



Comp4302/Comp 6909 – 3D Graphics

Course Outline – Fall 2021

Department of Computer Science

Course Instructor: Dr. Oscar Meruvia-Pastor

Office Hours: Available via Webex & by appointment only (send Email). On Campus on Mondays from 11:00 to 13:00 @ ER 6032 (send Email for appointment).

Email: Use MUN's [online course shell's email](#):

OMeruvia@online.mun.ca (include the title "Comp 4302 or Comp6909" in the subject)

Classroom Lectures: **EN 2040 – In-person lectures, with recorded lectures available on D2L.**

Teaching Assistant: To be announced in MUN's course shell, a.k.a. Brightspace/D2L

Email: Use the D2L Comp 4302/6909 course shell

Short Course Description: Comp 4302/6909 is an introduction to 3D Computer Graphics Fundamentals.

Prerequisite: COMP 3301

Calendar Description:

3D Computer Graphics introduces the student to the state-of-the-art concepts and developments in 3D computer graphics. The underlying algorithms, as well as the basic techniques to develop interactive 3D graphics systems including games and simulators, are presented. Topics of the course include 3D geometrical transformations, 3D projections, 3D modeling and rendering, 3D graphics languages and systems. Advanced photorealistic rendering and image-based rendering techniques may also be covered.

Message From CITL:

"Welcome to the fall 2021 term! This course is designed to be held in-person. Our class lectures have been carefully designed to emphasize safety while providing a rich learning experience for all students. Following campus-wide policy, masks are required for all students in our classroom. Should other health directives, or the overall situation connected to COVID-19 change over the course of the term, a back-up plan for remote delivery is in place to ensure that the course will continue and to minimize disruption to the student experience."

Course Textbooks (recommended, not required):

Interactive Computer Graphics, 8th Ed.

Editions: Both eText & Loose leaf are available & suitable.

Authors: Edward Angel & David Shreiner

Editorial: Addison Wesley

ISBN: 9780135217733

<http://www.mypearsonstore.com/bookstore/pearson-etext-for-interactive-computer-graphics-access-013525826X>

Reference Texts (for the keeners):

Real-Time 3D Graphics with WebGL 2: Build interactive 3D applications with JavaScript and WebGL 2 (OpenGL ES 3.0), 2nd Edition, Kindle Edition

Authors: Farhad Ghayour & Diego Cantor

ISBN: 1788629690

<https://www.amazon.com/Real-Time-Graphics-WebGL-interactive-applications-ebook/dp/B07GVNQLH5>

Learn Three.js: Programming 3D animations and visualizations for the web with HTML5 and WebGL, 3rd Edition.

Jos Dirksen (Author)

Editorial: Packt Publishing

ISBN: 1788833287

<https://www.amazon.com/Learn-Three-js-Programming-animations-visualizations-ebook/dp/B07H2WJD1P/>

Educational Goals:

Successful students will:

1. Acquire an understanding of the basic principles of 3D computer graphics.
2. Learn the concepts of perspective, display transformations, rendering, shading and illumination, texture mapping and languages and graphics systems.
3. Understand the graphics pipeline, learning WebGL and Javascript, and how to use them to execute 3D graphics programs on the Web browser.

Prerequisites and expected skills:

The calendar pre-requisite (Comp 3301) and the 3rd year standing are meant to ensure the student has the necessary skills to be successful in the course. The course examples and programs are in WebGL. The WebGL API is accessed through JavaScript code in HTML5 browsers. It will be important for students going into the course to have: good programming skills in JavaScript, Python, C, C++, or Java; an understanding of basic data structures (arrays, linked lists, trees); and a rudimentary knowledge of trigonometry and linear algebra, particularly matrix-by-matrix and vector-by-matrix multiplications, which are fundamental in applying viewing transformations.

