

A. Course Summery

1. Subject number and title

4.562/502 Architecture in Motion Graphics

2. Date(s) offered

2025 Fall Semester

3. Credits

4.562: 12 units (3-2-7, G-level), 4.502: 12 units (3-2-7, U-level)

4. Type of subject (lecture, seminar, studio, workshop, lab)

Lecture, Review, and Lab

5. Instructor(s)

Takehiko Nagakura (TA: Xiaoyun Zhang)

6. Prerequisites if any

4.560, 4.500, or experience in 3D geometric modeling

7. Subject overview/description

This course provides an opportunity to undertake a design visualization project with an emphasis on the use of computer graphics animation, interactive content, and video production media. Students will be introduced to a selection of contemporary tools for animation, rendering, scanning, game engine and video editing, and explore the relationships between spatial design and its representation in motion graphics format.

Selected movies and literatures will be reviewed to study and analyze professional film language such as editing styles, camera movement, mise en scene, and lighting strategy. Technical topics include global illumination and radiosity rendering, texture mapping, texture baking, montage, sound effect, key framing, motion tracking, motion dynamics, inverse kinematics, chroma keying, and virtual set. Additional exploration includes AI video generation tool (text-to-video/image-to-video), photogrammetric model/gaussian splatting, crowd simulation/character animation, interactive game engine, stereographics, panoramic video, Virtual/Augmented Reality (VR/AR), and HMD (Meta Quest 2/3) application.

Final project (Click [here](#) for examples) is to design a place for architectural scenes and create a short film or an interactive presentation as its narrative. Students are expected to know how to build a simple geometric model in 3D modeling software.

8. Learning objectives

The main target of the course is to exploit the sense of phenomena, event and movement in space by means of digital design media. The class suggests use of film theories as referential background and create a narrative through architectural motion graphics.

The class addresses the issues of film/game form as well as architectural event, materiality and light. It is not only about *what* you place in the movie frame and interactive screen, but also *how* it is represented to the audience as experience. Students become at the same time stage designers (who design spatial forms as the main star in their films/games) and film/game directors (who design and choreograph the moving/interactive sequence).

9. Completion requirements

Grades will be based on assignments, participation in class discussions and the final project.

- 4 assignments 55%
- reading/discussion 10%
- final project 35%

Assignments include the followings:

- Imagining Storyboard – Digital Previz - (1 week, small team)
- Opening Sequence : Light, Material, and Motion Camera (3+1 weeks, individual)
- Virtual Exhibition - Collaging Reality, Reconfiguring Experience (2 week, small team)
- Performing and Compositing – People in Space, People for Space (2 weeks, mid-size team)
- Final Project (4 weeks): There will be a pinup, a mid-term review and a final review.

* Students deliver their assignments and final projects as video clip/interactive content presentation. All the digital contents produced by students in this class (videos and interactive contents) will be publicly reviewed in the class, and submitted for class archive with selected projects allowing online access for future students and public education as reference. All student projects should include the full credit of any included contents within the digital material at the time of the assignment submission.

B. Syllabus (Schedule of topics, tests, and due dates for major assignments)

See the table at the end of this document.

Reference (Film Technicality)

The Five C's of Cinematography by J Mascelli
Michael Rabiger : Directing - Film Techniques and Aesthetics -
Richard Stromgre+Martin Norden : Movies -a language in light
Daniel Arijon : Grammar of the Film Language

Reference (Theory and Critique)

Andre Bazin: What is Cinema?
Eisenstein: Film Form, Film Sense

Rudolf Arnheim: Film as Art
Christian Metz: Film Language : A Semiotics of the Cinema
Tarkovsky: Sculpting in Time
The Architecture of Image - existential space in cinema -
Anthony Vidler: The Explosion of Space (Film Architecture From Metropolis to Blade Runner)

Software used

Main tools: 3DS Max, Adobe Premiere, Unity 3D, Recap, MIT Design Heritage
Other recommended/alternative tools: Google Veo3/Flow, Adobe Firefly, Metashape, Blender, V-Ray, Scaniverse, Metashape, Unreal Engine, Substance 3D Painter

