

TECHNICAL DEBATE

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, anticipated to be depleted within the next twenty years. The improper disposal of microelectronic components, including printed circuit boards and semiconductor chips, contributes to the growing challenge of electronic waste (e-waste), with global waste projections reaching 74.7 million metric tonnes by 2030.

Microelectronics presently account for 1.4% to 5.9% of worldwide greenhouse gas emissions, predominantly due to raw material mining, refining, and manufacturing processes. Inadequately handled e-waste disposal, especially from refrigeration equipment, has emitted approximately 98 million metric tonnes of carbon dioxide equivalents into the environment. These problems highlight the pressing necessity for sustainable solutions in microelectronics production.

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:

- 1) Identifying and creating safer, sustainable alternatives to hazardous compounds in microelectronics manufacturing, thereby mitigating toxicity and environmental dangers.
- 2) Developing and executing low-energy, low-carbon production methods that enhance energy utilisation, reduce emissions, and increase overall efficiency in microelectronics manufacture.
- 3) Implementing effective recycling and resource recovery systems to recover valuable materials, prolong the lifespan of electronic 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 electronics sector.

OBJECTIVES

- Encourage participants to explore and present well-researched arguments on chemical engineering solutions that promote sustainable microelectronics manufacturing and reduce environmental impact.
- Provide a platform for debaters to analyze complex engineering challenges, evaluate different perspectives, and construct well-reasoned arguments based on scientific evidence and logical reasoning.
- Develop participants' ability to articulate ideas clearly, concisely, and persuasively, while engaging with an audience and responding effectively to opposing viewpoints.
- Emphasize the use of credible data, scientific research, and engineering principles to support arguments, strengthening participants' ability to construct compelling and well-supported cases.
- Enhance team collaboration skills, encouraging participants to strategize, coordinate roles, and present cohesive and structured arguments as a unified team.
- Instill values of respectful discourse, active listening, and constructive engagement, ensuring a professional and intellectually stimulating debate environment.

- Inspire participants to propose innovative approaches to sustainability challenges in microelectronics manufacturing, aligning with Sustainable Development Goals (SDGs) such as SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

COMPETITION DESCRIPTION

- This is a **GROUP** competition with **3 participants per team**, and will be conducted **PHYSICALLY**.
- Each university/institution may enroll a maximum of **TWO (2) teams** in this competition.
- Each team will be assigned a stance (**Government** or **Opposition**) on topics related to **Synergising Chemical Engineering and Sustainable Microelectronics for a Greener Future**. The competition aims to enhance critical thinking, analytical skills, and persuasive communication by encouraging participants to analyze complex technical issues, explore various perspectives, and construct well-reasoned arguments based on scientific evidence.
- Each debate will last for approximately **60 minutes**, including substantive speeches, Points of Information (POIs), and reply speeches. Participants must adhere to the structured debate format while presenting their arguments on **sustainability in microelectronics manufacturing, materials innovation for greener electronics and the role of chemical engineers in reducing environmental impact**.
- Each **team** will be assigned a task according to the issues that will be provided during the participant briefing session on **18 October 2025**.

ELIGIBILITY

- **ALL** participants must be **full-time undergraduate students**. Each team must consist of **EXACTLY THREE (3) members** from the **SAME university/institution**. At least **TWO (2) team members** must be enrolled in a **Chemical Engineering program** (or its equivalent) at a **participating university/institution**.
- Each participant must submit a **certified true copy** of their **student identity card (Matric Card)** along with their **latest course/module registration slip** as **proof of enrollment**.
- Each participant is allowed to participate in **ONLY ONE (1) physical-mode competition**, but may participate in **ALL online-mode competitions**.

FORMAT

1. Match System

a) Preliminary Round

- The ‘**group power match**’ (**Swiss Bracket**) system will be used to determine match pairings and team roles (government or opposition).
- The role (government/opposition) for the first debate will be selected by ballot or computer.
- For subsequent debates, the role will be assigned based on the role played in the previous debate. Typically, a team’s assignment as government or opposition is determined by the numerical order in which they were previously designated.

b) Quarter-finals, Semi-finals, and Finals

- The role (government/opposition) is determined by a draw or coin toss in front of the respective team leaders.
- The competition will be conducted using the knockout system.

2. Preparation Time

- Debate motions will be announced **30 minutes** before the debate begins. Any travel time to the debate venue is included in this 30-minute preparation period.
- All teams must be **punctual**.
- A team that fails to arrive within **15 minutes** of the scheduled start time will be considered to have **forfeit** the debate.

3. Debate Structure

- Debates will be conducted in **English** using the **Asian Parliamentary style**.
- Each debate consists of two teams:
 - **Government team**
 - **Opposition team**
- Each team comprises **three debaters**.
- Every debater must deliver a substantive speech.
- Reply speeches can be delivered by either the first or second speaker from each team.

