

Syllabus for DM-UY 2133: 3D Modeling Section B 2024 Spring Term

# Tandon School of Engineering of New York University Department of Technology, Culture and Society Integrated Design and Media

## **Course Information**

DM-UY 2133: 3D Modeling Section B Spring 2024 Professor David Haines Fridays 10:00am – 11:50am and 12:00pm – 1:50pm Brooklyn Campus; 370 Jay Street; Room 308

## **Professor's Contact Information**

<u>david.haines@nyu.edu</u> Office hours: By Appointment

## **Course Pre-requisites**

This course does not have any pre-requisites.

## **Course Description**

In this studio, students will learn to produce and render high-quality 3D models. Upon completion of this course, students will have a solid understanding of the fundamentals of modeling, texturing, animation and lighting using industry standard software. Students may create content for video games, web, film, or other interfaces.

# **IDM Program Learning Objectives**

Students will:

- develop conceptual thinking skills to generate ideas and content in order to solve problems or create opportunities.
  - Students will develop a research and studio practice through inquiry and iteration.
  - develop technical skills to realize their ideas.
    - Students will understand and utilize tools and technology, while adapting to constantly changing technological paradigms by learning how to learn.
    - Students will be able to integrate/interface different technologies within a technological ecosystem.
- develop **critical thinking skills** that will allow them to analyze and position their work within cultural, historic, aesthetic, economic, and technological contexts.
- gain knowledge of **professional practices and organizations** by developing their verbal, visual, and written communication for documentation and presentation, exhibition and promotion, networking, and career preparation.
- develop **collaboration skills** to actively and effectively work in a team or group.

DM-UY 2133-B 3D Modeling

## **Course Objectives**

For the successful completion of this course, students should be able to:

- demonstrate proficiency in working with tools, menus, and keyboard shortcuts
- demonstrate proficiency in modeling 3D objects
- demonstrate proficiency in working with textures, lights, and cameras
- demonstrate proficiency in animating a scene
- demonstrate descriptive and analytic writing skills by preparing a 1 to 2-page report

## **Course Structure**

- Class lectures
- Laboratory exercises
- Projects
- Critiques
- Written reports
- Online conversations

## **Required Reading**

No specific texts are required, but students are encouraged to seek outside reading and to share sources with the class.

#### **Recommended Reading**

	Kerlow, Isaac. The Art of 3D Computer Animation and Effects. Fourth Edition. Hoboken: John Wiley & Sons Inc, 2009.
Books	
	Derakhshani, Dariush. Introducing Autodesk Maya 2016. First Edition. Indianapolis: John Wiley & Sons Inc, 2015.
	Lanier, Lee. Advanced Maya Texturing and Lighting. Third Edition. Indianapolis: John Wiley & Sons Inc, 2015.
	Thomas, Frank and Johnston, Ollie. <u>The Illusion of Life: Disney Animation</u> . Revised Edition. New York: Disney Editions, 1995.
	Williams, Richard. The Animator's Survival Kit. Revised Edition. New York: Farrar, Straus and Giroux, 2012.
	YouTube.com
	LinkedIn.com/Learning (formerly Lynda.com)
	Pluralsite.com
	11secondclub.com
	textures.com
Websites	area.autodesk.com
	help.autodesk.com/view/MAYAUL/2024/ENU/
	docs.arnoldrenderer.com/category/mtoa
	cgsociety.org
	artstation.com
	highend3d.com

### **Semester Grading**

- Project 1 (Maya Room) ......25%
- Project 2 (Maya Model) .....25%
- Project 3 (ZBrush Character) .....20%
- Written Report .....10%
- Preparation/Participation/Attendance ......20%

## **Project Directions**

### Project 1 (Maya Room)

Create a 3D interior space containing at least one floor, three walls, and three major objects. You should add as many additional objects as are necessary to make the environment believable and the composition complete. While both quality and quantity of objects are important, quality is more important than quantity. Focusing on one corner of the room may be a better idea than spreading your efforts over the entire room.