Cost

- Purchase of your own headphone is recommended to avoid annoying others while you are working on your assignments.
- All necessary software is available on the public/department-provided computers in studios free for student version, or through floating license distribution. They are also available on your own computer if you are using them on campus or while connected on MIT VPN. (These licenses are offered with limited numbers. Please see below.) Students who have access to alternative software (for instance, Blender for animation, Metashape for photogrammetry, and Sora for video gen. AI) are welcome to use them for all assignments.
- To work on the assignments using your own laptop computers:
 - a. Autodesk software (3DS Max, Remake, etc.): Student license is free.
 - b. Adobe Premiere: Adobe Creative Cloud for MIT students is free.
For others, student license is available from Adobe for \$20/month
 - c. Unity3D, Blender, Scaniverse: Personal/Student version is free.
 - d. Google AI Studio, Gemini and Flow: [2025] Students get Google AI Pro free for one year.
 - x. Please visit STOA website below for details of software availability and access.
<https://stoa.mit.edu/>

Fall 2025 MIT [4.562/4.502](#) Schedule

Takehiko Nagakura

Rev. 2025v0901

date:09-01 Mon		Labor Day holiday
date:09-02 Tue		Registration Day
date:09-08 Mon	Class 01 Lab	Introduction - Telling a story Digital NLE (Premiere/After Effects) Compositing and Editing with Audio Clips Lab Note for Premiere Tutorial

* Login as 4.562. Password required.
AI tools: Google Veo3/Flow and Adobe Firefly

	Excercise #1	OUT: Imagining Storyboard (Digital Pre-vis) Exercise 1 Handout Audio Clips and Demo (registration)
	Screening	Mr. Jones, My Architect
	Reading #1	OUT: Mascelli, The five C's of cinematography camera angle (pdf)
	date:09-15 Mon	
	Class 02	Composition and Motion Camera
	Discussion	Reading #1 [required for 4.562]
	Deadline	Excercise #1 (in-class presentation)
	Excercise #2	OUT: Opening Sequence -Architecture of Cinematic Reality - Exercise 2 Handout Furniture models (Herman Miller, etc)
	Lab	3DS Max Basics (and Radiosity Intro) Lab Note for Max install/Setup READ THIS FIRST! Lab Note for Max basics and radiosity Lab Note for Max importing files Radiosity Diagrams MIT 3dsMax2017_selector_classic_design.zip Camera Animation (Key framing and motion path) Lab Note for Max Camera animation Sample File (3D models) * When you open the models below in 3DS Max, the dialog to perform "scene conversion" may appear. For Radiosity, just close it without conversion. - Set 1 (Citrohan House): 3d citrohan v13c2.dwg/max (zipped) image sample - Set 2 (MIT office): rotch d 07b 4562 v01.dwg/max (zipped) image sample Lightscape (old tool: for reference only)
	Screening	Charade, Psycho, Ginza Walk Through
date:09-22 Mon	Class 03	Lighting the Scene Illumination Model, Radiosity and Raytracing
	Lab	Daylight Simulation, Photometric Lights in 3DS
Max		Radiosity Visualization IES Photometric Data, Render Farm/Cloud Rendering Lab Note for Max Photometric Light/IES Photometric Lights Catalogues Sample Photometric Lights Citrohan House Lighting Transformation Reference Film Analysis Example, Kyoung KWon (part #1) Stereographic imaging (See Class 04) Vray Introduction (See Class 10)
	Reading #2	[This assignment is moved to later class] OUT: Rudolph Arnheim: Film as Art Questions.pdf , FaA1.pdf , FaA2.pdf

