MEDD8860 Emerging Technologies in STEM Education

Course description
This course explores a broad range of current and emerging tools, practices and themes in STEM education. Also, the course will review current and future research trends in emerging tools, practices and themes in STEM Education. The course begins by exploring the historical development of cross-disciplinary integration in STEM education, in order to equip students with an overall picture on the types and trends of digital technology used for delivering STEM education in the past, present and future classrooms.

Course objectives
The course aims to develop a comprehensive knowledge of a wide range of emerging STEM technologies and enable more innovative and engaging teaching methods and learning experiences. It also provides students with a foundation to their understanding of coding and applications of STEM technology resources. The course will raise aspects of learning design and related theoretical frameworks for learning from the emerging STEM technologies with particular focus on pedagogical effectiveness.

Course learning outcomes (CLOs)	Aligned programme learning outcomes (PLOs)
1. Critically explore emerging technologies and possibilities they create for STEM education	PLOs 1, 2, 3
2. Practically engage with emerging technologies to demonstrate high level of understand of possibilities that these bring to applications in STEM learning activities	PLOs 2, 3
3. Develop a conceptual response to dealing with emerging technologies in STEM education, inclusive of critical issues that schools must consider in their STEM related strategic planning.	PLOs 2, 3, 4, 5

Course assessment methods
• Portfolio of Individual Reflections • A Cross-Industry Transfer Project Proposal in The Emerging STEM Technology • A Cross-Industry Transfer Project Report

Course content and topics
• Introduction to the course • The Learning Revolution • Technology in STEM education • STEM and Coding Pedagogy • Introduction to algorithmic skills with robotic toys • Coding as a playground • Get to know directions with the mouse robot • Introduction to Coding with Block-Coding • Block-Coding with Micro-Bits & Sensors • Activity Theory and HCI • Classwork: Coding with Sensors • The concept of STEM Makerspace • Technology Affordance and Perceptual Information • Makerspaces Pedagogy • Classroom activity: Robotic Arm Controlling • Immersive Technology in Education • Disruptive Innovation in Education

- Develop A VR/AR project with JavaScript
- Data Literacy in Education
- Machine Learning (ML) in Education
- Ill-structured Problem Solving
- Introduction to ML model deployment
- Introduction to Artificial Intelligence in Education
- Activity Theory and HCI
- Python and Computer Vision
- OpenCV and Chat GPT

Required / recommended readings and online materials

1. Behne, A., Beinke, J. H., & Teuteberg, F. (2021). A Framework for Cross-Industry Innovation: Transferring Technologies between Industries International Journal of Innovation and Technology Management, 18(3), 1-27.

2. Ching, Y.-H., Baldwin, S., & Hsu, Y.-C. (2017). Learning through Making and Maker Education. Tech Trends, 61(6), 589-594.

3. García-Valcárcel-Muñoz-Repiso, A., & Caballero-González, Y. A. (2019). Robotics to develop computational thinking in early Childhood Education. Comunicar. Media Education Research Journal, 27(1).

4. Kovács, P., Murray, N., Rozinaj, G., & Sulema, Y. (2015). Application of immersive technologies for education: State of the art. Paper presented at the 2015 International Conference on Interactive Mobile Communication Technologies and Learning, Thessaloniki.

Other additional course information

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