SYST 620 / ECE 673
DISCRETE EVENT SYSTEMS

Fall 2017

Department of Systems Engineering and Operations Research
George Mason University

This course is designed as a broad introduction to modeling and analysis of discrete event dynamical systems. Discrete event systems (DES) are introduced as a class of dynamic systems. A review of concepts from Discrete Mathematics, that are relevant for DES modeling, is done to prepare students for more in-depth study of DESs. This review includes a short introduction to topics in Graph Theory and then illustrates how these are used within dynamic systems modeling.

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

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szaidi2@gmu.edu
Office Hours: Monday and Wednesday 5:00 – 7:00 PM and by appointment via phone/email (preferred)

Class Information:

When: August 28 – December 20, Fall 2017

Where: All course communication will be done via the Blackboard system. Students are expected to have access and be able to use the system before classes start. Blackboard is accessible via MyMason portal at https://mymasonportal.gmu.edu/. Instructions for using the Blackboard system are provided on the Help button at the top right of the portal page.

Learning Objectives & Outcomes

The ability to effectively apply the concepts of discrete event systems modeling and analysis on real life systems by identifying the appropriate modeling abstraction for the system under study, formulating the analysis questions of interest, selecting the suitable analysis method for the study, and employing the state-of-the-art software tools/techniques to carry out the tasks.

By completing this course a student should be able:

- To classify a given system as a discrete event system
- To identify a suitable abstraction for modeling the system
- To model the system using Colored Petri Nets at the desired level of abstraction with temporal and stochastic issues addressed in the model (where applicable).
- To execute the model in simulation
- To analyze the structural and behavioral properties of the model

Student Evaluation Criteria: Homework 50%, Midterm 25%, Project 25%

The following scale can be used by students for self-assessment. The instructor may relax the grading scheme for final grade assignment.

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

Attendance and Participation Requirements

There are no specific attendance and participation requirements, other than the following:

- Midterm Examination on October 18, 2017, from 7:20 pm to 10:00 pm. There will be a live Collaborate session running during the examination. This live session is optional and can be used by students who may like to interact with the instructor during the examination.
- Final Project Presentations on December 06 and 13, 2017, from 7:30 pm to 10:30 pm. It is compulsory for all students to participate in this session.

Other Course Policies

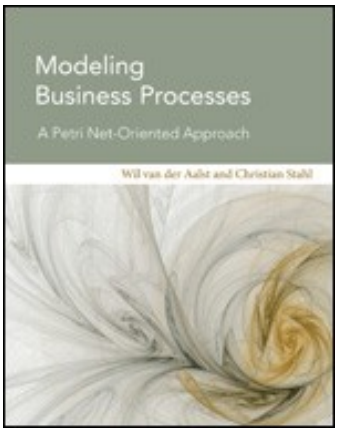
- There are no provisions for late submission of work and/or make-up examinations.
- In case of an emergency that prevents a student from submitting required work before the deadlines or taking an examination, the student must inform the instructor at the earliest via email or telephone. Such situations will be addressed on a case by case basis. (Instructor's contact information)
- No points will be awarded if homework is turned in after solutions have been posted.
- Religious observances are one common example of events that might impact students' activities. Students are responsible for planning ahead. Please, refer to the GMU's calendar of religious holidays.
- All academic policies as given in the Honor System and code will be strictly followed.
- The GMU's student privacy policy is in place for this course.
- All general policies defined in the University Catalog are in place for this course.
- George Mason University is an Honor Code university. See the Office of Academic Integrity website for a full description of the honor code and the honor committee process (http://oai.gmu.edu/the-mason-honor-code-2/).

Relevant Student Services at GMU

1. Distance Education Resources at GMU Library
2. Writing Center
3. Counseling & Psychological Services

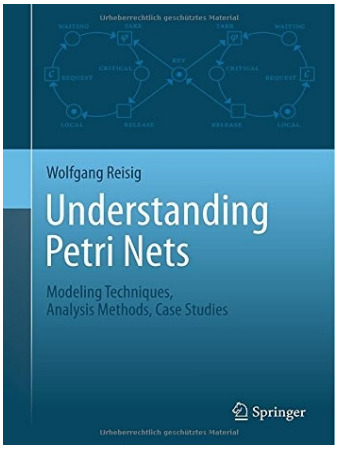
Reading and Reference Materials

A. Required 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)

B. Recommended Text



Understanding Petri Nets: Modeling Techniques, Analysis Methods, Case Studies
Wolfgang Reisig
Springer; 2013 edition
(ISBN-13: 978-3642332777)

Recommended as a reference handbook

C. Additional Materials

Handouts/Lecture notes and all supplementary material are included in each weekly module.

