Subject Description Form

Subject Code	COMP 5570
Subject Title	**Metaverse Applications: Design and Case Studies**
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: COMP5140 Metaverse Fundamentals & COMP5424 Extended Reality
Objectives	The objectives of this subject are to enable the students to: 1. understand how Metaverse technology can be adopted to solve practical problems, 2. understand how both the enabling technologies and the human factors can shape the design of Metaverse applications, and 3. apply and adapt existing design approaches to address new problems in Metaverse applications. The objectives of this subject will be achieved using the case-study method with real-world applications to fields such as entertainment, web learning, NFT, and healthcare.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a) develop systematic knowledge of the design dimensions of Metaverse applications; b) develop profound knowledge and experience of the process of developing Metaverse products by transforming ideas into real-world applications; c) master the design skills of tailoring the Metaverse technology to solve practical problems; d) enact the design skills to at least one of the fields and gain hands-on experience; e) understand members required in a team for Metaverse applications and appreciate their responsibilities and communication roles.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	This course introduces the principles of designing and developing Metaverse applications. The major topics include the immersive techniques for and the functionality of Metaverse applications, Metaverse privacy, security, ethics, and Metaverse intelligence. **Topic** **1. Introduction to Metaverse applications**

	Overview of the course, definition of Metaverse applications, design dimensions, Metaverse application ecology and economy, design and development process
	2. Immersive Techniques and Functionality SDKs, tools, and services for augmented reality, virtual reality, extended reality (XR), human computer interactions, devices and internet of things, and digital twins
	3. UIUX SDKs, tools, and services for vatar systems, spatial user interface, multimodal user interface, locomotion, UI prototyping, and accessible and inclusive UX design
	4. Metaverse Privacy, Security and Ethics SDKs, tools, and services for cyberspace encryption, blockchain, and federated learning
	5. Metaverse Intelligence SDKs, tools, and services for nature language processing, machine learning, data mining, and recommendation systems
	6. Case Study: Meat Entertainment Metaverse prototypes for entertainment, including multiplayer VR gaming, social VR, live performance in Metaverse, etc.
	7. Case Study: Meat Web Learning Metaverse prototypes for education, including avatar-mediated teaching and learning, immersive learning, experiential learning, collaborative learning, etc.
	8. Case Study: Meta NFT Metaverse prototypes for expressive arts and NFT, including digital museums in Metaverse, NFT and artworks trading, expressive art creations, live performance, etc.
	9. Case Study: Meat Healthcare Metaverse prototypes for healthcare and mental well-being, including teletherapy, teleoperation, rehabilitation, etc.
Teaching/Learning Methodology *(Note 3)*	Lectures: The lectures will focus on the introduction of the design dimensions including those related to immersive techniques, privacy, security, ethics, intelligence, and UIUX. Beyond the concepts, the dimensions will be discussed in case studies with the real Metaverse prototypes/applications. Onsite Visits: Tours will be organized to visit organizations who are developing applications for the students to gain onsite experience of what have been discussed in the case studies.

	Assignments: Students will implement specific components for immersive user experience by integrating the existing SDKs/services. Questions will be given to reinforce their understanding of the design dimensions by solving real-world problems. Roadshows (Group Projects): The projects are designed for each group to deliver a virtual roadshow. Each group has to prepare a business plan with the design of a Metaverse application, resources required, members and roles of their team, and an executive plan. Experts from both industry and academy will be invited as the examiners or investors to rate the projects.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Assignment I	30	√	√				
2. Assignment II	30			√	√		
2. Projects	40	√	√	√	√	√	
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment I: This assignment assesses the students' conceptually understanding of the design dimensions. The understanding has to be systematic and profound.

Assignment II: This assignment assesses the students' ability to relate the concepts with real applications. The students have to tailor the design dimensions by reviewing the specific needs of the applications.

Projects: The projects assess the students' understanding both conceptually and practically. The roadshows require both in-depth knowledge and a comprehensive set of skills.

Student Study Effort Expected	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Onsite Visits	8 Hrs.

	Other student study effort:	
	▪ Regular reading and assignments	80 Hrs.
	▪ Roadshows (Group Projects)	20 Hrs.
	Total student study effort	134 Hrs.
Reading List and References	Metaverse Roadmap (2007) https://www.metaverseroadmap.org/overview/ LaViola Jr, J. J., Kruijff, E., McMahan, R. P., Bowman, D., & Poupyrev, I. P. (2017). *3D user interfaces: theory and practice.* Addison-Wesley Professional. LaValle, M. (2019). *Virtual reality*. Cambridge University Press.	