We will develop these rooms both in class and for homework over the next few weeks. Future assignments will entail adding lights and textures to the room. The main goals of this project are to become comfortable with Maya's interface and to prove that you can keep a complex hierarchy of objects well organized. Another of the project's goals is to learn how to render high quality images. These images may become the beginning of your 3D portfolio.

#### Specifications:

- Objects should have UV Maps and Color Maps wherever necessary. Those maps are not specifically required for all objects.
- The three (or more) final rendered images must be in TIF, EXR, PNG, or JPG format.
- The images rendered from each angle (ex: front, side, back, ¾, and close-ups) must be at least 1920 x 1080 pixels ("HD\_1080").
- Your name must appear in each image (ex: bottom corner).

Failure to meet the deadlines listed below <u>on time</u> may result in a loss of points. Project files will be not be accepted 30 days after the final deadline. Students who have not submitted all project files 30 days after the final deadline will receive a zero on the project.

- Step 1 of **Project 1 (Maya Room)** is due on **Week 2 (2/2/24)**:
  - Bring in 5-15 reference images (photos and/or sketches) that will aid in the creation of a 3D room. At least
    one of the images must be an overhead floor plan. All reference images should be saved as digital files (ex:
    TIF, TGA, PNG, JPG, or BMP).
- Step 2 of **Project 1 (Maya Room)** is due on **Week 3 (2/9/24)**:
  - You should come to class with at least two major objects fully modeled. The walls and floor should also be modeled by this point.
- Step 3 of **Project 1 (Maya Room)** is due on **Week 4 (2/16/24)**:
  - You should come to class with the entire room fully modeled. All major and minor objects within the room should be fully modeled. You should also begin to incorporate lighting and camera choices.

#### • Step 4 of **Project 1 (Maya Room)** is due on **Week 5 (2/23/24)**:

 Modeling, texturing, lighting, and camera positioning should be completed. Images do not need to be rendered for today.

#### • Step 5 of **Project 1 (Maya Room)** is due on **Week 6 (3/1/24)**:

- All files are due. In order to receive a grade, students must submit a project folder containing the following files:
  - the Maya file (save as MA or MB; place in "scenes" folder)
  - 3 rendered images taken from different camera angles. Each image file should be 1920 pixels by 1080 pixels in a horizontal orientation. (save as TIF, EXR, or JPG; place in "images" folder)

### Project 1 (Maya Room) Grading Breakdown:

Checklist Item	Worth	Score
You labeled and organized all important nodes in the Outliner and created clean hierarchies. You also used "Delete History" to remove unnecessary nodes.	1 point	
You demonstrated a good amount of proficiency in populating the space with objects of different scales. The space's overall scale should be consistent and believable.	1 point	
You demonstrated a good amount of proficiency in populating the space with a sufficient quantity of objects. The absolute minimum is one floor, three walls, and three major objects, but your composition will likely appear too empty with only the absolute minimum.	2 points	
You demonstrated a good amount of proficiency in modeling objects of good quality. The objects should portray contrasting forms and believable distributions of weight.		
You included at least two lights and demonstrated a good amount of proficiency in lighting.	4 points	

Maximum Total		/25
Lateness		
You demonstrated a good amount of proficiency in rendering at least three images. Each image should be 1920x1080 or higher and have little to no noise.	4 points	
You demonstrated a good amount of proficiency in creating camera angles that have aesthetically pleasing compositions, spatial depth, and value contrast. (Tip: Avoid flat, straight-on angles.)	4 points	
You textured all objects and demonstrated a good amount of proficiency in texturing.	4 points	

#### Project 2 (Maya Model)

Spend the next few weeks developing one polygonal model. Most students choose to model a character. However, the model can be a non-character object of similar complexity. If the object is a character, it can either be an original or a pre-existing character. Be mindful about how complex a model you can create in about a month. A realistic human would be too complicated. However, a character like Kirby from Nintendo would be much too simple for this project. All students must obtain approval of design intentions from the instructor before starting to model in Maya. One of the primary goals of this project is learning how to keep topology clean.