Technology Requirements

The technology requirements for this online course are listed below:

Hardware

You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and to a fast, reliable broadband Internet connection (e.g., cable, DSL). For optimum visibility of course material, the recommended computer monitor and laptop screen size is 13-inches or larger. You will need computer speakers or headphones to listen to recorded content. A headset microphone is recommended for live audio sessions using course tools like Blackboard Collaborate. For the amount of computer hard disk space required to take an online course, consider and allow for the space needed to: 1) install the required and recommended software and, 2) save your course assignments.

For hardware and software purchases, visit Patriot Computers.

Technical Help for Blackboard & Online Tools

- For Supported Web browsers (see Blackboard Support)
- Log into Blackboard Courses (use http://mymason.gmu.edu, select the Courses Tab)
- Frequently Asked Questions (see Blackboard Student Support)
- For all technical issues regarding Blackboard, see Courses Support, Blackboard Help, and Blackboard Tutorials.
- Adobe Acrobat Reader (free download)
- Flash Player (free download)
- For technical questions regarding computer networking, see IT Services for Students. If you still have questions, email support@gmu.edu or call (703) 993-8870.

Other Software Requirements

A part of this course requires students to implement dynamic models using some software. These software will be introduced in-class and information to download them will be provided via Blackboard. Students are required to have the software ready for use on their individual computers for the homework assignments.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

Blackboard Collaborate *(for live online sessions)***:**

The project presentation will take place on Blackboard Collaborate, a synchronous videoconferencing platform. In addition, I will make a Collaborate Session available to each project group for their use during the semester. Login in to mymason.gmu.edu with your Mason NetID and password. Select the Courses Tab. Choose the course SYST 620 / ECE 673 (Fall 2017). Click on Collaborate on the left menu. Under Blackboard Collaborate. Click on the Collaborate Image to be redirect to your Collaborate 

Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. The IT Support Center can be found online here.

Navigate to the Student Support page on your MyMason page and select the Courses Tab:

Click on the link as shown in picture.

In the menu bar to the left you will find Blackboard Collaborate; you need to become familiar with Blackboard Collaborate for this course. Make sure you run a system check a few days before videoconference day. To do this, click on Bb Collaborate and a dropdown menu will appear. Become familiar with the attributes of Collaborate and online learning.

Weekly Schedule (subject to change as course progresses)

- The following table gives an overview of the entire course with important dates for examinations and presentations highlighted.
- A student needs to follow the links to the weekly modules to access all the course material including instructional videos, lecture notes, reading material, and assignments.
- The assignment submission must be done in the 'Assignment' Section in each weekly module before the deadline.

COURSE OUTLINE

Week	Lecture Topic(s)	Workshop Topic
Aug 28 - Sep 03	Introduction & Review of Concepts	
Sep 04 - Sep 10	Petri Net Basics	CPN Tools Tutorial I
Sep 11 - Sep 17	Petri Net Classes & Definitions	CPN Tools Tutorial II
Sep 18 - Sep 24	Towards Colored Petri Nets	CPN Tools Tutorial III
Sep 25 - Oct 01	A Detailed Colored Petri Net Model	
Oct 02 - Oct 08	Petri Nets with Time	CPN Tools Tutorial IV
Oct 09 - Oct 15	Formal Definition & CPN ML	
Oct 18	**Midterm Exam**	
Oct 23 - Oct 29	Hierarchical Petri Nets	CPN Tools Tutorial V
Oct 30 - Nov 05	Behavioral Properties of Petri Nets	CPN Tools Tutorial VI
Nov 06 - Nov 12	State Space Analysis	CPN Tools Tutorial VII
Nov 13 - Nov 19	Stochastic Time & Simulation Based Analysis	CPN Tools Tutorial VIII
Nov 20 - Nov 26	***No Class (Thanksgiving Recess)***	
Nov 27 - Dec 03	Structural Methods	
Dec 06	**Student Project Presentations**	
Dec 13	**Student Project Presentations**	

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/