	Screening	Lumiere Brothers First Film, Ruttmann's Berlin
date:09-29 Mon	Class 04	Materiality and Tectonics
	Discussion	Reading #2 [moved to later class]
	Lab	Texture UV Mapping, Procedural Mapping Lab Note for Max material and texture Lab Note for Max general tips Lab Note for Max rendering checklist Texture Coordinates Illustrations 3d citrohan model with no glass for texturing MAX Sample Textures (new) VIZ4 Sample Textures (old: only for reference) Adobe Substance 3D Painter (NEW) part1 2 3 4 5 Background, Sky, and Environment Map Lab Note for Max sky and ground Examples for Max sky and ground Sample Map for Sky and Ground Editing/Post-process Animation Lab Note for Importing/Post-process in Premiere HDR Image Example and OpenHDR Viewer Image Gamma Correction(old: for reference) Stereographic imaging Lab Note for Max stereoscopy TN Office stereoscopic animation on YouTube (Chrome or FireFox needed to see anaglyphic 3D) Citrohan House Anaglyphic images and animation 3DS Camera Rig by TN 02.max (zipped) Stereoscopic Player from 3dtv.at Vray Introduction (See Class 10)
date:10-06 Mon	Class 05	Scanning Reality, Interactive Viewing
	Deadline	Excercise #2 (in-class presentation)
	Excercise #3	OUT: Online Gallery -Collaging Dislocated Reality, Reconfiguring Experience- Exercise 3 Handout
	Reference	Baker House VR (YouTube v2007), (Oculus app v2024) Baker House AR (2021) (YouTube) MIT Machu Picchu Project (YouTube) Capturing History Bit by Bit Kangaku-in Villa Desktop VR
	Lab	3D capturing, Lidar, HMD (Oculus Quest) Example (Use Chrome for viewing) Design Heritage Workshop 2013(i palladio models) Tutorials 1 Photogrammetry, Gaussian Splatting, Design Heritage and Gravity Sketch Scanning tools (Metashape, Recap Pro, Scanniverse), Design Heritage and Gravity Sketch

Tutorials 2 (for class 06)
[Baking to Texture in 3DS Max](#)

date:10-13 Mon		Indigenous Peoples Day holiday
date:10-14 Tue		Student Holiday
date:10-20 Mon	Class 06	Interactive Experience vs Linear Montage
	Lab	Game Engine software Setting up a Scene in Unity 3D <u>Download Free Personal Edition of Unity 3D</u>
	Deadline	Excercise #3 (in-class presentation)
	Excercise #4	OUT: Virtual Tour of Location X <u>Exercise 4 Handout</u> <u>Examples (desktop VR and AR)</u> <u>Mies van der Rohe's drawings (zipped jpg)</u>
	Reference	Automated Cinematographer <u>A Synthetic Moviemaker (Siggraph 2006 paper)</u> <u>Man with the Movie Camera</u> (YouTube link)
	Screening	The Umbrellas of Cherbourg
	Reading #2	OUT: Rudolph Arnheim: Film as Art <u>Questions.pdf</u> , <u>FaA1.pdf</u> , <u>FaA2.pdf</u>
date:10-27 Mon	Class 07	Video Composite, Visualization with Network Model
	Discussion	Reading #2
	Lab	NeRF: Neural Radiance Fields, Gaussian Splatting Shot Planning with Premiere/Unity: Chroma key <u>Lab Note for Premiere Chroma Key</u> <u>Example (Firminy Long Lounge)</u> <u>Blue Screen (Chroma Key) demo</u> <u>Blue background session rig files (zipped)</u> Camera Motion Capture/Tracking Blender Tracking tutorial(See Dropbox location) SynthEyes (optional for self-learning) <u>Example (Firminy Pepsi Can)</u> <u>Blender home page (free)</u> <u>Blender Tutorial (pointers to videos)</u> <u>SynthEyes home page</u> <u>Synthedyes (Video) Tutorials</u> <u>Syntheyes Manual for v2013</u> <u>(Old Manual for v2008+1)</u> 3DS Max Channel rendering, Video post, G-channel (Render by Elements and Video Composite) <u>example</u>
	Reference	<u>Mies van der Rohe's drawings (zipped jpg)</u> <u>Shot examples in pre-vis. format</u>
	Marker-based	Motion Tracking example <u>GE Plugin Smartgird.com</u> <u>AR Media 3DS Plug-in</u>
	Screening	Video: <u>Setting up a Blue Screen Studio at MIT</u>

~~date:11-05 Sat extra lab Bluescreen studio live recording session~~
~~(Subject to the COVID-19 pandemic situation)~~

date:11-03 Mon Class 08 Figures and Props

Lab Animating Figures in Spatial Design
Populate video tutorial (Autodesk tips/tricks)
[1 , 2 , 3 , 4 , 5 , 6](#)
[Lab Note for 3DS Max Populate/Unity 3D Export](#)

Biped Character Animation (Character Studio)
[Lab Note for 3DS Max Character Animation](#)
[Sample figures and setup](#)
(Skinned Figures/BIP Motion/Blue Screen Set:
Download and unzip the Max file and texture
file to a directory together before use.)

