Course Syllabus

Course Code	Course Title	ECTS Credits
META-515DL	Virtual World Architectures	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	Michail Georgiou	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Distance Learning	N/A	N/A

Course Objectives:

The main objectives of the course are to:
1. Examine the role of architecture and design in the making of the metaverse
2. Discuss the potential and future of the design disciplines in the metaverse era.
3. Explore metaverse constituent elements (interfaces, avatars, economy, land, assets, ai) and their relation to virtual environments.
4. Demonstrate key design concepts, theories and industry practises applicable to creating spaces for the metaverse.
5. Explain voxel graphics, polygon graphics and gaming development environments and utilise them to create 3d content for the metaverse.

Learning Outcomes:

After completion of the course students are expected to be able to:
1. Demonstrate a comprehensive understanding of Metaverse and Architecture
2. Use key tools and workflows needed for creating designs in Metaverse
3. Explain Metaverse design principles (e.g. user interface and immersion, avatars and identities, economy, land, assets, and artificial intelligence)
4. Create designs in Metaverse, including voxel and polygon pipelines, virtual materiality, interactivity, and animations.

Course Content:

Session 1: Introduction to Metaverse and Architecture
- Course Overview
- Metaverse and Architecture

Session 2: Precedents
- Prehistory - "New Topics" Are Often Not That New
- Recent History - Early 2000 (Alpha World, Second Life, MMORPGs, etc.)

Session 3: Gateways
- Uses and Activities (Museums, Galleries, Event Spaces, etc.)
- Key Centralised Platforms
- Key Decentralized Platforms
- Architectural Metaverse Case Studies

Session 4: Pillars
- User Interfaces and Immersion
- Avatars and Identities (Avatar builders)
- Economy (Currencies, Wallets, Marketplace's, NFTs, Play-to-Earn)
- Land (Parcels, Mapping and Cartography)
- Assets (Digital Twins, Urban Scales, Communities, Landmarks)
- Artificial Intelligence

Session 5: Designing for the Metaverse
- Narrative and Storytelling
- User Experience/Perception/Interaction
- Systems Design and Interoperability
- Lessons from other disciplines (Programming, Gaming, etc)
- Design Rules and Constraints (Gravity, Navigation, etc)
- Aesthetics of the Metaverse

Session 6: Tools and Workflows
- 3D Modelling Software (Blender, Rhino)
- Gaming Engines and Templates (Unity, Unreal)
- Native Platform Builders
- Predominant File Types (*.vox, *.glb, *.gltf)
- Computer Graphics (Polygonal and Voxel Graphics)
- Textures / Transformations / Meshes (vertices, edges, faces)
- Optimising and Exporting 3D Models (constrains/limitations/considerations)

Session 7: Voxel Pipeline
- Voxel Graphics and Applications
- Tools, and UIs (Overview, Navigation, Uses, etc)
- Basic Voxel Modelling and Editing
- Workflow Example (Blender or Rhino to Sandbox or CryptoVoxels)
- Assets and Colliders

Session 8: Polygon Pipeline
- Polygon Graphics and applications
- Tools and UIs (Overview, Navigation, Uses, etc)
- Basic Polygon Modelling and Editing
- Workflow Example (Blender or Rhino to Decentraland)
- Assets and Colliders

Session 9: Game Engines Pipeline
- Tools and UIs (Overview, Navigation, Uses, etc)
- Unity SDK Templates
- Workflow Example (Unity or Unreal to MONA)
- Assets and Colliders

Session 10: Virtual Materiality
- Standard and Physically based rendering (PBR) Materials
- Shaders (diffuse, specular, transparency, emissiveness, etc.)
- Textures
- Lights

Session 11: Interactivity and Animations
- Interactivity (Adding Media, Audio, Links, NFTs)
- Animations (Creating and Testing)
- SDK Intro – Create by writing code

Session 12: Recap
- Summarizing the course
- A checklist of virtual worlds builder's questions
- Q&A discussion on the role and future of Design 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 and classroom participation
- Assignments
- Final exams

Assessment Methods in alignment with Intended Learning Outcomes:

Assessment Method	Weighting	Intended Learning Outcomes to be assessed			
		LO1	LO2	LO3	LO4
Interactive activities	30%	✓		✓	✓
Assignments	10%	✓	✓	✓	✓
Exams	60%	✓	✓	✓	✓

Student Study Effort Expected:

Student Study Effort Expected	Hours
Lectures	12h
Assignments	25h
Interactive activities and forum participation	70h
Reading and research	140h
Exam	3h
Total	250h

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Rethinking Virtual Places (The Spatial Humanities)	E. M. Champion	Indiana University Press	2021	978-0253058355

Recommended Textbooks / Readings:

- Ball, M. (2021). The Metaverse Primer.
- Chen, H. (2021). Designing the Metaverse.
- Chen, C. (2021). Architecting the Metaverse.
- Craig, T. (2022). What Can You Do in Decentraland's Metaverse?
- Cowdrey, R. (2021). Why Architecture Matters in the Metaverse.
- Damer, B. (1997). Avatars: Exploring and Building Virtual Worlds on the Internet. Peachpit Pr.
- Dimopoulos, K. (2020). Virtual Cities: An Atlas & Exploration of Video Game Cities. Countryman Press; 1st edition.
- Dodge, M. (1999). The geographies of Cyberspace. Working paper series, CASA, UCL.
- Eck, D. J. (2016). Introduction to Computer Graphics. Hobart and W. S. Colleges.

- Ensslin, A. & Muse, E. (Eds.). (2011). Creating Second Lives: Community, Identity and Spatiality as Constructions of the Virtual. Routledge; 1st edition.
- Jensen, T. H. (2021). Designing for the Metaverse.
- Monfared, F. (2021). 101 Guide to the Metaverse for Architects.
- Morgado, L. (Ed.), Boa-Ventura, A. (Ed.), & Zagalo, N. (2011). Virtual Worlds and Metaverse Platforms: New Communication and Identity Paradigms 1st Edition. IGI Global.
- Murray, P. (2022). Preparing for the Metaverse.
- Niland, J. (2022). BIG unveils designs for Vice's new virtual headquarters 'Viceverse'.
- Parra, E. & Saga, M. | Translated by Valletta, M. (2021). Cartography in the Metaverse: The Power of Mapping in Video Games.
- Pearson, L. & Youkhana, S. (2022). The metaverse doesn't look as disruptive as it should, it looks ordinary – here's why.
- Shakeri, S. (2022). Metaverse, The Upcoming Realm of Architects.
- Sun, C. (2021). What Can Metaverse Planners Learn from Italo Calvino's Invisible Cities.
- Thompson, D. (2021). A Map of the Metaverse.
- White, S.T. (2017). Designing the Metaverse: The Role of Architecture in Virtual Environments.
- Zhou, A. (Pengan) (2022). Prehistory of the Metaverse.
- Zaha Hadid Architects. (2022). Zaha Hadid Architects designs virtual Liberland Metaverse city.

Required Online Resources:

- Unity3D, https://unity3d.com/learn/
- Rhinoceros3D, https://www.rhino3d.com/
- Blender, https://www.blender.org/
- VoxEdit, https://www.voxedit.io/
- MagicaVoxel, https://www.voxelmade.com/magicavoxel/
- PBR Textures, https://www.cgbookcase.com/textures/