EASTERN MENNONITE UNIVERSITY

TOPICS: COMPUTER GRAPHICS

CS 333 A
Fall 2017
Office Hours:

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Room:
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COURSE DESCRIPTION:
This course is an introduction to Computer Graphics programming. We will be writing some great 2D and 3D code using OpenGL with Python.

COURSE OBJECTIVES:
This course is aimed at providing you with some of the general tools necessary to develop computer graphics.

- My main goal as a facilitator for this course is to help you achieve your academic and learning goals.

- I will try to employ a variety of techniques to help us learn. This might include

    - Programming exercises
    - Creative coding – you have an idea, code it!
    - Puzzles / Brainteasers
    - Maybe a few videos
    - Lectures
    - Plus more!

- I will respect that you are an undergraduate student with a difficult academic load and a full and perhaps stressful life. If you feel like this course is introducing excessive stress, please talk to me about it. I want this course to be helpful – not painful.

- You are a "value-added" to this course. You are not merely an information receiver. You are also an information transmitter. You will share what you have learned, and we (myself included) will learn from each other. There are many ways to do things with graphics. Show the class a new or better way!

- In this course (and in all of my computer science courses) I will encourage:

    - Self-Directed Learning (Huge – especially for a computer scientist)
    - Careful listening – to colleagues, clients and classmates
    - Communication
    - Code Reuse – with citation
    - Quality

- Reflection
- Problem-Solving
- Ethical and Professional Behavior

- You can be as good a computer scientist as you want. Learning material is readily available. You just need practice – practice – practice.

- To ensure that we get practice, we will be looking at a new piece of code each class. I will provide the code from our text. The code will be a complete Python program. You should examine the code thoroughly, and then answer questions about it. Write a short report on the work you have done. It is important that you pause and think about the code and the questions. The questions will encourage you to experiment with the code. **It is more important to think about the code than to rush through all the questions.** Think about code applications. You do not have to complete all the questions. Take your time and do as many as you can. A slow, steady approach – doing a bit each day – seems to be the best learning methodology.

REQUIREMENTS AND EVALUATION:

Grading:
Each week we will have a brief quiz on the previous week's material. This quiz is basically to ensure that you come to class and think about the work.

10 Weekly Quizzes – Short and sweet. Two questions, each worth one point.
(= 20 points total)

20 Homework Exercises – one exercise Tuesday, one exercise Thursday, each two points. These will be reports of the work you have done on the section and exercises - insights, learnings, challenges, questions answered, etc. Please write in complete sentences. Do not spend more than three or four hours outside of class on any of the individual assignments. (One hour a day would be ideal.)
(= 40 points total)

Final Project – Your own graphics program!

Idea Paper	(= 5 points)
Progress Report	(= 5 points)
Code / Presentation	(= 30 points)

TOTAL 100 points

There are many ways to earn extra credit in this course!

- Finish all the homework exercises for the day. Be creative and code something interesting with the material from that lesson.
- Use your graphics programming in another course or a real-world situation.
- Suggest your own idea

ATTENDANCE POLICY:

Attending class is a good idea. If you feel like you aren't getting anything from attending class, let's have lunch and talk about it. Every Tuesday we will have a brief quiz on the material from the previous week.

BOOKS AND MATERIALS:

Python Programming in OpenGL: A Graphical Approach to Programming by Stan Blank (2011). I will provide this text.

ACADEMIC HONESTY:

Academic Integrity Policy (AIP): EMU faculty and staff care about the integrity of their own work and the work of their students. They create assignments that promote interpretative thinking and work intentionally with students during the learning process. Honesty, trust, fairness, respect, and responsibility are characteristics of a community that is active in loving mercy, doing justice, and walking humbly before God. EMU defines **plagiarism** as occurring when a person presents as one's own someone else's language, ideas, or other original (not common-knowledge) material without acknowledging its source. (Adapted from the Council of Writing Program Administrators). [Taken from "Academic Integrity," 2017-18 Undergraduate Catalog.] This course will apply EMU's Academic Integrity Policy (see catalog, pp. 20-24) to any occurrences of academic dishonesty.

DISABILITY STATEMENT:

If you have a physical, psychological, medical, or learning disability that may impact your work in this course, it is your responsibility to contact the Office of Academic Access (http://www.emu.edu/academics/access/) on the third floor of the Hartzler library. This office will work with you to establish eligibility and to coordinate reasonable accommodations. All information and documentation is treated confidentially.

ACADEMIC SUCCESS CENTER TUTORS:

Please take advantage of the free individual tutoring from AcademicSuccess Center tutors. ASC tutors are undergraduate students trained tosupport students in particular courses anddepartments. Tutors also offeroccasional study group options. To make an appointment, access ASCTutoring through quick links on myEMU.

TITLE IX:

It is important for you to know that all faculty members are required to report known or alleged incidents of sexual violence (including sexual assault, domestic/relationship violence, stalking). That means that I cannot keep information about sexual violence confidential if you share that information with me. For example, if you inform me of an issue of sexual harassment, sexual assault, or discrimination I will keep the information as private as I can, but I am required to bring it to the attention of the institution's Title IX Coordinator. Incidents that have occurred on campus, at a campus event, and/or while a student at EMU require follow up by the Title IX Coordinator. If you would like to talk to the Title IX Coordinator directly, Irene Kniss can be reached at 540-432-4302 or irene.kniss@emu.edu. Additionally, you can also report incidents or complaints through our online portal at http://emu.edu/safecampus/. You may report, confidentially, incidents of sexual violence if you speak to Counseling Services counselors, Campus Ministries pastors, and Health Services personnel providing clinical care. These individuals, as well as the Title IX Coordinator, can provide you with information on both internal and external support resources.

Please refer to the Student Handbook which can be found at http://www.emu.edu/studentlife/student-handbook/ for additional policies, information, and resources available to you.

CLASS ASSIGNMENT SCHEDULE:

Schedule.

Week 1:

Introduction
Syllabus
Chapter 2 Needs, Expectations, and Justifications

Text Editors
Debugging
GitHub
Chapter 3 Your First Python Program

Week 2:

Chapter 4 Your First OpenGL Program

Section 5.1 Plotting Points

Week 3:

Section 5.2 Plotting 2D Functions

Section 5.3 Parametric Equations

Week 4:

Section 5.5 Polar Coordinates
Section 5.6 Conclusions

Section 6.1 PySkel
Section 6.2 Some Interesting Patterns

Week 5:

Section 6.3 The Chaos Game

Section 7.5 Newton's Method and the Complex Plane

Week 6:

Section 7.7 Explorations with the Mandelbrot Set

Section 8.1 Follow the Bouncing Ball (2D Animation)

Week 7:

Section 8.2 A Little Gravity!

Section 8.3 A Little MORE Gravity... a 2-Body Simulation

Week 8:

Section 8.4 The REAL 3 Body Problem

Section 8.5 From 3Body to NBody Using Arrays

Week 9:

Section 8.6 Navigating the Stars

Section 9.1 Rotating Objects in Space (3D Animation)

Week 10:

Section 9.2 Real Time Interactive Computer Animator (RTICA)

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Week 11:

Section 10 Animation and Display Lists: Electron Orbitals

Section 11 Rendering Teapots

Week 12:

Section 11 Fog

Section 11 Nate Robins and Multiview

Week 13

Final Project

Week 14

Final Project

Final Exam Final Project Presentation

(This document was mostly created with LibreOffice Writer on a Raspberry Pi running Linux.)