

ECE 673 / SYST 620 Discrete Event Systems (3.0:3)

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 such as locality and concurrency. Topics include Condition/event systems; Place/transition nets; Colored Petri nets; Reachability graphs (Occurrence nets); State Space analysis and Invariant analysis, Temporal and stochastic time issues in Petri nets. Stochastic Petri nets. Applications of the theory to modeling and simulation, executable models of architectures, and to systems engineering problems

Instructor: Prof. Abbas K. Zaidi
SEOR, Nguyen Engineering Building
Ph: 703 993 1774
szaidi2@gmu.edu

Fall 2014: Wednesdays 7:20 –10:00 PM
Room 2608 Nguyen Eng. Building & On-line via Blackboard Collaborate (<http://mymason.gmu.edu>)

Office Hours:

Mondays 5:30 – 6:30 PM
Wednesdays 5:30 – 7:20 PM
and by appointment (via email)

Hardware/Software Requirements:

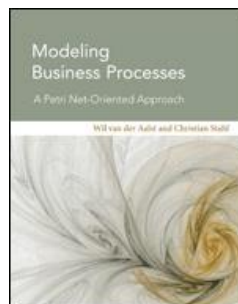
A major part of this course requires students to implement Colored Petri Net models using an application called *CPN Tools*. The installer for *CPN Tools* is available for download at <http://cpntools.org/download>. *CPN Tools* is available for *Windows (XP, Vista, Windows 7/8, 32/64 bit versions)* and *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 the class.**

Reading and Reference Material

- 1) **Text:** Modeling Business Processes – A Petri Net-Oriented Approach
W.M.P. van der Aalst and C. Stahl,
The MIT Press, 2011
(ISBN-13: 978-0-262-01538-7)



- 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 made available via MyMason.gmu.edu

COURSE OUTLINE
(Tentative)

Date	Lecture Topic(s)	Workshop Topic
27-Aug	1. Systems and Models; Graph Theory; Petri Net Basics	CPN Tools Preliminaries
3-Sep	2. Essential Features of Petri Nets	Tutorial: CPN Tools I
10-Sep	3. Symbolic Logic; Petri Net Models and Definitions	Tutorial: CPN Tools II
17-Sep	4. Colored Petri Nets	Tutorial: CPN Tools III
24-Sep	5. PN Properties	ML programming I
1-Oct	6. Formal Definition of Colored Petri Nets (CPN)	ML programming II
8-Oct	7. Midterm Exam	
15-Oct	8. Petri Nets with Time	Tutorial: Time in CPN Tools
22-Oct	9. Timed CPN; Hierarchical Petri Nets	Tutorial: Creating Hierarchies
29-Oct	10. State Space Analysis	Tutorial: State Space Analysis
5-Nov	11. Structural Methods and Invariants	Tutorial: The Farkas Algorithm
12-Nov	12. Stochastic Petri Nets	Tutorial: Simulation Based Analyses I
19-Nov	13. Monitors	Tutorial: Simulation Based Analyses II
26-Nov	<i>No Class (Thanksgiving Recess)</i>	
3-Dec	14. Review & Engineering Applications of Petri Nets	Demonstration of Models
10-Dec	15. Final Exam/Project	

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

The following scale can be used by students for self-assessment. The instructor may decide to relax/change it a little for final grade assignment.

94-100	A
88-93	A-
83-87	B+
77-82	B
70-76	B-

Academic Integrity

GMU is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Disabilities Statement

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474; <http://ods.gmu.edu>) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Mason Diversity Statement

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.

Student Support Resources on Campus

Resources that you may find helpful may be found at:

<http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/>