

Course Description

MEDD8860 Emerging Technologies in STEM Education

Course description		
<p>This course explores a broad range of current and emerging tools, practices and theories in STEM education. Students will develop hands-on skills in areas such as artificial intelligence (AI) in education and robotics. The course begins by exploring the historical development of cross-disciplinary integration in STEM education. The topics of the course are progressively disclosing the application of emerging STEM technologies in education from abstract to specific and from simple to more complex educational applications. This is supplemented with the industry visit as the group project to cultivate the thinking of cross-industry learning with the emerging STEM technologies.</p> <p>The exploration of STEM technologies begins with a review of the knowledge of computational thinking (CT) and the use of the appropriate robots. Next, the introduction to block coding and text-based coding with Python will merge with hands-on practices of simple robotics with sensors and AI educational software design. Lastly, attention will be given to introducing to the concepts of engineering design self-efficacy, ability to innovate, and tinkering with digital fabrication and 3D printing in cultivating the maker mindset.</p>		
<p>Coursework / Examination ratio: <u> 100 </u> % Coursework, <u> 0 </u> % Examination</p>		
Course objectives		
<p>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.</p>		
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		
Assessment method	Weighting (%)	Aligned course learning outcome(s)
Portfolio of Individual Reflections	50	CLOs 1, 2
A Cross-Industry Transfer Project Proposal in The Emerging STEM Technology	40	CLOs 1, 2, 3
A Cross-Industry Transfer Project Report	10	CLOs 1, 2, 3
Course content and topics		
<ul style="list-style-type: none"> • Introduction to the course • Using technology to support teaching and learning • Technology in STEM education • Learning design framework for Technology integration in STEM • 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
- Activity Theory and HCI
- Python and Computer Vision
- OpenCV and Artificial Intelligence in Education
- Data Literacy
- Graduate Students: ML to improve the passing rate
- Three types of data and ML algorithms: Linear Regression, Logistic Regression and Classification
- The AR & VR
- The Introduction to Haptic Technology
- The Innovation in Education with MR and Haptic Touch
- The concept of STEM Makerspace
- Robotic Design with Acrylic Board
- Prototyping and product design
- Introduction to ML model deployment
- Introduction to App/Web Repository
- The case of applying the machine learning to reduce school dropouts
- Revision
- Discussion of final assessment requirement
- Presentation of the key achievements in your group portfolio

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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