

# COMPUTER GRAPHICS & GAME TECHNOLOGY, MSE

Interactive entertainment and computer-animated visual effects are now part of our mainstream culture. Creating such computer-generated imagery, however, is no trivial task. It requires a delicate blending of art with science by teams of highly skilled professionals, including artists, animators, writers, designers, engineers and software developers working long hours with cutting-edge technology and tools. Currently there are very few interdisciplinary academic programs at four-year research universities adequately preparing students for such positions. The Master of Science in Engineering in Computer Graphics and Game Technology (CGGT) was created specifically to address this need.

**For more information:** <http://www.cis.upenn.edu/prospective-students/graduate/cggt.php>

## Curriculum

A total of 10 course units are required for the MSE in Computer Graphics and Game Technology (CGGT).<sup>1,2</sup>

Code	Title	Course Units
<b>Core Areas</b>		
<i>Creative Arts and Design</i>		
DSGN 5005	3-D Computer Modeling	1
<i>Computer Science, Systems and Technology</i>		
CIS 5600	Interactive Computer Graphics	1
CIS 5620	Computer Animation	1
CIS 6600	Advanced Topics in Computer Graphics and Animation	1
Select 1 required Math-based course. Recommendations include:		1
CIS 5190	Applied Machine Learning	
CIS 5200	Machine Learning	
CIS 5610	Advanced Computer Graphics	
CIS 5630	Physically Based Animation	
CIS 5810	Computer Vision & Computational Photography	
CIS 5800	Machine Perception	
ENM 5030	Introduction to Probability and Statistics	
<i>Business and Entrepreneurship</i>		
Select 1 Business and Entrepreneurship course. Recommendations include:		1
EAS 5450	Engineering Entrepreneurship I	
IPD 5150	Product Design	
<b>Graphics Elective</b> <sup>3</sup>		
Select 1 Graphics elective. Recommendations include:		1
CIS 5650	GPU Programming and Architecture	
CIS 5610	Advanced Computer Graphics	
CIS 5630	Physically Based Animation	
FNAR 5004	Video I	
FNAR 5017	Cinema Production	
FNAR 5025	Computer Animation	
<b>Technical Elective</b> <sup>4</sup>		

Select 1 Technical elective. Recommendations include: 1

CIS 5610	Advanced Computer Graphics
CIS 5630	Physically Based Animation
CIS 5810	Computer Vision & Computational Photography
CIS 5800	Machine Perception
CIS 5190	Applied Machine Learning
CIS 5200	Machine Learning
ESE 5050	Feedback Control Design and Analysis
ESE 6190	Model Predictive Control
CIS 5550	Internet and Web Systems
CIS 5990	Independent Study for Masters Students
CIS 5640	Game Design and Development (only offered during the summer term)

### Free Elective<sup>5,6</sup>

Select 1 free elective. Recommendations include: 1

EAS 5460	Engineering Entrepreneurship II
DSGN 5004	Art of the Web: Interactive Concepts for Art & Design
DSGN 5009	Digital Figure Modeling
OIDD 6620	Enabling Technologies
FNAR 5066	Advanced Projects in Animation

### Design Project

CIS 5680	Game Design Practicum	1
or CIS 5970	Master's Thesis Research	

**Total Course Units 10**

- <sup>1</sup> 10 course units are required; 9 course units in addition to a one semester design project over a one year period.
- <sup>2</sup> Students enrolled in the program from outside the University who have taken substantially similar coursework at their undergraduate institutions also can petition the program for approval of appropriate course substitutions. Granting of such approvals will be at the Program Director's discretion, and will be made on a case by case basis.
- <sup>3</sup> Must be graduate-level technical or creative course in the area of graphics or animation. Approval of the CGGT program director is required.
- <sup>4</sup> Any graduate level course in the School of Applied Science and Engineering (SEAS). Approval of the CGGT program director is required.
- <sup>5</sup> Any graduate level course at the University that relates in some way to graphics, animation and/or games. Approval of the CGGT program director is required.
- <sup>6</sup> Recommended choices include any of the Graphics Elective, Technical Elective or Business and Entrepreneurship courses.

## Additional Information

- CGGT Related Course Schedules and Descriptions (<http://www.cis.upenn.edu/current-students/graduate/cggt/courses.php>)
- Candidates with non CS backgrounds (<http://www.cis.upenn.edu/current-students/graduate/cggt/non-cs.php>)
- Students interested in the Accelerated Masters (<http://www.cis.upenn.edu/current-students/graduate/cggt/submatriculation.php>)

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

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