UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
META-523DL	Emerging Topics in Metaverse	10
Prerequisites	**Department**	**Semester**
None	Digital Innovation	Fall/Spring
Type of Course	**Field**	**Language of Instruction**
Elective	Metaverse	English
Level of Course	**Lecturer**	**Year of Study**
2nd Cycle	Dr. Elias Iosif	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Distance Learning	N/A	N/A

Course Objectives:

The main objectives of the course are to:

1. Explain how the underlying technologies of the Metaverse lead the way for the digital transformation.
2. Discuss how the algorithmic governance is impacting the Metaverse.
3. Describe how DeFi and Metaverse combine to form complex financial interactions.
4. Explain what drives the Metaverse VR/AR HW products design and development.
5. Analyse the new HW capabilities and explain how they will enable Metaverse.
6. Discuss Metaverse open issues.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Demonstrate how the algorithmic governance is impacting metaverse communities.
2. Illustrate how DeFi and Metaverse combine to form complex financial interactions.
3. Explain how the new HW capabilities enable Metaverse and analyze how these HW products will interact in their daily life and what needs will cover.
4. Discuss open issues of the Metaverse and the vision for the Metaverse 2030.

Course Content:

Transition to open web and the relationship to the Metaverse emergence

- Metaverse origins
- Spatial Web and Open Web transition

Metaverse typology and applications

- Metaverse typologies
- Metaverse types
- Metaverse-native and non-native applications

Metaverse: challenges and vision

- Challenges and debated issues (open vs closed systems)
- The vision of the Open Metaverse

Decentralized Autonomous Organizations and token curated registries

- Decentralized Autonomous Organizations (DAOs) and Token Curated Registries (TCRs)
- DAOs and TCRs and their interaction
- Future applications and contributions

Algorithmic governance and the Metaverse

- Mechanisms of algorithmic governance
- Algorithmic governance in Decentralized Autonomous Organizations
- Present the future implementations of algorithmic governance

DeFi in the Metaverse- MetaFi

- DeFi
- MetaFi
- Present of the future applications and capabilities of the MetaFi ecosystem

Human-Machine Interaction: Dialogue Systems

- Human conversation and terms
- Techniques underlying the simplest dialogue system, chatbots
- Architectures of more complex systems

Human-Machine Interaction: Question Answering

- Architecture and respective models in the framework of information retrieval-based question answering
- Synergy between entity linking and question answering

Human-Machine interaction: behavioral signal processing

- Behavioural signal processing (BSP)

- BSP acquisition, feature engineering, and modelling
- Use cases

The evolution and the future of wireless networks

- Mobile networks: From 1G to 5G
- 6G and the vision behind it
- The power of disruption of 6G (autonomous driving, e-Health, massive scale communication, Virtual Reality, Metaverse)

Towards a fully digital and connected World

- KPIs for 6G use cases
- Performance metrics for 6G use cases (QoS, QoE, QoPE)
- Enabling key technologies for 6G

Virtual reality / augmented reality (AR/VR) hardware

- VR/AR hardware (HW) products and key components of each one.
- Drivers for Metaverse VR / AR HW products design and development.
- New HW capabilities and how they will enable Metaverse.

Learning Activities and Teaching Methods:

- Faculty Lectures
- Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Simulations
- Student-led Presentations
- In-Class Exercises

Assessment Methods:

- Interactive activities and classroom participation
- Assignments
- Final exams

Assessment Methods in alignment with Intended Learning Outcomes:

		Intended Learning Outcomes to be assessed			
Assessment Method	**Weighting**	LO1	LO2	LO3	LO4
Interactive activities	16%	✓	✓	✓	✓
Assignments	24%	✓	✓	✓	✓
Exams	60%	✓	✓	✓	✓

Student Study Effort Expected:

Student Study Effort Expected	Hours
Lectures	12h
Assignments	80h
Interactive activities and forum participation	20h
Reading and research	135h
Exam	3h
Total	250h

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
The Metaverse: Prepare Now for the Next Big Thing!	Terry Winters	Independently published	2021	979-8450959283

Recommended Textbooks / Readings:

