



ACADEMIC YEAR 2018-2019  
WINTER 2019

<b>Course number</b>	SOEN 6761	<b>Course Title</b>	Multimedia Computing
<b>Department</b>	Computer Science and Software Engineering	<b>Semester</b>	Winter 2019
<b>Type</b>	Elective	<b>Credits</b>	4.0
<b>Level</b>	Graduate	<b>Prerequisites</b>	Good programming skills in C/C#/C++ are required. Knowledge of Unity3D or Unreal Engine is recommended.
<b>Lecture</b>	Tue, Thu @14:45 - 16:00 H521 SGW	<b>POD</b>	Mon@14:00-17:00 Wed@11:30-14:30 EV3.172
<b>Instructor</b>	Charalambos Poullis, CSSE	<b>Office hours</b>	Wed @ 14:00 - 15:00 and by appointment
<b>Office</b>	EV3.183	<b>Email</b>	charalambos@poullis.org
<b>Teaching Assistants</b>	Majid Pourmemar Yashas Joshi	<b>Email</b>	SOEN6761.TA@gmail.com

## COURSE DESCRIPTION

This course covers the basic concepts and principles involved in multimedia systems design. In the first part of the course, we will cover the theory and provide in-depth overview of the various media formats e.g. text, audio, images, video, graphics, etc. We will also analyze the current standards for the creation, compression, and storage of multimedia content. In the latter part of the course, we will introduce virtual and augmented reality and learn how to develop interactive and immersive visualizations using the full capacity of state-of-the-art VR and AR technologies.

## COURSE OBJECTIVES

The primary objective of the course is to provide a comprehensive overview of the techniques used for the creation, compression, and storage of multimedia content, as well as provide hands-on experience on the design and development of immersive visualizations using state-of-the-art VR and AR technologies. In particular, the course will cover the following:

- audio - digitization and quantization, compression, standards
- image - data representation, color models, compression, standards
- video - analog, digital (subsampling), 3D, color models, compression, standards
- text - compression
- VR - HMDs, interaction, navigation, mobile
- AR - HMDs, interaction with gaze, gestures, spatial mapping

## LEARNING OUTCOMES

By the end of this course, students will be able to:

- identify and explain the data representations used for different media types e.g. text, image, video, audio, graphics, etc.
- compare, criticize and assess a number of compression standards for audio, image, and video
- explain a number of color models available for image, video
- design and develop an immersive and interactive visualization using VR/AR technologies

## COURSE CONTENTS

- multimedia data representations (audio, image, video)
- multimedia data compression (audio, image, video)
- virtual reality
- augmented reality

## TEACHING METHOD

The course comprises of weekly lectures and practical training in the form of individual assignments. **It is emphasized that attendance in lectures is mandatory for learning and performing well in this course.**

## ASSESSMENT

Assignments (x3)	3 × 10%
Project (x1)	20%
Quiz #1	20%
Quiz #2	30%

**All assignments and exams must be completed in order to pass the class.**

**Quizzes:** Quiz #1 will take place on **February 14th, 2019**. Quiz #2 will take place on **April 04th, 2019**.

**Assignments/Project:** The goal of the programming assignments is to gain practical experience in multimedia computing. There are three programming assignments. Please refer to the schedule for the assignment descriptions and due dates. All assignments must be completed to pass the course. The assignments *may* have a small amount of bonus credit. All assignments must be done **individually** and ran during the lab session for evaluation. Lab instructors will test your knowledge of programming the assignment during this evaluation.

**Submission:** The assignments should be submitted by 13:00 on the day they are due. Late submissions will be accepted until 3 days following the initial deadline, however, there will be a penalty of 20% from the total assignment grade and [if applicable] no bonus.

## ACADEMIC INTEGRITY POLICY

There is a plethora of online resources. You are allowed to incorporate code or tips you find on the Web, provided this doesn't make the assignment/project trivial **and** you explicitly acknowledge your sources. You are allowed to discuss assignments with each other, but coding must be done individually.

Please make sure you familiarize yourself with Concordia's Academic Code of Conduct

## SUGGESTED REFERENCE TEXTBOOKS

Lecture slides for this course will be the primary pointers. There is a vast amount of learning content in the form of notes, programming tutorials, etc. available on the Internet. The theoretical part of the course will cover parts of the following textbooks:

1. Fundamentals of Multimedia by Ze-Nian Li, Mark S. Drew, Jiangchuan Liu. ISBN-13: 978-3319052892

## COMMUNICATION

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email [team@piazza.com](mailto:team@piazza.com).

Find our class page [here](#)

## COURSE SCHEDULE

The list below provides a summary of the material that will be covered during the course as well as a tentative schedule. During the latter part of the course, we will cover VR and AR technologies and provide hands-on experience in class. It is therefore recommended that you bring your laptop to class.

Session	Topic	Reading	Comments
01. Jan 08th	Introduction to the course	Syllabus Ch.1	
02. Jan 10th	Overview of multimedia	Ch. 2	
03. Jan 15th	Digitization (sampling)	Ch. 6.1	Assignment 1 out
04. Jan 17th	Digitization (quantization)	Ch. 6.3	
05. Jan 22nd	Images	Ch. 3	
06. Jan 24th	Image sampling	Ch. 3	
07. Jan 29th	Fundamental Concepts in Video	Ch.	Assignment 1 due Assignment 2 out
08. Jan 31st	Data Compression (Lossless)	Ch.	
09. Feb 05th	Data Compression (Lossy)	Ch.	
10. Feb 07th	Image Compression Standards	Ch.	
11. Feb 12th	Assignment #1 solution	Ch.	
12. Feb 14th	<b>QUIZ #1</b>		
13. Feb 19th	Video Compression Techniques	Ch.	Assignment 2 due Assignment 3 out
14. Feb 21st	Video Coding Standards	Ch.	
15. Mar 05th	Audio Compression Techniques	Ch.	
16. Mar 07th	Assignment #2 solution	Ch.	Project out
17. Mar 12th	Developing Virtual Environments	Ch.	Assignment 3 due
18. Mar 14th	Introduction to Virtual Reality (VR)	Ch.	
19. Mar 19th	Interaction/Navigation Techniques in VR	Ch.	
20. Mar 21st	Mobile VR	Ch.	
21. Mar 26th	Assignment #3 solution	Ch.	
22. Mar 28th	Introduction to Augmented Reality (AR)	Ch.	
23. Apr 02nd	Interaction Techniques in AR	Ch.	
24. Apr 04th	<b>QUIZ #2</b>		
25. Apr 09th	Project Presentations	Ch.	Project due
26. Apr 11th	Project Presentations	Ch.	