

## Computer Graphics

CAP5705

**Class Periods:** M,W,F | Period 6 (12:50 PM - 1:40 PM)

**Location:** Room: [WM 0100](#)

**Academic Term:** Fall 2019

### **Instructor:**

Corey Toler-Franklin

[ctoler@cise.ufl.edu](mailto:ctoler@cise.ufl.edu)

352-294-6673

Office Hours: M,W,F | Period 7 (1:55 PM – 2:45 PM) | Lab: CSE 319 ( or Office CSE 332)

### **Course Description**

Display device characteristics; system considerations, display algorithms. Curve and surface generation. Lighting models and image rendering.

### **Course Pre-Requisites / Co-Requisites**

COP 3530

### **Course Objectives**

CAP5705 is a graduate-level course that presents the concepts and principles behind current and emerging methods, tools and techniques in computer graphics. Through programming assignments and written exercises, students will develop a thorough understanding of the field. Topics covered include shading and illumination, sampling and reconstruction, ray tracing, graphics hardware, geometric and viewing transformations, rendering, modeling curves and surfaces and image-based methods. The emphasis is on the fundamental concepts, mathematical principles, algorithms and data structures used in computer graphics. If time permits, students will be introduced to an overview of advanced topics in computer graphics research.

*Preparation:* The course requires basic knowledge of algorithms, data structures and linear algebra. Central concepts require matrix operations, composition and parametrization of curves and surfaces. Students should be able to program using a high-level language. Familiarity with C or C++ is helpful — otherwise the learning curve is quite steep in the first weeks. Familiarity with OpenGL is not assumed. The mathematical underpinnings and OpenGL practice are emphasized.

**\*\*Contact instructor if you are not sure you are prepared for the course\*\***

### **Materials and Supply Fees**

N/A

### **Required Textbooks and Software**

Fundamentals of Computer Graphics

Marschner and Shirley

Fourth Edition

ISBN 1482229390

### **[OpenGL Programming Guide: the Official Guide to Learning OpenGL](#)**

Dave Shreiner, Graham Sellers, John M. Kessenich, Bill M. Licea-Kane

Latest, Available Online

ISBN 0321773039

### **Course Schedule:**

*Computer Graphics, CAP5705*

*Corey Toler-Franklin and Fall 2019*

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Date	Topic	Reading	Assignments
21-Aug	Introduction	Ch. 1, Ch. 2	course survey/assessment out
23-Aug	Triangle Meshes	Ch. 12: up to Fig. 12.1.4	course survey/assessment due
26-Aug	Triangle Meshes		prog 1 Mesh Manip out
28-Aug	CAP5705 Coding Platform: OpenGL	OpenGL Online Guide	
30-Aug	CAP5705 Coding Platform: GLSL Shaders	OpenGL Online Guide	
<b>2-Sep</b>	<b>Holiday: Labor Day</b>		
4-Sep	History of CG		
6-Sep	Math in CG	Ch.5	prog 1 Mesh Manip due
9-Sep	Math in CG		
11-Sep	Ray Tracing	Ch. 4	prog 2 ray tracer out
13-Sep	Ray Tracing		
16-Sep	Shading - Reflectance and Illumination		
18-Sep	Texture Mapping	Ch. 11: Sec. 11.1, 11.3, 11.4	
20-Sep	Texture Mapping		
23-Sep	Interpolation   Transformations		
25-Sep	2D Transformations   Final Proj. Guidelines	Ch. 6: Sec. 6.1	prog 2 ray tracer due
27-Sep	3D Transformations	Ch. 6: Sec. 6.2 to end	hw 1 out
30-Sep	Projection & Modeling Hierarchy	Ch. 12: Sec. 12.2	
2-Oct	Viewing Transformations	Ch. 7: Sec 7.1	hw 1 due 10/03
<b>4-Oct</b>	<b>Holiday: Homecoming</b>		prog 3 shaders out
7-Oct	Perspective  hw 1 review in class	Ch. 7: Sec 7.2 to end	
9-Oct	Exam 1 (Lectures 08/21-10/02)		
11-Oct	Perspective		Final Proj. Proposal due
14-Oct	Rasterization   Exam 1 discussion	Ch. 8: Sec 8.1	prog 4 isosurfaces out
16-Oct	Graphics Pipeline & Hardware	Ch. 8: Sec. 8.2 to end	prog 3 shaders due
18-Oct	Graphics Pipeline & Hardware		
21-Oct	Images	Ch. 3: up to 3.3	
23-Oct	Images, Displays, Antialiasing, Compositing	Sec. 3.4	
25-Oct	Signal Processing	Ch. 9	
28-Oct	Signal Processing		hw 2 out
30-Oct	Curves	Ch. 15	prog 4 isosurfaces due
1-Nov	Curves		
4-Nov	Curves		hw 2 due
6-Nov	Surfaces	SIGGRAPH course notes	Final Proj. : Mid Point Eval. Due
<b>8-Nov</b>	<b>Holiday: Veterans Day</b>		
11-Nov	Surfaces   hw 2 review in class		
13-Nov	Exam 2 (Lectures 10/07-11/06)		
15-Nov	Advanced: Deep Learning in Graphics		TED Talk - AI
18-Nov	Advanced: Animation		TED Talk - Animation
20-Nov	Advanced: Animation   Exam 2 discussion		TED Talk - VR
22-Nov	TBD		
25-Nov	TBD		
<b>27-Nov</b>	<b>Holiday: Thanksgiving</b>		
<b>29-Nov</b>	<b>Holiday: Thanksgiving</b>		
2-Dec	Extra Credit Activity		
4-Dec	Final Project Presentations   CSE 319 TBD		Final Projects Due

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

Attendance is expected and noted. One half of a letter grade will be deducted (e.g. an A becomes a B+) for missing more than 3 classes for the semester without a documented university excused absence. Emergencies must be approved by the instructor. Excuses for school related business will be accepted only with prior approval. Make-Up homework, projects and exams for university excused absences must be approved in advance by the instructor. Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Programming Projects	100 each	30%
Final Project	100 each	20%
Written Homework	100 each	20%
Exam 1	100 each	15%
Exam 2	100 each	15%
		100%

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
93.0 - 100	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 - 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 - 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

**Late Policy:** Late programming projects will receive a late penalty of 5% per day late up to a maximum of a 50% reduction. Students are permitted 1 free late pass for 1 programming assignment. No late penalties will be applied for up to 1 week over the deadline when using a late pass. Students must notify the instructor in writing by the assignment due date and receive a confirmation email from the instructor in order to use the late pass. Written homework is reviewed in class in preparation for exams and cannot be turned in late.

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

### ***Students Requiring Accommodations***

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will

receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

## Health and Wellness

### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

## Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.