Evaluation for Comp 4302:		Evaluation for Comp 6909:	
In-class participation (TopHat).....	20%	In-class participation (TopHat).....	20%
Assignments.....	15%	Assignments.....	15%
Midterm Exam.....	25%	Midterm Exam.....	25%
Final Assignment.....	15%	Final Project.....	15%

Final Exam	25%	Final Exam	25%
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The midterm exam will be held according to the Semester Plan below. The final exam will be scheduled by the Registrar's Office later in the term and will be administered using the Proctorio extension in TopHat. In the event of university closure on the day of a test, the test will be given in the next available lecture day with no special announcement. For other exemptions, see the policies and important notes below.

The D2Lwebsite (<https://online.mun.ca/>) is used for posting all assignments and you are required to check regularly regarding assignment announcements and due dates. All assignments are due at the time and dates specified in the assignment sheet. Late submissions will not be accepted. All assignments must be submitted online via Desire2Learn.

If, for special circumstances (such as medical, accidental or bereavement) a student misses an examination, a quiz or an assignment, the student should notify the instructor as soon as possible (within a week), providing any related documentation, in accordance with University policies, in which case, the percentage will be distributed to the corresponding evaluation category (exams, assignments or participation). If the student wishes to write a make-up examination, it is the responsibility of the student to initiate contact to ask for the make-up examination within the first week of the missed examination and be ready to write the examination as soon as possible. Failure to notify within one week will result in a mark of 0% for that work or examination. The information required for medical notes in the case of a missed final exam is established in the University Calendar's general academic regulations section 5.14.4.

Student Resources

We want to see each committed student succeed in the course. All students are encouraged to regularly consult with the professor and teaching assistant for help or clarification with the topics presented in class, lab or tested in the examinations. However, before asking for help, students are expected to read the assignment sheets and complete the necessary work as much as possible.

Notes

1. Important news and all course communication should be directed through the online shell for the course, available through the following link:
<https://online.mun.ca/>
2. For the schedule of activities and the course slides to read from each text refer to the semester plan shown below.
3. Special dedication should be given to the assignments, as they are essential for success.
4. Online course materials will be available through the Brightspace/Desire2Learn (D2L) system. The lectures provided in this course, including any visual or audio

- recording thereof, are subject to copyright owned by Drs. Minglun Gong and Oscar Meruvia and, in some cases, the authors of the supplemental materials used in the course. They are meant solely for academic use by the students registered in the class. It is prohibited to record, copy or republish by any means, in any format, openly or surreptitiously, in whole or in part, in the absence of express written permission from the course instructor, any of the lectures or materials provided or published in any form during or from the course.
5. Any e-mail messages to the instructor should be sent through the Brightspace/D2L course shell. Brightspace/D2L email will be checked within three working days, typically during office hours. Only when extraordinary circumstances (emergencies) arise, you can email your professor at oscar@mun.ca.
 6. Important dates (such as drop and add dates) can be found in the University Diary (<http://www.mun.ca/regoff/calendar/sectionNo=GENINFO-0086>).
 7. Grading of work will follow the scale laid out in the general regulations in the University Calendar, general regulations section 5.8.
 8. Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities (<http://www.mun.ca/policy/site/policy.php?id=239>). Students who may need an academic accommodation are asked to initiate a request with the Glenn Roy Blundon Centre at the earliest opportunity (www.mun.ca/blundon/).
 9. All written materials delivered must comply with the expectations set out in the University Calendar regulations for good writing (section 5.8.3).
 10. To protect yourself and those around you, it is important to stay home if you feel unwell or if you are under quarantine, because you have potentially been exposed to the virus. Please keep me informed so we can work together to allow you to keep up with the course materials should you need to miss classes. You will not be penalized if you need to stay home for quarantine. Memorial University has recognized the importance of academic leniency as we work to keep our campus safe for all.
 11. Cheating will not be tolerated. Students are expected to complete the material on their own and need to prove they personally understand the course material. If an assignment is found to be copied from other student or any other source, it will receive a mark of zero. In addition, students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University, in accordance with the University Regulations for Academic Misconduct (<https://www.mun.ca/regoff/calendar/sectionNo=REGS-0748>).
 12. As a part of our shared responsibility to keep each other and our extended families safe during the upcoming school year, [COVID-19 vaccines are required for all students, faculty, and staff; masks are required on all Memorial campuses in all](#)

[indoor spaces](#). For further information, see the University webpage on [COVID-19 Vaccination Clinics](#).

