## TECHNICAL INFOGRAPHIC

### 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**

- To highlight the role of chemical engineering in achieving a sustainable microelectronics industry.
- To raise awareness of sustainable practices in microelectronics through chemical engineering innovations.

- To emphasize the importance of sustainable materials and processes in the microelectronics industry through the applications of chemical engineering.

**COMPETITION DESCRIPTION**

- This is an **INDIVIDUAL** competition, and will be conducted via **ONLINE**.
- Each university or institution may enroll a maximum of **SEVEN (7)** participants.
- Participants must design an infographic according to the event's topics, which will be announced during the participant briefing session on **18 October 2025**. The infographic should provide solutions or insights into challenges.
- Participants must explain a chemical engineering process, innovation, or technology relevant to sustainable microelectronics, and must integrate accurate data and insights into a visually appealing layout.

**ELIGIBILITY**

- For 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** are allowed to participate.
- Each participant in a team must be from the **SAME** university / institution.

**FORMAT**

1. **Poster Guidelines**
    - File Format: PNG or JPEG **ONLY**.
    - Size: 1350 pixels height × 1080 pixels wide
    - Language: English (all text, labels, and captions must be in English).
    - Orientation: Portrait
    - Resolution: 300 pixels per inch or above

- The theme of the poster must follow NACES 2025's theme including the footer that is provided in the drive.
- The footer should be inserted at the bottom of the infographics poster, and will be given in the Google Drive link which will be provided
- Any licensed editing software, including Canva, PowerPoint, Adobe Illustrator, and Adobe Photoshop, etc. may be used by participants.
- Relevant images and attributions must be included.
- Please ensure the content is clearly visible, and easy to read.

**2. Caption Guidelines**

- For online voting purposes, participants must provide a caption to describe the poster with a word limit of **50**.

**RULES AND REGULATIONS**

- Each university/institution is entitled to send a maximum of **SEVEN (7)** participants.
- For online competition, each participant is entitled for **ONE (1)** submission only.
- The submitted work must be of original work. Plagiarism is **STRICTLY PROHIBITED.**
- Decisions by judges are **FINAL** and **NOT** open to appeal.
- Late submissions will not be entertained under any circumstances.
- Entries that do not comply with any one of the above rules will be **AUTOMATICALLY DISQUALIFIED**.
- Upon submission, any modification on the contents is not allowed. Evaluators have the right to penalise the participating team for the change of contents.
- Political and '3R' (Race, Religion and Royalty) contents are **NOT ALLOWED**.

**SUBMISSION GUIDELINES**

- Submission deadline: **15 November 2025**
- Submissions can only be made **SIX (6) days** before the submission deadline: **10 November 2025 - 15 November 2025**.

- All the copy materials must be submitted in the required format together and reached the organiser (via email) before the submission deadline.
  - Poster in **.jpeg** or **.png**
  - Caption in **.pdf**
- Email: regnaces.usm@gmail.com
- Email Subject: [TIC]_Name of University/Institution_Full Name
- Example: [TIC]_USM_Tee Jia Lin
- All successful receipt of submissions will be notified via the provided email within 3 working days. If the participants do not receive any reply from us, please do not hesitate to contact the organizer.

**JUDGEMENT CRITERIA**

**INFOGRAPHIC POSTER [90%]**

Content [60%]

- The information should be accurate (statistics, data, etc).
- Originality and Novelty
- Convey messages effectively with logical sequence.
- No grammatical errors, punctuation, or spelling errors.

Design [20%]

- Layout
- Font
- Colour scheme
- Attractive and Creativity
- Design elements should be consistent

Visual Appearance [20%]

- Information is hierarchically organised
- Colour contrast
- Flow of information
- Easy readability with wise use of text and background colours

**ONLINE VOTING [10%]**

- Divide by the number of likes in the highest liked posting times 10%
- Any suspicious and doubtful action on social media toward the post will cause the participant to be disqualified.

**RESULT**

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

**PRIZES**

1st prize - RM 500
2nd prize - RM 450
3rd prize - RM 400

**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 10 October 2025 to be eligible for participation.
- Any changes on the confirmed participants' list must be informed before 17 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 copyright reserved.
- Registration fees are non-refundable.
- The contents of this booklet are subjected to amendment and improvisation. Participants will be notified when the amendments are made.

**CONTACT INFORMATION**

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