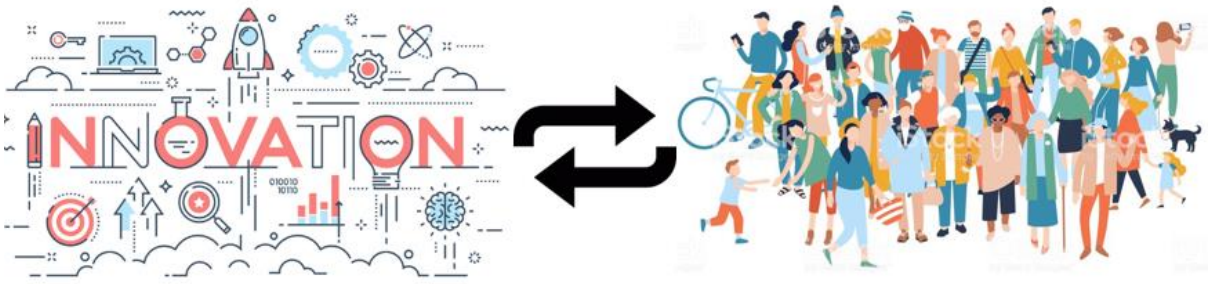
ENGG3000: - Semi-structured perspective piece: "interdependency of culture, society and technological innovation"



Engineering is a socio-technical subject with many involving human factors in addition to technological innovation. Students are to discuss the implication and interdependency of social and technological innovation. The perspective piece is designed to draw attention towards the effects of technological innovation on human culture and experience. **The submission should range between 1500 – 3000 words (5-8 pages in length).**

The scoring guidelines and additional resources on crafting a critical reflective essay can be found on iLearn. Sections that exhibit significant plagiarism, such as extensive passages of substituted synonyms or content that appears to be auto-generated (using GAI or ChatGPT), **will lead to a 50% reduction in the overall document's grade.**

Students must select ONE topic from the "**Technology List**" and another from the "**Challenge List**" and provide an opinion on the chosen subject. (list of topics also shown below) A perspective piece offers viewpoints, delves into associated challenges, and aims to enlighten and explore concepts within a specific, narrow topic. This assignment will focus on the selected technology's interrelationship and potential societal repercussions.

The structure you should aim to have is similar to a research thesis and these headings may include but not be limited to:

1. **Abstract/Executive summary**
   - An executive summary of your perspective based on background research into the topic.
2. **Introduction/background**
   - All the relevant background information for the perspective piece. Research work etc.
   - Include an opening line on your perspective, i.e. the thesis of the work.
3. **Body/Discussion**
   - List and discuss the topics. Each paragraph's section should support the thesis statement.
   - There should be a logical flow between arguments.
   - There could be counterarguments or alternative views.
4. **Conclusion/impact**
   - Summaries the arguments provided in the body paragraphs that support the thesis.
   - State the impact and implementation of the thesis and possible future consideration.
5. **Reference list**
   - This isn't a bibliography; references should be integrated directly into the text with in-text citations. The complete list of references should be provided in this section using the IEEE citation style. Prioritise references from post-2021, focusing on recognized journal papers and review articles rather than web pages.

Example:

- Adil, A. M., & Ko, Y. (2016). Socio-technical evolution of Decentralized Energy Systems: A critical review and implications for urban planning and policy. *Renewable and Sustainable Energy Reviews*, *57*, 1025-1037. (https://www.sciencedirect.com/science/article/pii/S1364032115014628)
- Steinhilber, S., Wells, P., & Thankappan, S. (2013). Socio-technical inertia: Understanding the barriers to electric vehicles. *Energy policy*, *60*, 531-539. (https://www.sciencedirect.com/science/article/pii/S0301421513003303)
- Kondratenko, Y. P. (2015). Robotics, automation and information systems: future perspectives and correlation with culture, sport and life science. In *Decision Making and Knowledge Decision Support Systems* (pp. 43-55). Springer, Cham. (https://link.springer.com/chapter/10.1007/978-3-319-03907-7_6)
- Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British journal of educational technology*, *39*(5), 775-786. (https://onlinelibrary.wiley.com/doi/full/10.1111/j.1467-8535.2007.00793.x)

Technology list:

CE1 Building Information Modelling (BIM): Digitalizing building processes from inception to demolition.

CE2 3D Printing in Construction: Transforming construction with rapid prototyping and reduced waste.

CE3 Smart Infrastructure and IoT: Embedding intelligence into infrastructure.

CE4 Green and Sustainable Building Materials: Emphasizing environmentally-friendly construction.

CE5 Geospatial Technologies: Enhancing site analysis and visualisation using tools like GIS.

EE1 High-Efficiency Power Converters: New designs and control techniques are being developed for power converters and inverters, especially for renewable energy applications and electric vehicles.

EE2 Photonics and Optoelectronics: Advancements in this area have led to faster and more energy-efficient optical communication systems.

EE3 Biomedical Electronics: Innovations in implantable devices, wearables, and telemedicine are transforming healthcare.

EE4 Embedded Systems and Edge Computing: With the proliferation of IoT, there's a growing need for processing data at the source, leading to advances in embedded systems and edge computing.

EE5 Artificial Intelligence (AI) Hardware: Specialized hardware like Graphics Processing Units (GPUs) and Tensor Processing Units (TPUs) are being developed to handle the computations required by AI and machine learning algorithms.

