

Concordia University
Electrical and Computer Engineering
COEN 7311: Protocol Design and Validation
Winter 2012
Room: MB S2.401

Fridays: 17:45- 20:15

Instructor

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Office hours: Fridays: 13:00 to 15:00

Objectives

Engineering communications protocols using formal methods

By the end of the term the student should be able to understand

- Communication Protocol basics
- Foundations of formal description techniques (SDL, LOTOS and **Promela**) used for the precise description of communication protocols
- Communication protocols design techniques
- Techniques for the validation/verification of communication protocols
- Communication protocol refinement techniques and implementation
- Techniques for testing communication protocol implementations

Prerequisites

- (COEN 6311 and ELEC 6851) or (COMP 5541 and COMP 6461)
- Knowledge of ISO 7 layers architecture and concepts such as service, protocols, interfaces etc. and protocols basic concepts such as flow control, error control, multiplexing, etc. is very important.

Detailed Course Outline

The following topics will be covered:

- ISO Reference Model - Overview of the 7 layers
- Service Architecture vs. Protocol Architecture
- ISO Transport Service and Protocols: Review of Basic features such as flow control, error control, multiplexing, etc.
- Real-time aspects in communication protocols
- Overview of (Protocol) Formal Description Techniques: SDL, LOTOS and **Promela**
- Semantic models: Labelled Transition Systems, (Extended) Finite State Machines

- Communication protocols general properties: absence of deadlock, unspecified receptions, livelock, etc.
- Liveness and Safeness properties
- Protocol verification techniques and tools: reachability analysis, partial techniques
- Behaviors comparison: preorders and equivalences
- Communication protocol simulation
- Refinement and protocol synthesis techniques
- Protocol implementation
- Conformance testing:
 - ✓ Definitions
 - ✓ Test cases generation methods
 - ✓ Test cases description (TTCN)
 - ✓ Protocol test architectures and test cases application

Reference Book

Gerard J. Holzmann “Design and Validation of Computer Protocols”, Prentice Hall, 1991, 512 pages. ISBN 0-13-539925-4 hardcover (USA), ISBN 0-13-539834-7 paperback (international edition). An updated version is available online for US\$10. Go to <http://spinroot.com/gerard/popd.html> to download it.

Evaluation Scheme

The course grade is based on a clear pass in each of:

Project on communication protocol modeling and validation or Survey Report to do in teams of two students counts for 30%

Quizzes : Two quizzes are scheduled

- ✓ Quiz #1: counts for **30%** [scheduled for Friday March 2d]
- ✓ Quiz #2: counts for **40%** [scheduled for Friday March 30th]

Course Web page

There is a web page: <http://users.encs.concordia.ca/~dssouli/teaching.html> for the course. Lecture notes, exam samples, announcements and interesting links will be posted on this page.

Note: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.