Speaking Time:

- Each speaker is given **8 minutes** to present their speech.

- Bell signals:
 - **First minute:** Bell rings once (signaling the start of the protected time).
 - **Seventh minute:** Bell rings once (signaling the start of the final minute).
 - **Eighth minute:** Bell rings twice (indicating the end of speaking time).
- **Reply speeches** are limited to **4 minutes**.
 - Bell signals:
 - **Third minute:** Bell rings once (one minute remaining).
 - **Fourth minute:** Bell rings twice (indicating the end of the speech).

Break Before Reply Speeches:

- A **3-minute break** is given for teams to prepare their **reply speeches**

4. Points of Information (POI)

- POIs are allowed only between the second and seventh minutes of a speaker's speech.
- **POIs are not allowed:**
 - During the first minute and the final minute of a speech.
 - During reply speeches.
- A debater must accept or offer at least one POI per debate.
- **POI rules:**
 - The opposing team must politely raise their hand and stand to indicate their intent to offer a POI.
 - Each POI is limited to 50 seconds.
 - The timekeeper will ring a bell to indicate the start and end of the POI period.
- No heckling, harassment, or disruptive behavior is allowed during the debate.

5. Ethical Guidelines

- Debaters **must not** discuss sensitive topics related to **race, religion, or personal matters** that could **offend, humiliate, or embarrass** any participant, including debaters, adjudicators, or audience members.
- The use of **any religious quote** to support arguments is strictly **prohibited**.

RULES AND REGULATIONS

- Each university/institution is entitled to send a **maximum of TWO (2) teams**.
- Each team must consist of **THREE (3) members**.

- The competition will be conducted **PHYSICALLY** at **Lecture Hall Complex, USM Engineering Campus**.
- In case of emergencies, **any changes in team members must be notified at least ONE (1) week before the competition date (13 December 2025)**, which is **6 December 2025**.
- The use of **external electronic aids** (e.g., online searches, digital tools) is **strictly prohibited**. If an objection is raised with valid evidence, the team's participation will be **immediately DISQUALIFIED**.
- Teams will be assigned either the **Government** or **Opposition** stance for the debate topic by the organizer.
- **Rolled speeches** will be evaluated based on the **substantive speech scoring ratio**, with a **maximum score of 50 points**, as outlined in the scoring criteria.
- **Plagiarism** or the use of **unauthorized data or content** is **strictly prohibited**.
- **Judges' decisions are FINAL** and **not open to appeal**.
- **Late submissions will not be entertained under any circumstances**.
- Topics involving **politics**, or those categorized under **3R (Race, Religion, and Royalty)**, are **strictly prohibited**.
- **Rude, abusive, or aggressive behavior** will result in **mark deductions**. Severe violations may lead to **disqualification**.
- All teams must **comply with the rules and guidelines**. **Failure to comply will result in automatic disqualification**.

JUDGEMENT CRITERIA

Content [40%]

- **Relevance to Topic:** How well the content aligns with the debate motion.
- **Clarity & Development of Arguments:** Logical flow and organization of ideas.
- **Depth & Complexity:** Level of sophistication, detail, and innovation in arguments.
- **Use of Supporting Facts & Examples:** Credibility and relevance of evidence, including real-world examples and statistical data.
- **Counterarguments & Rebuttals:** Effectiveness in dismantling opposing viewpoints logically.
- **Logical Consistency:** Coherent structure without contradictions.

- **Coverage of Different Perspectives:** Inclusion of ethical, technical, economic, and social dimensions.
- **Effectiveness in Refuting Opponents' Points:** Strength of counterpoints and responses.

Style/Presentation [40%]

- **Persuasiveness & Engagement:** Ability to attract and maintain audience attention.
- **Rhetorical Techniques:** Effective use of repetition, analogy, and metaphor.
- **Emotional Resonance:** Engaging the audience while maintaining logical integrity.
- **Self-Confidence & Composure:** Poise, especially during rebuttals.
- **Vocal Variety:** Use of tone, volume, and pacing to enhance delivery.
- **Adaptability:** Ability to respond effectively to unexpected challenges or time constraints.

Procedure [20%]

- **Speech Structure & Organization:** Logical arrangement with clear introductions, transitions, and conclusions.
- **Time Management:** Effective allocation of time for all points.
- **Continuity of Arguments:** Smooth progression and coherence of ideas.
- **Teamwork:** Collaboration, support, and case continuity within the team.

RESULT

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

PRIZES

The winners of the Technical Debate Competition will receive the following cash prizes:

- 1st Prize: RM 850
- 2nd Prize: RM 700
- 3rd Prize: RM 600

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 **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.

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