[Emerging "Video to Motion" apps \(Figure Mo-cap\)](#)

[Modeling by Gesture](#)
[Tracking a walk by Kinect](#)
Circulating a figure in architectural model
[example](#)

Screening [Space Re-Actor](#) by Taro Narahara

date:11-10 Mon Student Holliay
~~Monday classes shift to Tuesday this week.~~

date:11-11 Tue Veterans Day Holiday

date:11-17 Mon Class 09 Precedents: Final project for 4.502/4.562
Physics Simulation

Deadline **Excercise #4** (in-class presentation)
Excercise #F OUT: Final project
[Final Project Handout](#)
Spatial Experience in Motion Graphics

Reading #3 OUT: Eisenstein: Film Form/Sense
[Questions.pdf](#)
[arch.pdf](#), [form.pdf](#), [sense.pdf](#)
Acropolis 360 on Plan
[YouTube video by TN](#) (Use Chrome for 360 view)

Screening Final projects of previous students
Kuleshov Experiment, Psycho, Battleship Potemkin
Psycho, [Hitchcock 1964 Interview on Montage](#)

Lab Motion Dynamics/Inverse Kinematics in MassFX
[demo file \(MassFX basics\): after Max 2012](#)
[demo file \(Reactor, part 1\): before Max 2011](#)

[\(old\)](#)

[Lab Note for Max MassFX](#)
[Lab Note for Max ART rendering](#)
[Lab Note for Max iray rendering \(old\)](#)

Physics Animation Examples
[example \(gravity, collision, wind\)](#)

More procedural material
[Simple Water in 3DS Max](#)

Screening [SONY Bravia CF](#)/transformating daily life (at MIT)

date:11-24 Mon	Class 10	Predictive Visualization: Unbuilt Monuments
	Discussion	Reading #3 [required for 4.562]
	Reference	Automated Cinematographer A Synthetic Movie-maker (Siggraph 2006 paper) Man with the Movie Camera (YouTube link)
	Deadline	Final Project Proposal review (Storyboard + Set)
	Lab	VRay (Global Illumination Rendering with Caching) Lab Note for 3DS Max Vray (Check yellow part.) Rendering Animation with Vray
	Reading #4	OUT: Andre Bazin: What is Cinema? Questions.pdf bazin.pdf Special Effect use in Citizen Kane (YouTube) YouTube Clips (Flaherty/Lamorisse/Chaplin, etc)
	Reading #5	Christian Metz: Film Language
	Screening	Unbuilt Monuments
date:11-27 Thu	No class	Thanksgiving Holiday Week (Th 27, Fr 28)
date:12-01 Mon	Class 11	Augmented and Virtual Reality
	Discussion	Reading #4 [required for 4.562] Reading #5 [required for 4.562]
	Lab	Palladio Burns and 360 (Chrome recommended.) Double Tour: S. Giorgio Maggiore Refectory QuickTime VR by Apple (History) Interior Panorama with IES Light (Citrohan House) QTVR Panorama conversion tool demo file: 3d citrohan v13c panorama.max (zipped) Workshop (Consultation for Final Projects)
	Reference 4:	Augmented Reality in Architectural Exhibitions (Nagakura, et. al.)
date:12-08 Mon Students)	Class 12	Final Presentation 1 (Recommended for UG
	Lab	Clothes, Hair, Snow, etc. Workshop (Consultation for Final Projects)
date:12-10 Wed		Last day of class at MIT
date:12-15/19	(TBD during MIT Final exam week)	
	9am -12noon	Final Presentation 2 (Rm 1-371)