A. Course Summery

1. **Subject number and title**
   4.562/502 Architecture in Motion Graphics

2. **Date(s) offered**
   2026 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 digital animation, interactive contents, 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 permitted)
- Opening Sequence : Light, Material, and Motion Camera (3 weeks, individual)
- Collaging Reality, Reconfiguring Experience (2 weeks, small team permitted)
- Event and Spatial Experience – People in Space, People for Space (3 weeks, individual)
- Final Project (4 weeks): an initial pinup, a mid-point 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 (The lab shows Main tools but you may use any alternative tools.)

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

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 free on your own computer through floating license distribution or as free student versions. (Running the software on you computer may require it connected to campus Wi-Fi or MIT VPN, and some are offered with limited numbers. Please see below) Students who have access to alternative software (for instance, Blender for animation, Metashape for photogrammetry, and Veo 3 for video gen. AI video) are welcome to use them for all assignments, but many come with costs.

- 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, Unreal, Blender : Personal/Student version is free.
  d. Google Flow: [2026] Free for a limited production.
  x. Visit METIS website below for details of all software availability and access.
  https://stoa.mit.edu/

Fall 2026 MIT 4.562/4.502 Schedule (subject to change) Takehiko Nagakura

Rev. 2026v0910

date:09-07 Mon		Labor Day holiday
date:09-08 Tue		Registration Day
date:09-14 Mon	Class 01	Introduction – Telling a story
	Excercise #1	OUT: Imagining Storyboard (Digital Pre-vis)
		Exercise 1 Handout
		Audio Clips and Demo (registration)
	Lab	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

Lab Note for Video Generation AI tools

Screening — Mr. Jones, My Architect

Reading #1 — OUT: Mascelli, The five C's of cinematography

camera_angle (pdf)

date:09-21 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

~~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.dwg/max (.zip)

image sample

- Set 2 (MIT office):

⬇ rotch_d_elongated.dwg/max (.zip)

image sample

~~Lightscape (old tool: for reference only)~~

Screening — Charade, Psycho, Ginza Walk Through

date:09-28 Mon

Class 03 — Lighting the Scene

Illumination Model, Radiosity and Raytracing

Radiosity Diagrams

Citrohan House Lighting Transformation

Lab — Daylight Simulation, Photometric Light 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 (.zip)

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:10-05 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(no glass) for texturing(.zip) MAX Sample Textures VIZ4 Sample Textures (old: only for reference) 3DS Viewport Canvas (See the first hand for details) 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 (.zip) Editing/Post-process Animation Lab Note for Importing/Post-process in Premiere HDR Image Example and OpenHDR Viewer Image Gamma Correction(old: only 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 (.zip) Stereoscopic Player from 3dtv.at Vray Introduction (See Class 10)

~~date:10-08 Sat optional VR Lab tour~~

date:10-12 Mon Indigenous Peoples Day holiday

date:10-13 Tue 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: 10-19 Mon Class 06 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

Unity Tutorial Videos Part 2

Biped Character Animation (Character Studio)

Lab Note for 3DS Max Character Animation

⬇ Sample figures and setup (.zip)

(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: 10-26 Mon	Class 07	Interactive Experience vs Linear Montage
	Lab	Game Engine software Setting up a Scene in Unity 3D Download Free Personal Edition of Unity 3D
	Deadline	Excercise #3 (in-class presentation)
	Excercise #4	OUT: Virtual Tour of Location X Exercise 4 Handout Examples (desktop VR and AR) Examples (interaction design) Unity Tutorial Videos Part 1 ⬇ Mies van der Rohe's drawings (.zip .jpg)
	Reference	Automated Cinematographer A Synthetic Moviemaker (Siggraph 2006 paper) Man with the Movie Camera (YouTube link)
	Screening	The Umbrellas of Cherbourg
	~~Reading #2~~	~~OUT: Rudolph Arnheim: Film as Art~~ ~~Questions.pdf, FaA1.pdf, FaA2.pdf~~ (Reading assignments moved to November classes.)
date:11-02 Mon	Class 08	Video Composite, Visualization with Network Model
	~~Discussion~~ ~~Reading #2~~	
	Lab	NeRF: Neural Radiance Fields, Gaussian Splatting Shot Planning with Premiere/Unity: Chroma key Lab Note for Premiere Chroma Key Example (Firminy Long Lounge) Blue Screen (Chroma Key) demo ⬇ Blue background session rig files (.zip) Camera Motion Capture/Tracking Blender Tracking tutorial(See Dropbox location) SynthEyes (optional for self-learning) Example (Firminy Pepsi Can) Blender home page (free) Blender Tutorial (pointers to videos) ~~SynthEyes home page~~ ~~Synthedyes (Video) Tutorials~~ ~~Syntheyes Manual for v2013~~ ~~(Old Manual for v2008+1)~~ 3DS Max Channel rendering, Video post, G-channel (Render by Elements and Video Composite) example

	Reference	⬇ Mies van der Rohe's drawings (.zip .jpg)
		Shot examples in pre-vis. format
	Marker-based Motion Tracking example	
		GE Plugin Smartgird.com
		AR Media 3DS Plug-in
	Screening	
		Video: Setting up a Blue Screen Studio at MIT
~~date:11-05 Sat~~	~~extra lab~~	~~Bluescreen studio live recording session (Subject to the COVID-19 pandemic situation)~~
date:11-09 Mon	Class 09	Precedents: Final project for 4.502/4.562
		Physics Simulation
	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
		Final projects of previous students
	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:11-11 Wed		Veterans Day Holiday
date:11-16 Mon	Class 10	Predictive Visualization: Unbuilt Monuments
	Discussion	Reading #2 [required for 4.562]
	Reference	Automated Cinematographer
		A Synthetic Moviemaker (Siggraph 2006 paper)
		Man with the Movie Camera (YouTube link)
	Deadline	Excercise #4 (in-class presentation)
	Excercise #F	OUT: Final project
		Final Project Handout
		Spatial Experience in Motion Graphics

	Lab	VRay (Global Illumination Rendering with Caching) Lab Note for 3DS Max Vray (Check yellow part.) Rendering Animation with VRay
	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	Kuleshov Experiment, Psycho, Battleship Potemkin Psycho, Hitchcock 1964 Interview on Montage
	Screening	Unbuilt Monuments
date:11-23 Mon	Class 11	Augmented and Virtual Reality
	Deadline	Final Project Proposal review (Storyboard + Set)
	Discussion	Reading #3 [required for 4.562]
	Reading #4	OUT: Andre Bazin: What is Cinema? Questions.pdf bazin.pdf Special Effect use in Citizen Kane (YouTube)
	Screening	YouTube Clips (Flaherty/Lamorisse/Chaplin, etc)
	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 (.zip) Workshop (Consultation for Final Projects)
	Reference 4:	Augmented Reality in Architectural Exhibitions (Nagakura, et. al.)
date:11-26/27	No class	Thanksgiving Holidays
date:11-30 Mon	Class 12	TBA
	Discussion	Reading #4 [required for 4.562]
	Reading #5	Christian Metz: Film Language
	Lab	Clothes, Hair, Snow, etc.
date:12-07 Mon	Class 13	Final Presentation 1 (Recommended for UG Students)
	Discussion	Reading #5 [required for 4.562]
	Lab	Workshop (Consultation for Final Projects)

date:12-10 Thu	Last day of class at MIT
date:12-14…12-18	MIT Final exam period Final Presentation 2 (Rm w41-1219)