UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
META-512	Metaverse Technologies and Applications	10
Prerequisites	**Department**	**Semester**
None	Digital Innovation	Fall/Spring
Type of Course	**Field**	**Language of Instruction**
Required	Metaverse	English
Level of Course	**Lecturer**	**Year of Study**
2nd Cycle	Dr. Marinos Themistocleous	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Face to face	N/A	N/A

Course Objectives:

The main objectives of the course are to:

1. Present and discuss Metaverse characteristics, concepts and layers.
2. Explain and analyse Metaverse technologies, tools, platforms, and applications.
3. Discuss design theories and practices relevant to the Metaverse.
4. Explore cybersecurity and cybercrime in the Metaverse.
5. Examine open challenges in the Metaverse.

Learning Outcomes:

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

1. Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
2. Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.
3. Examine and discuss Metaverse platforms, applications and the latest technological developments in this area.
4. Identify cybersecurity issues, understand cybercrime, and discuss the open challenges.

Course Content:

Session 1: Metaverse fundamentals:

- Metaverse evolution
- Metaverse importance and characteristics
- The interdisciplinary nature of the Metaverse
- Metaverse opportunities and risks
- Computer-mediated communication (social presence theory, social information processing theory, media richness theory, cyborg theory)
- Avatar-mediated communication

Session 2: The seven layers of Metaverse:

- Experience
- Discovery
- Creator economy
- Spatial computing
- Decentralization
- Human interface
- Infrastructure

Session 3: Metaverse Technologies part I:

- AR/VR/MR/XR
- 3D reconstruction
- Game engines
- Smart glasses, wearables, haptic devices, headsets and headwear

Session 4: Metaverse technologies part II

- Blockchain, smart contracts, tokens, NFTs
- Cryptography
- Artificial Intelligence (AI)
- Internet of Things (IoT)
- Edge computing and 5G, 6G

Session 5: Design theories and practices

- Social presence and co-presence
- Motion sickness and cybersickness
- Uncanny valley
- Sense of self- location, sense of agency and sense of body ownership
- Universal simulation principle
- Prototyping
- Evaluation techniques (qualitative and quantitative)

Session 6: Tools and technologies for Metaverse UX and UI

- Tools and services for avatar systems
- Spatial user interface design
- Cross-platform user experience design

- Multimodal user interface
- Technologies and devices for human computer interaction in Metaverse

Session 7: Metaverse platforms

- Decentraland, SANDBOX
- Roblox, Axie Infinity
- uHive, Hyper Nation
- Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS)
- Bloktopia (BLOK), Stageverse
- Spatial, PalkaCity, Viverse
- Sorare, Illuvium, Upland
- Second Life, Sansar, Sensorium Galaxy

Session 8: Metaverse applications - part I

- Gaming and entertainment
- Travel and tourism
- Education and learning
- Remote working
- Commerce and business

Session 9: Metaverse applications - part II

- Real estate
- Banking and Finance
- Healthcare
- Social media
- Fashion

Session 10: Metaverse and cybersecurity

- Cybersecurity concerns in Metaverse:
    - Social engineering attacks
    - Data theft
    - Decentralization vs vulnerabilities
- Cybersecurity risks in Metaverse: process, people, technology
- Best practices for preventing cyberattacks in Metaverse
    - Risk assessment and mitigation
    - Physical security
    - Data encryption
    - Controlled access
    - Protect outbound data
- Implementing cybersecurity in the Metaverse:
    - Platform owners,
    - Property owners/renters
    - Consumers/users

Session 11: Metaverse and cybercrime

- Scam and theft

- Rug pull
- Money manipulation and wash trading
- Money laundering

Session 12: Metaverse challenges and open issues

- Persistency
- Interoperability and scalability
- Maturity
- Regulation
- Usefulness and ease-of-use
- Privacy and data security
- Content creation
- NFTs and creator economy
- Social, legal and ethical issues in the 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
- Assignments / Project
- 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	15%	✓	✓	✓	✓
Assignments	25%	✓	✓	✓	✓
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	Terry Winters	Independently published	2021	979-8450959283

Recommended Textbooks / Readings:

1. Ball, M., 2022, "The Metaverse and How It Will Revolutionize Everything", Liveright, ISBN: 978-1324092032
2. Christodoulou, K. Katelaris, L., Themistocleous, M, Christoudoulou P. and Iosif E, 2022, "NFTs and the Metaverse Revolution: Research Perspectives and Open Challenges", Blockchains and the Token Economy: Theory and Practice, Eds: Lacity M., Treiblmaier H., (2022), Palgrave Macmillan, Cham, pp. 139-178
3. Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal of Metaverse, 1(1), 1–8.
4. Day, J. (2022) Metaverse will see cyberwarfare attacks unlike anything before: 'Massively elevated', February 28, https://www.express.co.uk/news/science/1570844/metaverse-news-cyber-warfare-attacks-virtual-worlds-russia-china-spt.
5. Davis, A., Khazanchi, D., Murphy, J., Zigurs Ilze, & Owens, D. (2009). Avatars, people, and virtual worlds: Foundations for research in metaverses. Journal of the Association for Information Systems, 10(2), 90–117. https://doi.org/10.17705/1jais.00183
6. Doppler, D. (2022) Hospitality industry and Metaverse. https://www.quicktext.im/blog/metaverse-for-hospitality-part-2-for-hoteliers/
7. Falchuk, B., Loeb, S., & Neff, R. (2018). The social metaverse: Battle for privacy. IEEE Technology and Society Magazine, 37(2), 52–61.
8. Nidagundi, P., 2022, "Metaverse Development: Handbook For Software Developer, Analyst, Consultant, Startups and Business Owners" ISBN: 979-8418729293
9. Polyviou, A., Pappas, I.O. (2022). Chasing Metaverses: Reflecting on Existing Literature to Understand the Business Value of Metaverses. Information Systems Frontiers, 1-17. Link:https://link.springer.com/article/10.1007/s10796-022-10364-4
10. Polyviou, A., Pappas, I.O. (2022). Metaverses and Business Transformation. In: Elbanna, A., McLoughlin, S., Dwivedi, Y.K., Donnellan, B., Wastell, D. (eds) Cocreating for Context in the Transfer and Diffusion of IT. TDIT 2022. IFIP Advances in Information and Communication Technology, vol 660. Springer, Cham. Link: https://link.springer.com/chapter/10.1007/978-3-031-17968-6_25
11. Polyviou, A., Sharma K., Pappas, I.O.(2023). Training in the metaverse: Employing physiological data to improve how we build metaverses for businesses. The next generation internet: The role of

metaverses, AR, VR, MR, and digital twins, Temple University Institute for Business and Information Technology Link: https://ibit.temple.edu/nextgenerationinternet/
12. QuHarrison T. , Keeney, S., 2022, “The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift”, Wiley, ISBN: 978-1119892526
13. Stephenson, N., 1992, “Snow Crash”, ISBN: 978-055338
14. Themistocleous, M., Christodoulou, K., & Katelaris, L. (2023). An Educational Metaverse Experiment: The first on-chain and in-Metaverse academic course. Information Systems. EMCIS 2022. Lecture Notes in Business Information Processing, Springer, Cham.