- Arodami Chorianopoulou, Efthymios Tzinis, Elias Iosif, Asimenia Papoulidi, Christina Papailiou, and Alexandros Potamianos. (2017). Engagement detection for children with autism spectrum disorder. In 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 5055-5059. IEEE.
- Berners-Lee, T.J. (1989). Information management: A proposal (No. CERN-DD-89-001-OC);(online).
- Dan Jurafsky and James H. Martin. (2022). Speech and Language Processing (3rd edition).
- DuPont, Q. (2017). Experiments in algorithmic governance: A history and ethnography of "The DAO," a failed decentralized autonomous organization. Bitcoin and beyond, 157-177.
- Dionisio, J.D.N., III, W.G.B. and Gilbert, R. (2013). 3D virtual worlds and the metaverse: Current status and future possibilities. ACM Computing Surveys (CSUR), 45(3), pp.1-38. (online).
- Duan, H., Li, J., Fan, S., Lin, Z., Wu, X., and Cai, W. (2021, October). Metaverse for social good: A university campus prototype. In Proceedings of the 29th ACM International Conference on Multimedia (pp. 153-161).
- El Faqir, Y., Arroyo, J., & Hassan, S. (2020). An overview of decentralized autonomous organizations on the blockchain. ACM International Conference Proceeding Series. https://doi.org/10.1145/3412569.3412579
- Emmanuel Bertin, Noel Crespi, Thomas Magedanz (Editors), Chapter 2, Shaping Future 6G Networks: Needs, Impacts, and Technologies, IEEE Press, Wiley, ISBN: 978-1-119-76551-6, 2021.
- Erin Pangilinan, Steve Lukas, & Vasanth Mohan. (2019). Creating Augmented and Virtual Realities. O'Reilly Media, Inc.
- Galia Kondova, & Renato Barba. (2019). Governance of Decentralized Autonomous Organizations. Journal of Modern Accounting and Auditing, 15(8), 406–410. https://doi.org/10.17265/1548-6583/2019.08.003
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- Kaur, J., & Visveswaraiah, B. (2021). A Brief Survey of Token Curated Registries. In Emerging Technologies in Data Mining and Information Security (pp. 189-202). Springer, Singapore.
- Keller, Joaquin, and Gwendal Simon. (2002). Toward a peer-to-peer shared virtual reality. Proceedings 22nd International Conference on Distributed Computing Systems Workshops. IEEE.
- Kushal Kafle and Christopher Kanan. (2017). Visual question answering: Datasets, algorithms, and future challenges. Computer Vision and Image Understanding 163 (2017): 3-20.
- Matthew Turk. (2014). Multimodal interaction: A review. Pattern recognition letters 36 (2014): 189-195.
- Rauschnabel, P. A., Brem, A., & Ivens, B. S. (2015). Who will buy Smart Glasses? Empirical Results of two Pre-market-entry Studies on the Role of Personality in Individual Awareness and Intended Adoption of Google Glass Wearables. Computers in Human Behavior, 49, 635–647.
- Rauschnabel, P. A., Brem, A., & Ro, Y. (2015). Augmented reality smart glasses: definition, conceptual insights, and managerial importance. Working paper, The University of Michigan-Dearborn, ResearchGate.
- Shrikanth Narayanan, & Panayiotis G. Georgiou. (2012). Behavioral signal processing: Deriving human behavioral informatics from speech and language. Proceedings of the IEEE, 101(5), 1203-1233.
- Taha, A.-E. M. (2021). Quality of Experience in 6G Networks: Outlook and Challenges. J. Sens. Actuator Netw. 10, 11. https://doi.org/10.3390/jsan10010011
- Thomason, J. (2021). MetaHealth-How will the Metaverse Change Health Care? Journal of Metaverse, 1(1), 13-16.
- Treleaven, P., Greenwood, A., Pithadia, H., & Xu, J. (2022). Web 3.0 Tokenization and Decentralized Finance (DeFi). Available at SSRN 4037471.
- Zhao, Yajun, Guanghui Yu, & Hanqing Xu. (2019). 6G Mobile Communication Network: Vision, Challenges and Key Technologies. 10.1360/N112019-00033.