#### Specifications:

- The model must have a UV Map.
- The model must have a Color Map.
- The final images must be in TIF, EXR, PNG, or JPG format.
- The images rendered from each angle (ex: front, side, back, ¾, and close-ups) must be at least 1920 x 1080 pixels ("HD\_1080").
- Your name must appear in each image (ex: bottom corner).
- Optional: The multiple final images may be combined into one composite image.
- Optional: The final image may be composited over a non-distracting background (ex: a flat color, simple pattern, or gradient).

Failure to meet the deadlines listed below <u>on time</u> may result in a loss of points. Project files will be not be accepted 30 days after the final deadline. Students who have not submitted all project files 30 days after the final deadline will receive a zero on the project.

#### • Step 1 of **Project 2 (Maya Model)** is due on **Week 7 (3/8/24)**:

Bring in at least two reference images of your design (front orthographic view and side orthographic view). The images can be your original drawings or images from another source. If the design is a character, it is best to show the character in a neutral pose with arms held diagonally downwards and legs slightly apart. The character's posture should be as symmetrical as possible. Each image must be a separate digital file (ex: JPG, PNG, or TGA). The files will be assigned to image planes during class next week. You may bring in additional images (ex: a perspective view) that might help you to model.

#### • Step 2 of **Project 2 (Maya Model)** is due on **Week 8 (3/15/24)**:

Both in class and for homework, you will turn your 2D drawings into 3D models. By this date, you must show that you are about 50% finished with the modeling stage.

#### • Step 3 of **Project 2 (Maya Model)** is due on **Week 9 (3/29/24)**:

Both in class and for homework, you will turn your 2D drawings into 3D models. By this date, you must show that you are about 90% finished with the modeling stage.

#### • Step 4 of **Project 2 (Maya Model)** is due on **Week 10 (4/5/24)**:

- All files are due. In order to receive a grade, students must submit a project folder containing the following files: • the Maya file (save as MA or MB; place in "scenes" folder)
  - 3 rendered images taken from different camera angles. Each image file should be 1920 pixels by 1080 pixels in a horizontal orientation. (save as TIF, EXR, or JPG; place in "images" folder)

Checklist Item	Worth	Score
You labeled and organized the Outliner to have a clean hierarchy.	1 point	
Your 3D model matches the reference images relatively well.	4 points	
You demonstrated a good amount of proficiency in keeping the topology relatively clean. Also, construction history on geometry must be deleted.	5 points	
You demonstrated a good amount of proficiency in modeling objects of good quality. The objects should portray contrasting forms and believable distributions of weight.	5 points	
You textured all objects and demonstrated a good amount of proficiency in lighting and texturing.	5 points	
You demonstrated a good amount of proficiency in rendering at least three images. Each of the original rendered images should be 1920x1080 or higher and have little to no noise. If you create one composite image, that composite image should be 1920x1080 or higher and have little to no noise.	5 points	
Lateness		
Maximum Total	25 points	/25

#### Project 3 (ZBrush Character)

Use ZBrush to model a simple character. The character can either be an original or a pre-existing character. Keep the design relatively simple because of the short deadline. Instead of modeling a character's entire body, you may choose to model a character's head and shoulders. If you go with the head and shoulders option, the complexity level of the face should be comparable to modeling an entire body. The primary goal of this project is to learn the basics of ZBrush. Use Maya and Arnold for lighting and rendering of final images.

#### Specifications:

- The character must have at least 2 different Subtools.
- The use of Polygroups is encouraged, but not mandatory.
- The "TotalPoints" must be between 10,000 and 3,000,000. This is the number of vertices.
- The character must demonstrate an effective use of Alphas.
- The character must have both a UV Map and a Texture Map (aka Color Map). These maps should be created primarily in ZBrush.
- The final images must be in TIF, EXR, PNG, or JPG format.
- The images rendered from each angle (ex: front, side, back, ¾, and close-ups) must be at least 1920 x 1080 pixels ("HD\_1080").
- Your name must appear in each image (ex: bottom corner).
- Optional: The multiple final images may be combined into one composite image.
- Optional: The final image may be composited over a non-distracting background (ex: a flat color, simple pattern, or gradient).

Failure to meet the deadlines listed below <u>on time</u> may result in a loss of points. Project files will be not be accepted 30 days after the final deadline. Students who have not submitted all project files 30 days after the final deadline will receive a zero on the project.