ME1 Micro-Electro-Mechanical Systems (MEMS) are tiny integrated devices or systems that combine electrical and mechanical components. They are found in various applications, from automotive sensors to medical devices.

ME2 Smart Manufacturing (Industry 4.0): Using AI, IoT, and big data analytics, manufacturing processes are becoming more efficient, adaptable, and customisable.

ME3 Additive Manufacturing (3D Printing): 3D printing has revolutionised how prototypes are built and has found applications in end-use parts production, aerospace components, medical implants, and more.

ME4 Advanced Materials: The discovery and utilisation of new materials like graphene, metamaterials, and nanomaterials have led to more robust, lighter, and versatile applications.

ME5 Digital Twins: This involves creating a digital replica of physical assets (like machinery) that can be used for various purposes, including optimising operation and maintenance.

ME6 Energy Harvesting Systems: Developing sustainable energy solutions from ambient sources.

MET3 Micro-Electro-Mechanical Systems (MEMS) are tiny integrated devices or systems that combine electrical and mechanical components. They are found in various applications, from automotive sensors to medical devices.

MTE1 Robotics and Automation: Advanced robots with AI integration are more adaptable and can handle complex tasks, from manufacturing lines to surgical procedures.

MTE2 Advanced Sensing and Feedback Systems: Utilizing low-cost, high-performance sensors to enhance machinery responsiveness.

MTE4 5G Technology: Serving as the backbone for IoT and other technologies.

MTE5 Augmented Reality (AR) and Virtual Reality (VR): Innovations like Microsoft HoloLens that transform digital interactions.

MTE6 Advanced Sensing and Feedback Systems: Enhancing system responsiveness with high-quality sensors.

MTE7 Collaborative Robots (Cobots): Fostering human-machine collaboration in shared workspaces.

SE 4 Augmented Reality (AR) and Virtual Reality (VR): As AR and VR technologies mature, there's an increased demand for software development tools and platforms that support these technologies.

SE1 Low-code and No-code Platforms enable rapid application development with minimal hand-coding, speeding up the software development process.

SE2 Blockchain: Beyond cryptocurrencies, blockchain has seen applications in supply chain, voting systems, and more, leading to new paradigms in software development.

SE3 Serverless Computing: Building and running applications without server management using platforms like AWS Lambda.

Societal challenge list:

Biodiversity Loss: Within the broader challenge of climate change and environmental degradation, biodiversity loss is unique as it concerns the variety and variability of life on Earth. This loss is not just about species but also includes genetic differences within species and the variety of ecosystems.
Digital Misinformation: Under the category of technological disruption and cybersecurity, the spread of digital misinformation stands out. This problem encompasses the proliferation of fake news, propaganda, and other misleading information, mainly through social media, which can distort public perceptions and influence elections and public policies.
Educational Disparities: Quality of education can vary widely within and across regions.
Gender, Race, and Ethnicity-based Inequalities: Among the broader umbrella of inequality, the challenges tied specifically to gender, race, and ethnicity represent specific forms of discrimination and systemic biases that impact millions of individuals globally.
Infrastructure Needs: Many regions need better roads, schools, hospitals, and public transportation.
Lack of Effective Governance: While political instability is more overt and immediate, the subtler, long-term problem of ineffective governance in some regions can erode trust, hinder development, and lead to numerous societal issues, including corruption and lack of accountability.
Underemployment: Within economic challenges, while unemployment is a clear issue, underemployment represents a unique problem where individuals work, but the jobs don't use their skills fully or provide enough hours/pay to meet their needs.

Marking rubrics:

Grade Category	Synthesis of Argument (45%)	Supporting Factors (35%)	Clearly Developed Perspective (20%)
HD	A detailed and profound exploration highlighting the ties between culture and technological advances. This includes historical context leading to the contemporary topic, balancing pros and cons, and leading to a clear and thoughtful position.	In-depth support from peer-reviewed resources, with various sources like journals, books, review pieces, and credible websites. Reflects publication-worthy quality.	Presents a profound and original perspective, effectively questioning and weaving in different views. Offers an in-depth analysis of the subject's current state, leading to a unique viewpoint.
Cr - D	A structured submission that accentuates the importance and nexus between cultural and technological shifts, along with a reasoned evolution to the current subject.	Utilises a broad array of references, combining websites with peer-reviewed content such as review articles, scholarly research, and books. All references are diligently cited.	Showcases skill in analysing prevailing opinions and the latest developments in the topic. Crafts a clear and persuasive viewpoint.
P	It reasonably reviews the topic's significance, though it only partially connects culture and technological evolution.	It uses a satisfactory mix of references to support the arguments, though it leans heavily on web sources. Most of these sources are correctly attributed.	Acknowledges a range of opinions and attempts to position one's stance alongside the merits and limitations of other views.
F	Provides a basic or superficial overview of the topic without diving deep into its significance. Contains plagiarised segments from online sources or significant portions generated using Generative AI tools.	Need to include critical supporting data. Any provided viewpoint needs substantial evidence. Contains plagiarised segments from online sources or significant portions generated using Generative AI tools.	Fails to offer a discerning perspective, merely echoing existing knowledge. Lacks a comprehensive critique and needs to appreciate diverse opinions. Contains plagiarised segments from online sources or significant portions generated using Generative AI tools.