Advanced Visualization: Architecture in Motion Graphics

COURSE DESCRIPTION and OBJECTIVES

This course provides an opportunity to undertake interactive experience, design visualization, and/or narrative media projects with an emphasis on the use of computer graphics animation and video production media. Students will be introduced to advanced visualization and video editing software, and explore the relationships between spatial design and its representation in motion graphics format. They will study basic concepts behind interactive media and user experience in the context of built and virtual environments.

The main target of the course is to exploit the sense of phenomena, event and movement in space as well as psychological response to augmented and virtual interactions. The class suggests the use of film theories, art composition, and non-linear storytelling as referential backgrounds for the creation of architectural motion/interactive graphics.

Technical topics include global illumination, radiosity rendering, texture mapping, montage, sound effect, key framing, motion tracking, motion dynamics, inverse kinematics, chroma keying, and virtual set. Additional exploration includes character animation, augmented and virtual reality, and interactive game engines. Final project is to develop narrative virtual(ized) experience that captures unique aspects of built environments.

Undergraduate students should sign up for 4.502 (U level credits). Graduate students should sign up for 4.562 (H level credits).

COURSE SCHEDULE

Each student is expected to attend all class meetings, to verbally participate in class discussions, as well as to develop additional work and ideas beyond the minimum requirement. It is also very highly recommended that students take advantage of any additional sessions that are announced.

The semester is arranged as follows:

WEEK 1  Introduction (9/7)
Survey of the semester work and expectations.
2D and 3D graphics, Motion Graphics/Typography

Lab: How to composite with Adobe AfterFX and Premiere, Motion Typography,

Assignment 1: Motion Graphics issued
WEEK 2  Image and Camera Composition (9/14)
Camera Work, Screen Composition (human eye versus camera eye), Transitions (supporting narratives)

Lab: Working with camera (controls and movements) within 3D environments; Stereoscopic cameras
Assignment 1 working session with students

Assignment 2: Readymades: Spatial Narratives issued

WEEK 3  Student Holiday no Friday classes (9/21)

Assignment 1 due end of Thursday, 9.20 (screening postponed)

WEEK 4  Lights and Materiality (9/28)
Textures (UV Unwrap) and Rendering Engines,
Assignment 1—screening review

Lab: Setting up a scene within 3D Max

WEEK 5  Figures and Props in Space (10/5)
Live Video Composite; Motion Capture; Camera tracking

Lab: video capture, compositing in AfterFX

Assignment 2 due—screening review
Assignment 3: Figures and Props in Space issued
Assignment 3 alt: Interactive Environments issued

Live Location Shooting at Long Lounge (with blue background screen) on Saturday, 10.6

WEEK 6  Narratives, Storyboards, Animatic, Screenplay (10/12)
Screenings: Storyboards, Animatics

Lab: Assignment 3 support session

WEEK 7  Immersive Environments (10/19)
Virtual Reality (VR), QTVR, Photogrammetry,
Headset technologies
Lab: Machu Picchu project by Takehiko Nagakura team.

Assignment 3 due—screening review
Assignment 4: Final Project Pre-vis issued
Final Project issued

WEEK 8  Interactive Environments (10/26) TA-led Sessions
Gaming Mechanics: Physics, Triggers, Assets, Real-time Rendering
Graphic User Interface (GUI)
Lab: Unity game engine

WEEK 9  **Augmented Reality** (11/2)
Concepts, types, and applications
Marker-based, Marker-less utilizing GPS and mobile phone sensors, Projection Mapping

Lab: marker-based visualizations with Vuphoria and Unity

**Assignment 4: Final Project Pre-vis** due

WEEK 10  **Physics and Particle Systems** (11/9)
Reactor (3D Max), Cloth modifier (nCloth), Particles; Physics within Unity game engine (triggers)

**Character Controls and Animation**
FK/IK, Rigging, weight painting

Lab: Reactor, Cloth. FK/IK, Controls, Weight painting, BIP files (Max)

WEEK 11  **Unbuilt Monuments** (11/16)
Predictive Visualization and Digital Reconstruction
Applications of visualizations techniques

WEEK 12  **Working Session** (11/30)
Final project individual work sessions

Lab: Lab session with students

WEEK 13  **Final Presentation** for undergrad students and discussion (12/7)
Working Session (before or during the exam session)

**FINAL PROJECT**
At the end of the semester, each student will prepare a final project. There is no written final exam for the class, instead all projects will be presented to reviewers and the class during the final exam week or the last class of the semester. Each project will consist of a 2 to 4 minutes video clip. Team projects are allowed upon consent of the instructor.

**EVALUATION**
Completion of ALL assigned projects and presentations is required to complete this course. All assignments are due by 8 AM of the class day unless otherwise indicated in the syllabus. Your performance will be graded based on the successful completion of the class objectives, projects, presentation and documentation requirements. The MIT- Honor Code will be upheld.

Four (4) short assignments (possibly team work), each from 1-3 weeks.
All of them required for successful completion of the class. 50% [individual]
Term Project and Presentations (animation, AR environment, or projection mapping) 50% [group]
Final DVD/Google Drive Folder Required
The final grades are broken down as follows:

A   Exceptionally good performance
B   Good performance
C   Adequate performance
D   Minimally acceptable performance
F   Failed

DELIVERABLES

◦ All assignments and the term project submission should include final products in its native file format. Quick time (.mov) or MPEG (.mv4, .mp4) for animations, Application files (.apk) for Unity and AR apps, etc.
◦ Project files (3DMax, AfterFX, Unity, etc)
◦ Presentation files (.pdf, .ppx)
◦ Process documentation

For specific requirements, please see individual assignments sheets.