ECE 673 / SYST 620 Discrete Event Systems (3.0:3)
Prerequisites: ECE 521 or SYST 611 or equivalent

Introduction to modeling and analysis of discrete event dynamical systems. Course covers elements of discrete mathematics and then focuses on Petri Net models and their basic properties: locality and concurrency. Condition/event systems; Place/transition nets; Colored Petri nets; Reachability graphs (Occurrence nets); and Invariant Analysis. Temporal issues in Petri nets and Temporal Logic. Stochastic Petri nets. Relation to other discrete event models of dynamical systems. Applications of the theory to modeling and simulation and to systems engineering problems

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Guest Instructor: Prof. Alexander H. Levis Ph: 703 993 1619 alevis@gmu.edu

Fall 2011: Tuesday 4:30 – 7:10 PM
Office Hours: Tuesday 3:00 – 4:30 PM and by appointment

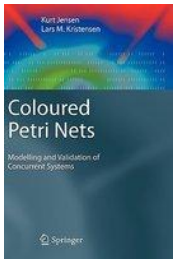
Hardware/Software Requirements:
A major part of this course requires students to implement Colored Petri Net models using an application called *CPNTools*. The installer for *CPNTools* (*Windows*) is available at http://cpntools.org/download for download. *CPNTools* is available for *Windows* and *Linux* operating systems. Students are required to have the software ready for use on their individual computers before the second week of the classes.

For more information on the software, visit: http://cpntools.org

NOTE: Most of the class sessions will consist of a lecture and a workshop session. The lecture will present the theory and application of Discrete Event Systems while the workshop session will focus on the software application CPN Tools. There will be tutorials, demonstrations, and practice sessions. Students should bring their laptops to class.

Reading and reference material (available via Blackboard):

1) **Text:** Kurt Jensen and Lars Kristensen, *Coloured Petri Nets: Modelling And Validation of Concurrent Systems,* Springer, Berlin



2) Class notes by A. H. Levis and A. K. Zaidi
3) Supplementary Readings: A set of papers and books on Petri Nets and CPN Tools

Student Evaluation Criteria: Homework 50%; Midterm 25%; Final 25%

COURSE OUTLINE (subject to minor changes)

	Lecture Topics	**Workshop Topic**
08/30/2011	1. Systems and Models; Graph Theory; Petri Net Basics	CPN Tools Preliminaries
09/06/2011	2. Set Theory; Essential Features of Petri Nets	Tutorial: CPN Tools I
09/13/2011	3. Symbolic Logic; Petri Net models and Definitions	Tutorial: CPN Tools II
09/20/2011	4. Colored Petri Nets	Tutorial: CPN Tools III
09/27/2011	5. PN properties	ML programming I
10/04/2011	6. Formal Definition of CPN	ML programming II
10/11/2011	*No Class*	
10/18/2011	**7. Midterm Exam**	
10/25/2011	8. Petri Nets and Time	ML programming III
11/01/2011	9. Timed CPN; Hierarchical Petri Nets	
11/08/2011	10. State Space Analysis	Tutorial: State Space analysis tools
11/15/2011	11. Structural Methods and Invariants	Tutorial: The Farkas Algorithm
11/22/2011	12. Stochastic Petri Nets	Tutorial: Simulation based analysis
11/29/2011	13. Engineering applications of Petri Nets	
12/06/2011	14. Review	
12/13/2011	**15. Final Exam**	