13. Memorial encourages faculty, staff, and students to [download the COVID Alert app](#) to help protect yourself and others. The app is designed to let people know **whether they may have been exposed to COVID-19**.
14. If Memorial University campus operations are required to change because of health concerns related to the COVID-19 pandemic, it is possible that this course will rapidly move to a fully online delivery format. Should that be necessary, students will need to have access to a networked PC or Mac computer with webcam and microphone, for remote delivery of the class. The university has published [minimum computer requirements](#) which you can review. Should we shift our class to remote lectures, this will likely remain in-place for a minimum of two weeks as a “circuit-breaker” to allow the university and province to evaluate safety requirements. Remote lectures for our class will be held synchronously, following our normal class hours.
15. Although changes to this document are not intended at this time, any part of this course outline can be subject to change, and more so within the first two weeks of classes. Changes will be announced in class and/or posted over Brightspace/D2L.

3D Graphics - Semester Plan for Lectures & Reading - Fall 2021

Week	Monday	Tuesday	Wed	Thursday	Fri
1	September 6	7 Lectures Begin ->	8	Sep 9 Course Overview	10
2	Sep 13 Introduction to Graphics, WebGL sample	14 Chapter 1 Light, color, and photography	15	Chapter 1 16 Image Formation (CG03) Models & Architectures & The Graphics Pipeline	17
3	Chapter 2 20 Introduction to WebGL Programming	Chapter 2 21 Programming WebGL 2D (CG05)	22	Chapter 2 23 Programming WebGL 3D	24
4	Chapter 3 27 Input and Interaction (CG07)	Chapter 3 28 GL callbacks (CG08)	29	Chapter 3 30 Truth & Reconciliation day (no lectures)	Oct 1
5	Chapter 4 Oct 4 Picking and Display Lists (CG09)	Chapter 4 5 Defining Objects' Geometry (CG10)	Oct 6	Chapter 4 7 Spatial Frames of Reference (CG11)	8
6	Chapter 4 11 Thanksgiving & Midterm Break (no lectures)	Chapter 5 12 Midterm Break (no lectures) Monday Schedule -> Transformations in WebGL (CG12)	13 Xtra Lec- ture	Chapter 5 14 Transformations (CG12) Tuesday Schedule (Oct15)-> Transformations in WebGL (CG13, Oct 15)	15 Xtra Lec- ture
7	Chapter 5 Oct 18 Topology of 3D models (CG14)	Chapter 5 19 Viewing (CG15)	20	Chapter 5 21 Views and Projections (CG 15)	22
8	Oct 25 WebGL Cameras, Projection (CG16)	26 Specifying projection matrices (CG17)	27	October 28 * Midterm Exam *	29
9	November 1 Lighting and Shading (CG 18)	Chapter 6 2 Shading and the Phong model (CG19)	3	Chapter 6 4 Shading in WebGL (CG20)	5
10	8 Midterm Review & Vertex and Fragment Shaders (CG23)	Chapter 6 9 Texture Mapping & Rendering Buffers (CG24)	10	November 11 Remembrance Day (no lectures)	12
11	Chapter 7 15 WebGL Texture Mapping (CG25)	Chapter 7 16 Environment Reflection and Bump Maps	17	Chapter 7 18 Framebuffers intro (CG27)	19
12	Chapter 8 22 Compositing and Blending (CG27)	Chapter 8 23 Compositing and Blending	24	Chapter 8 25 Off-Screen Rendering Picking (CG28)	26
13	Chapter 8 29 Shadow Maps and Projective Textures	Chapter 8 30 Hierarchy & Scene Graphs (CG29)	Dec 1	Chapter 9 Dec 2 Hierarchy & Scene Graphs (CG29) Lectures End!->	3
14	Dec 6 Final Exams Start	7	8	9	10
15	13	14	15	16 Final Exams End (17)-->	17