COSC 471 Computer Graphics

COSC 471-001, Spring 2023
Computer and Information Sciences
Towson University

Instructor	Dr. Ziying Tang	Office Phone	410-704-3090
E-mail	ztang@towson.edu	Office	7800 York Rd. Room#478
Office hours	Tue/Thurs 4-5pm	Credit Hours	3 credits
Classroom	YR 402	Meeting	Tue/Thursday
TA	Ms. Nikhita Vegesna	Days/Time	11am-12:15pm

Course Description

This course provides a broad introduction to the foundations of three-dimensional computer graphics. Topics covered in this course include, but may not be limited to, 2D and 3D transformations, Rasterization based interactive 3D graphics, shading and reflectance models, texture mapping, geometric modeling using Bézier and B-Spline curves, ray tracing, and animation. There will be an emphasis on both the mathematical and geometric aspects of graphics, as well as the ability to write fully functional 3D graphics programs.

Pre-requisites for the course:
Linear algebra, C++ Programming, Algorithm, Data Structure.

Note this is **NOT** a course that teaches the use of graphics software such as Photoshop, 3D Max, Maya etc. This is **NOT** a course that teaches programming in C/C++, GPU coding.

Course Learning Outcomes

Students will learn everything about modern topics in Computer Graphics. At the end of this course, students should:
1. Have a basic understanding of the core concepts of computer graphics;
2. Understand the graphics pipeline;
3. Get familiar with mathematical tools for graphics algorithms and hardware;
4. Be able to how to create three-dimensional interactive applications.

Course Materials

There are no required textbooks for this course. I will provide lecture slides and discussion materials as your main references. And they will usually be available by the next day of the corresponding lecture/discussion.

Recommended Textbook
1. Peter Shirley and Steve Marschner, "Fundamentals of Computer Graphics", 3rd or later edition. Release date: July 2009, Publisher(s): CRC Press, ISBN: 9781439865521 (Recommended as "Reading" of each lecture).
2. Tomas Akenine-Möller et al., "Real-Time Rendering", 3rd or later edition.

- **OpenGL "Red Book"** --- *the* reference for OpenGL programming
- Nate Robbin's **OpenGL "tutors"** programs
- **3-D computer graphics: a mathematical introduction with OpenGL**, Volume 385, By Samuel R. Buss
- Andrew S. Glassner, **An Introduction to ray tracing**, 1989

Course Mode

This course will be meeting in person every week during regular course meeting time. If there is any change, we follow school decisions and instructor will provide detailed information later through email or announcement on Blackboard. Please check school emails regarding mask policy.

Mask Policy

Clear expectations have been shared with the University community about the wearing of masks. Face coverings over the nose and mouth are recommended while you are indoors. Contact the Dean of Students, Anthony Skevakis 410-704-2270 or the Office of Student Conduct and Civility Education 410-704-2057 if you have any questions about this process.

Grades

The final grade will be a weighted average of the following components:

Graded Components	Contribution to Overall Grade	Due Dates
Assignments (5)	50%	Due by 11:59PM on the dates specified.
Exam 1	25%	Announced in class
Project	25%	Due by the final exam date
Total	100%	

Grading criteria and rubrics related to each assignment, project and exam will be announced before releasing of each submission.

The following scale will be used to determine grades:

A ≥ 93.3% A- ≥ 90.0%	B+ ≥ 86.7% B ≥ 83.3% B- ≥ 80.0%	C+ ≥ 75% C ≥ 70%	D+ ≥ 66.7% D ≥ 63.3% D- ≥ 60.0%	F < 60.0%

Attendance and Absence Policy

All students are expected to be on-time for – and remain for the duration of – all class sessions. If we have online session, please try to login online earlier so that to avoid any last-minute technical issues. If students are late getting online session, please keep voice down to minimize disturbing the whole course.

If for some reason students cannot make to the online synchronous meeting during course time.

Please refer to the course videos. Note that instructor will have to follow the Towson University Policy on Student Class Attendance/Absence in regard to excused absences.

Absence of exam and project presentation will be required to provide related documents following the Towson University Policy on Student Class Attendance/Absence. If there is absence due to technical issues during exam and project presentation, students are required to contact instructor immediately and provide documented proofs.

Late Work Policy

NO late submission is allowed after due date.

