The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
UNIVERSITY OF TORONTO

FACULTY OF APPLIED SCIENCE & ENGINEERING

ECE 1529 Adaptive Systems for Signal Processing & Communications
FALL 2012
Course outline

Instructor

Kostas Plataniotis
Bahen, 40 St George Str., Room 4140
Tel: 416 946 5605, E-mail: kostas@comm.utoronto.ca

Overview: This course presents an introduction to principles, advance topics, and applications of adaptive and learning systems theories. Topics covered include: Bayesian decision theory, detection and classification, supervised learning, clustering and unsupervised learning, state-space modeling, statistical estimation, and non-parametric learning techniques. The application focus will be on brain-computer interfaces. The course will demonstrate the application of adaptive learning techniques in this emerging field.

Text: No specific text will be assigned. Class Notes and lecture handouts have been posted online (see ECE1529 blackboard web page).

Recommended references:

- **Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, (2nd Edition), Wiley, N.Y., October 2000, ISBN 0-471-05669-3, Chapters 2-5, 10.**
- **James V. Candy, Model-based Signal Processing, Wiley, N.Y., 2005, ISBN 978-0-471-23632-0, Chapters 4&5.**
- **Shanbao Tong, N.T. Thakor (Eds), Quantitative EEG Analysis, Methods, and Clinical Applications, Artech House, 2009, ISBN 978-1-59693-204-3, Chapters 2-4.**

Place & Time: Location TBD, Thursday 4.00 pm – 7.00 pm
(Starting Thursday, September 13, 2012)

Office hours: By appointment

ECE1512: Composition of the Final Mark

Final Examination: 40% --- In class examination. The final examination will be closed-book, but you will be allowed "a cheat sheet" (or handwritten notes).
Project: 60% (attendance and "in class" presentation: 30%, final report: 30%) --- A project will be assigned or chosen by October 25, 2012. Students are expected to make a presentation on their approach and methodology in addressing the project tasks, during the last two lectures. Interactive discussion and feedback from the class is expected. Final project reports are due Thursday, December 13, 2012.

Tentative Course plan

September 13: Lecture 1
Bayesian decision theory.

September 20: Lecture 2
Maximum likelihood detection & estimation.

September 27: Lecture 3
Innovations representation & Bayesian estimation.

October 4: Lecture 4 (class to meet during the week of Monday Sept 24)
Non-parametric learning.

October 11: Lecture 5
Feature extraction & dimensionality reduction.

October 18: Lecture 6
Supervised classification.

October 25: Lecture 7
Unsupervised learning.

November 1: Lecture 8 (class to meet during the week of Monday Oct 22)
Application : Basics of brain-computer communication – preprocessing.

November 8: Lecture 9 (shelf study)
Discussion of Course Projects.

November 15: Lecture 10
Application: Basics of brain-computer communication – feature extraction.

November 22: Lecture 11
Application: Basics of brain-computer communication - classification.

November 29: Lecture 12
Presentation of Course Projects.

December 6: Lecture 13
Presentation of Course Projects.

December 13: Lecture 14
ECE1529 Final Examination.

Attendance: Attendance is important on project critique days and on final project presentation days. Attendance on these lecturing sessions will contribute 10% to your final grade.

Feedback: The instructor welcomes your comments on the course at any time. Please use the "course tools" section of the web page to provide feedback. Feel free to send comments -- in the past, the instructor has obtained helpful remarks that allow him to make improvements mid-course. The ECE Department and the COMM group want to maximize the value of this course for everyone and welcome your input, positive or negative. A formal evaluation of the course will be performed in early December.