

CMPT 468/768: Computer Music Theory and Sound Synthesis Fall 2011

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Course Information

Meeting Time and Place

Meeting Dates: 2011/9/6 - 2011/12/5

	Time	Location (Harbour Centre)	Section
Lecture:	MoWeFr 12:30PM -1:20PM	SUR5080	All
Midterm Exam	Oct. 31 (Week 9)	SUR5080	All
Final Exam:	Fri Dec. 9, 12:00PM - 3:00PM	TBA	All
Office hours:	After lecture or by appointment	TBA	All

Course Description

This course introduces the fundamentals of digital audio, computer music, basic sound synthesis algorithms and digital audio effects and processing. Understanding of theoretical concepts will be consolidated through practical programming assignments in Matlab (3 credits).

Prerequisites

MATH 152 and one of CMPT 125, 126 or 128 (or permission of instructor).

Topics

- Concepts of Sound and Digital Audio
- Sampling and Quantization

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- Sound Synthesis
 - Spectrum Analysis
 - Frequency and Amplitude Modulation
 - Digital Filters
 - Convolution
 - Sound Processing and Effects
 - Physical Modelling (a brief introduction time permitting)

Grading

- Midterm 15%
- Assignments 30%
- Project 20%
- Final Exam 30%
- Participation 5%

Required Textbooks

- Charles Dodge and Thomas A. Jerse. Computer Music: Synthesis, Composition, and Performance, 2nd Edition, Wadsworth Publishing, 1997.
- CMPT 468 course on-line notes

Reference

- DSP First: A Multimedia Approach, J.H. McClellan, R.W.Schafer and M.A. Yoder, Prentice Hall, 1998, 9780132431712
- A Digital Signal Processing Primer, Ken Steiglitz, Addison Wesley, 1996, 9780805316841
- The Computer Music Tutorial, Curtis Roads, MIT Press, 1996, 9780262680820
- Elements of Computer Music, F. Richard Moore, PTR Prentice Hall, 1990, 9780132525527
- Real Sound Synthesis for Interactive Applications, Perry R. Cook, A K Peters Ltd, 2002, 9781568811680

Schedule and Online Lecture Notes

- Week 1:
 - Course Overview
 - Lecture 0: Introduction to Computer Music with Audio and Music Demonstrations
 - Lecture 1: Fundamentals of Acoustics and Sound
 - Lecture 2: Sinusoids
- Week 2:
 - Lecture 3: Digital Audio
 - Lecture 4: Additive Synthesis
 - Matlab Tutorial 1
 - Matlab Tutorial 2
- Week 3:
 - Lecture 5: Complex Exponentials and Spectral Representation
 - Matlab Tutorial 3
- Week 4:
 - Lecture 6: Amplitude Modulation
 - DFT Review
 - Continuation of Matlab Tutorial 3
 - Lecture 7: Frequency Modulation
- Week 5:
 - Frequency Modulation cont. (Lecture 8)
 - classexample.m
- Week 6:
 - Waveshaping Synthesis
- Week 7:
 - Subtractive Synthesis
- Week 8:

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- Delay Effects (flanging, phasing, chorus)
 - * topo1.m (Shroeder's Reverb seen in class)
 - * comb.m
 - * allpass.m
 - Week 9:
 - Physical Modeling Synthesis (a brief introduction)
 - Week 11:
 - Localization
 - * stereoLocal.m (stereo localization example)
 - Psychoacoustics
 - Week 12:
 - Student projects
 - Week 13: Student presentations
 - Week 14: Review review2011

Assignments

- Week 1:
 - Read Chapter 1 of *Computer Music*.
 - Go through Matlab Tutorial 1 and Matlab Tutorial 2
- Week 2:
 - Read Chapter 2 of *Computer Music*.
 - Assignment 1 (PDF or PS) due 21 September, 2011.
- Week 3:
 - Read Chapter 3 of *Computer Music*
- Week 4:
 - Read Chapter 4 of *Computer Music*
 - Go through Matlab Tutorial 3
 - Assignment 2 (PDF or PS) due 7 October 2011.

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- * BbClar_ff_D3.wav
 - * Trumpet_novib_pp_C4.wav.
 - Here are some student results (as played in class):
 - * Anthony Prechtl: clarinet.wav clarinet.m trumpet.wav trumpet.m
 - * Hsuan Yu Wang clarinet.wav clarinet.m trumpet.wav trumpet.m
 - * Rodrick Yu clarinet.wav clarinet.m trumpet.wav trumpet.m
 - * Marjan Rouhipour clarinet.wav clarinet.m
 - Week 5:
 - Read Chapter 5 (Synthesis Using Distortion Techniques) of *Computer Music*.
 - Week 6:
 - Assignment 3 (PDF or PS) due 21 October 2011.
 - Week 7:
 - Continue reading Chapter 5 (Synthesis Using Distortion Techniques) of *Computer Music*.
 - Week 8:
 - Assignment 4 (PDF or PS) due 4 November 2011.
 - Week 9:
 - Midterm (Monday, Oct. 31 2011).
 - Week 10:
 - Week 11:
 - work on projects
 - Assignment 5 (PDF or PS) due 25 November, 2011.
 - source.wav
 - ir.wav
 - flange.m
 - flangeCircDL.m (circular delay line implementation)
 - Week 12:
 - work on projects
 - Week 13:

– work on projects

- Week 14:

- project presentations

Projects

- Please find the final project HTML template [here](#).