness on the importance of sustainable microelectronics in the chemical engineering field.

COMPETITION DESCRIPTION

- This is an **INDIVIDUAL** competition and will be conducted **via ONLINE**. The competition consists of **ONE PHASE**
- Each university/institution may enroll a maximum of **TEN (10)** participants in this competition.
- Chemical Engineering Challenge is where the participants will be tasked with multiple choice questions (MCQ) and subjective questions.
- The Chemical Engineering Challenge requires participants to answer 30 multiple-choice questions and 20 subjective questions within 1 hour and 15 minutes.
- The **TOP THREE (3)** highest scorers will be chosen as the winners.

ELIGIBILITY

- For an individual competition, participants must be **full-time undergraduate students** enrolled in the **Chemical Engineering Program** (or equivalent) offered by one of the participating universities / institutions.
- Participants must submit an **APPROVED** original copy of their **student identity card (Matric Card)** together with the **LATEST module registration** file.
- Each participant is only allowed to participate in **ONE (1) physical mode competition** and **ALL online mode competitions**.

FORMAT

- The competition will be conducted via **QUIZIZZ**.
- Each participant must follow the following guidelines to set their usernames during the competition.
    - Username: Name of University/Institution_Full Name
    - Example: USM_AliBinAbu
- Participants must answer **ALL OF 50 QUESTIONS** given.
- Failure to set a proper username during the competition will lead to null results for that particular stage/section.
- The format of the competition is **SUBJECT TO CHANGE** depending on the total number of registered participants. Any changes in the format will be informed through our social media and WhatsApp group.

RULES AND REGULATIONS

- Each university/institution is entitled to send a maximum of **TEN (10)** participants.
- Each participant is entitled to **ONE (1)** submission only.
- Cheating is **STRICTLY PROHIBITED**.
- Participants are advised to ensure their **Internet connections are stable** before the competition starts. If participants were to face any technical problems before the online quiz session starts, they are required to inform any of the committees involved. Organizers are not responsible for any unanswered questions submitted after the competition.
- Electronic external aids are strictly prohibited. **DISQUALIFICATION** will occur immediately if an objection with evidence is received.

SCORING

- Objective questions
    - **TWO (2)** points will be awarded for every question answered correctly.
- Subjective questions
    - **THREE (3)** points will be awarded for every question answered correctly.
    - Total marks allocated are **ONE HUNDRED TWENTY (120)** marks.
    - In case the overall results are tied between 2 participants, the number of subjective questions answered correctly would be used as a tiebreaker. The participant that answers the higher amount of questions answered correctly would be declared as the winner

RESULT

The winners of the competition will be announced during the NACES 2025 Closing Ceremony on **14 December 2025**.

PRIZES

- 1st place: RM250
- 2nd place: RM210
- 3rd place: RM140

All prizes were subjected to increment based on decisions from the organizer.

IMPORTANT NOTES

- Each participant must agree to be bound by the official contest rules. The organizer has all the rights to eliminate or disqualify any participants that violate the guidelines as stated above. Such actions may be taken by the host without any prior notice.
- The judges' decisions are final and any appeals to the decisions will not be entertained.
- Participants must complete the registration form by the **10th of October 2025** to be eligible for participation.
- Any changes on the confirmed participants' list must be informed before the **17th of October 2025**. Any changes after the date will not be entertained.
- Organisers will hold the right to publish submitted presentations for future publications without prior notice to the participants. Kindly notify the organiser if you have a patent or a copyright reserved.

- Registration fees are non-refundable.
- The contents of this booklet are subject to amendment and improvisation. Participants will be notified when the amendments are made.

CONTACT INFORMATION

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