- Step 1 of **Project 3 (ZBrush Character)** is due on **Week 11 (4/12/24)**:
  - Bring in at least two images of your character (frontal orthographic view, side orthographic view). Each
    image must be a separate digital file (ex: JPG, PNG, or TGA). The files will be assigned to image planes. You
    may bring in additional images (ex: perspective view) that may aid you in the modeling process.
- Step 2 of **Project 3 (ZBrush Character)** is due on **Week 12 (4/19/24)**:
  - The main form should be at least 25% completed. At this point, alphas and textures should not be applied.
- Step 3 of **Project 3 (ZBrush Character)** is due on **Week 13 (4/26/24)**:
  - The main form should be at least 50% completed. At this point, alphas and textures should not be applied.
- Step 4 of **Project 3 (ZBrush Character)** is due on **Week 14 (5/3/24)**:

- All files are due today. Please note that in order to receive any grade, students must submit the following files:
  - the ZBrush file (save as ZTL or ZPR)
  - 3 rendered images taken from different camera angles. Each image file should be 1920 pixels by 1080 pixels in a horizontal orientation. (save as TIF, EXR, or JPG; place in "images" folder)

Project 3 (ZBrush Character) Grading Breakdown:

Checklist Item	Worth	Score
Your ZBrush file contains at least at least 2 different Subtools.	1 point	
"TotalPoints" is between 10 thousand and 3 million.	1 point	
Your 3D model matches the reference images relatively well.	3 points	
You demonstrated a good amount of proficiency in modeling objects of good quality. The objects should portray contrasting forms and believable distributions of weight.	5 points	
You textured all objects and demonstrated a good amount of proficiency in lighting and texturing.	5 points	
You demonstrated a good amount of proficiency in rendering at least three images. Each of the original rendered images should be 1920x1080 or higher and have little to no noise. If you create one composite image, that composite image should be 1920x1080 or higher and have little to no noise.	5 points	
Lateness		
Maximum Total	20 points	/20

## Written Report

Research an industry in which you would like to work and provide background information about that industry. Describe how learning 3D modeling and/or 3D animation might help you to find work in that industry.

You may decide to choose one company within that industry, and describe some of the work it produces. What type of role would you like to play within that company? Are you hoping to specialize in one skill (ex: modeling, texturing, rigging, character animation, motion graphics, compositing) or are you hoping to become a 3D generalist? You may name a specific 3D artist and describe their career. It is fine if you have no interest in pursuing 3D modeling or animation directly as a career. You should still describe how 3D technology affects the industry in which you would like to work.

This written report must be between 300 and 500 words, and is due on **Week 13 (4/26/24)**. Submit this assignment via email (<u>david.haines@nyu.edu</u>). Please email me if you need help.

# **Attendance Policy**

Attendance is taken and is important to success in this class. Students arriving 15 minutes after the class start time will be marked "late." Two "lates" equal one absence. If a student's class absences or equivalents are excessive, the instructor will alert the student that he or she may be in danger of not meeting the course objectives and earning a grade of "F".

## Academic Accommodations

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at <u>http://www.nyu.edu/csd</u>. The Moses Center is located at 726 Broadway on the 2nd floor.

# Weekly Schedule

Note: The following schedule is subject to change.