Academic Integrity Policy

- For issues pertaining to Academic Integrity, the student should consult the Student Academic Integrity Policy. It should be noted that the instructor is obliged to report any incidents of academic dishonesty to the office of Academic Affairs. Occurrences of cheating or plagiarism (including the submission of source code copied from the Internet) may yield a failing grade for the assignment or course, and are subject to the university established academic integrity policies:
  http://www.towson.edu/provost/resources/studentacademic.asp
- Course repeat policy: Students may not repeat a course more than once without prior permission of the Academic Standards Committee.
- For any issues not specifically addressed in this syllabus, the student should consult the Towson University Undergraduate Catalog
  http://www.towson.edu/main/academics/ugrad/undergraduatecatalog.asp.
- All assignments should be done individually. You are not to collaborate with other students, or to discuss assignment with other students prior to submission. Copying of homework, projects, or exams, in whole or in part, from other students will be considered an act of scholastic dishonesty. All assignments should be submitted via BlackBoard, not emailed to the instructor.
- Collaboration only when projects/assignments are with groups
- Always cite sources of code and ideas
- Project is group based and grading details of project will be posted and discussed in the course later.

Students with Disabilities Policy

If you are a student with a disability, please contact me to discuss your specific needs. A memo from Disability Support Services (DSS) authorizing your accommodations will be needed. Please note that accommodations needed for an online course may be different than those needed in a traditional classroom setting, so it is important that you work with DSS to determine appropriate accommodations for this course as early as possible. For more information, or if you have questions about accommodations, contact Disability Support Services at 410-704-2638 or visit https://www.towson.edu/dss/.

Instructor Responses

I will provide feedback on all written assignments and projects. But TA may be grade your

assignments.
I will respond to all emails within 24-36 hours on weekdays.
During office hour, I will be available in office or online. If you need to meet in other time, email me to make an appointment.
The best way to reach me is through email.

General Guidelines

Log into our Blackboard course on a daily basis and check your TU email regularly. To ensure you are aware of current information being communicated to you, you should log into the course site at least once every 48 hours. Proactively respond to instructor and peer discussion posts/emails in a timely manner.

Email the instructor with personal matters (e.g., academic concerns, study conflicts, planned absence) **and follow the given email format**. Include our course number and title in the email subject; write in clear logic with correct grammar and use appropriate language.

Tentative Course Schedule

Changes: This course will be very dynamic, please expect changes. Changes in assignments or schedules will be notified in class and posted on Blackboard. It is the student's responsibility to keep up with the changes that are posted on Blackboard.

Week/ Date Range	Topics	Activities	Deliverables
Jan 31-Feb2	Welcome		
	Overview and Intro of CG		
Feb 7-9	Vector and Linear Algebra	Reading Chapter 2 (Miscellaneous Math)	
	Vector and Linear Algebra	Reading Chapter 5 (Linear Algebra)	**Assignment 1**
Feb 14-16	Transformation 1		
	Transformation 2	Reading: Chapter 6.1-6.5(Transformation Matrices)	
Feb 21-23	Transformation 3		
	Rasterization 1	Reading: Chapter 7 (Viewing)	**Assignment 2**
Feb 28-Mar 2	Rasterization 2	Reading: Chapter 3.1, 3.2, 7.1.1, 8.1	
	Rasterization 3	Reading: Chapter 8.2, 8.3, 9	
Mar 7-9	Shading 1	Reading: Chapter 10.1, 10.2, 11.1-11.4	**Assignment 3**
	Shading 2		
Mar 14-16	Shading 3		
	Shading 4		**Assignment 4**
Mar 21-23	Spring Break		
	No class		
Mar 28-30	Geometry 1	Reading: Chapter 15.1-15.3,15.6	
	Geometry 2		
Apr 4-6	Geometry 3		**Assignment 5**
	Exam review		
Apr 11-13	Midterm exam		

	Project discussion		
Apr 18-20	Ray Tracing	Reading: Chapter 4, 12.1-12.3	
	Project discussion		
Apr 25-27	Animation 1	Reading: Chapter 16.1, 16.2, 16.5	
	Animation 2		
May 2-4	Project discussion		
	Project discussion		
May 9-11	Project discussion		
	Project discussion		
May 16-18	Final Project presentation		**Project**