	Lecture Topics	Classroom Exercises	Homework Assignment
<b>Week 1</b> 1/26/24	Introductions; Digital Arts Organizations; Fundamental 3D Terms and Concepts; Overview of Maya's Interface; Mouse/Camera Controls; Creating/Altering Polygon Primitives; Move; Rotate; Scale; Objects and Components; Discussion of 3D Industry	<ul> <li>Students will model a table and populate it with various objects using Polygon Primitives.</li> <li>Students will also make alterations at the Object and Component levels. In doing so, students will gain familiarity with Maya's interface.</li> </ul>	<ul> <li>Finish today's modeling exercise (ex: a table with various objects on top).</li> <li>Step 1 of <b>Project 1 (Maya Room)</b> is du on <b>Week 2.</b></li> </ul>
<b>Week 2</b> 2/2/24	Proper File Management; Grouping and Parenting; Outliner; Node Hierarchy; Reference Images/Image Planes; Layer Editor; Polygonal Modeling Basics; Smooth Mesh Preview; Soft Selection; Symmetry Settings; Combining Polygonal Objects; Delete History; Establishing a Scale	<ul> <li>Students will pitch ideas for Project 1 (Maya Room).</li> <li>Students will use tools learned today to model a chair. Students may also begin modeling objects for Project 1 (Maya Room).</li> </ul>	<ul> <li>Finish modeling a chair.</li> <li>Step 2 of <b>Project 1 (Maya Room)</b> is du on <b>Week 3</b>.</li> </ul>
<b>Week 3</b> 2/9/24	Importing; Working with Multiple Files; Point; Vertex; Line; Polygons vs. NURBS; Snapping; Overview of NURBS/Surfaces; Curve Tools; Pivot Points; Normals; Booleans; nCloth Basics	<ul> <li>Students will use tools learned today to make progress on Project 1 (Maya Room).</li> </ul>	<ul> <li>Step 3 of Project 1 (Maya Room) is du on Week 4.</li> </ul>
<b>Week 4</b> 2/16/24	Arnold; Hypershade; Materials, Texture Maps, Bump Maps; Lights and Shadows; Camera Basics, Bookmarks	<ul> <li>Students will use Textures, Lights, and Cameras (among other new tools) to make progress on Project 1 (Maya Room).</li> </ul>	<ul> <li>Step 4 of Project 1 (Maya Room) is du on Week 5.</li> </ul>
<b>Week 5</b> 2/23/24	UV Mapping Basics; Rendering Basics; Tweaking Lights and Shadows; Sampling and Noise	<ul> <li>Students will experiment with UV Maps, Lights, and Render Settings to make progress on Project 1 (Maya Room).</li> </ul>	<ul> <li>Step 5 of Project 1 (Maya Room) is due on Week 6.</li> </ul>
<b>Week 6</b> 3/1/24	Model Sheets; Character Design Basics; Basics of Character Modeling	<ul> <li>Presentations of Project 1         <ul> <li>(Maya Room). Students should use class critique to revise their projects.</li> <li>Students will brainstorm ideas for Project 2 (Maya Model).</li> </ul> </li> </ul>	○ Step 1 of Project 2 (Maya Model) is due on Week 7.
<b>Week 7</b> 3/8/24	More Tools for Polygons; Clean Topology; Poly Count; Overview of Sculpting Tools; Cleanup Mesh	<ul> <li>Students will pitch ideas for Project 2 (Maya Model).</li> <li>Students will use new modeling and texturing methods to make progress on Project 2 (Maya Model).</li> </ul>	○ Step 2 of Project 2 (Maya Model) is du on Week 8.
<b>Week 8</b> 3/15/24	Discussion of <b>Written Report</b> ; Topology; Quad Draw; More About Rendering (Image	<ul> <li>Students will use new modeling, texturing, and rendering methods to make progress on <b>Project</b> 2 (Maya Model).</li> </ul>	<ul> <li>Step 3 of Project 2 (Maya Model) is du on Week 9.</li> <li>Begin Written Report. It is due on Wee 13.</li> </ul>

	Format, Wireframe Rendering,						
	etc.); Model Sheet Compositing						
		ing Break will occur from 3/18					
<b>Week 9</b> 3/29/24	Overview of Principles of Animation; Bouncing Ball; Graph Editor; Playblasts	<ul> <li>Students will use animation methods learned today to animate a bouncing ball.</li> </ul>	<ul> <li>Step 4 of Project 2 (Maya Model) is due on Week 10.</li> </ul>				
Week 10 4/5/24	ZBrush Basics (ex: Primitives; Navigation; PolyMesh3D Tool; Saving; Symmetry; Reference Images; Masking; Dynamesh; IMM Primitives Brush); Designing Characters Based on Simple Shapes; Silhouette Design/Silhouette Test; Typical Stages of the ZBrush Portion of the 3D Character Pipeline	<ul> <li>Presentations of Project 2 (Maya Model).</li> <li>Students will pitch ideas for Project 3 (ZBrush Character).</li> <li>Students will use new modeling and texturing methods to make progress on Project 3 (ZBrush Character).</li> </ul>	<ul> <li>Step 1 of Project 3 (ZBrush Character) is due on Week 11.</li> </ul>				
Week 11 4/12/24	Review of ZBrush Basics and 3D Character Pipeline	<ul> <li>Students will use new modeling and texturing methods to make progress on Project 3 (ZBrush Character).</li> </ul>	<ul> <li>Step 2 of Project 3 (ZBrush Character) is due on Week 12.</li> </ul>				
<b>Week 12</b> 4/19/24	Brush, Stroke, and Alpha; Most Necessary Brushes; Selection Brushes; Polygroups; Subdivision Levels; Extract; Subtools; Methods for Making Holes; Transpose; Gizmo 3D; Symmetry	<ul> <li>Students will use new modeling and texturing methods to make progress on Project 3 (ZBrush Character).</li> </ul>	<ul> <li>Step 3 of Project 3 (ZBrush Character) is due on Week 13.</li> </ul>				
Week 13 4/26/24	Polypaint; Material; Color; Texture; Creating UV, Texture, Normal, and Displacement Maps; Exporting from ZBrush and Importing into Maya	<ul> <li>Students will use new modeling and texturing methods to make progress on Project 3 (ZBrush Character).</li> </ul>	<ul> <li>Step 4 of Project 3 (ZBrush Character) is due on Week 14.</li> </ul>				
<b>Week 14</b> 5/3/24	Last Day of Class; Creating Clean Topology in Maya; Rigging Basics; Intro to Advanced Skeleton; Rigging a Body in Advanced Skeleton; Discussion of Various Uses for 3D Modeling and Animation; Discussion of Student Goals	<ul> <li>Presentations of Project 3 (ZBrush Character).</li> </ul>					
	NYU Tandon's Spring 2024 Semester last day of class is 5/6/24.						
NYU Tandon's Spring 2024 Semester Exams will occur from 5/8/24 – 5/14/24.							
Week 15 -/-/-	This course does not have a final exam.						

# **Cheating and Plagiarism**

If students use dishonest methods to fulfill course requirements, they are cheating. Plagiarism is a bit more complicated, but the rules of documentation and citation are very specific and are tailored to different academic disciplines.

Types of plagiarism include:

• Including any material from any source other than you in a paper or project without proper attribution. This includes material from the Internet, books, papers, or projects by other students, and from any other source.

Using your own work to fulfill requirements for more than one course. The extensive use of the ideas of others in
your work without proper attribution. Turning in work done by another person or a fellow student as one's own.

Please remember that all work must be the student's own. If it is not, the source should be cited and documented appropriately. If there are aspects of this statement that are not understood, ask faculty members for help.

## **Technical Failures**

A technical failure (i.e. a hard drive crash) is not an acceptable excuse for late or missing work. Students should expect the unexpected and take extra precautions. Students are encouraged to save multiple versions of files and to back them up frequently.

### **Cell Phones**

Except for emergency situations, students should not use cell phones during class.

### Inclusion

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me.

## Health

If you are experiencing an illness or any other situation that might affect your academic performance in a class, please email Deanna Rayment, Coordinator of Student Advocacy, Compliance and Student Affairs: <a href="mailto:deanna.rayment@nyu.edu">deanna.rayment@nyu.edu</a>. Deanna can reach out to your instructors on your behalf when warranted.

## **Mental Health**

Our aim is for students to be as successful academically as they can, and to help them overcome any impediments to that. Any student who may be struggling and believes this may affect their performance in this course is urged to contact the Moses Center for Student Accessibility at 212 998-4980 to discuss academic accommodations. If mental health assistance is needed, call NYU's 24/7 Wellness Exchange hotline at 212 443-9999. Furthermore, please approach me if you feel comfortable doing so. This will enable me to provide relevant resources or referrals.

## **Outside Events**

Students in this class are encouraged to attend 3D events outside of the college. Suggestions include:

- NYC ACM SIGGRAPH (nyc.siggraph.org)
- Animation Nights New York (animationnights.com)
- ASIFA-East (asifaeast.com)