

# OEM Program - ESI 6346: Decision Making Under Uncertainty (Spring 2019)

## COURSE SYLLABUS

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<b>Teaching Assistant</b>	Seonho Park Email: <a href="mailto:seonhopark@ufl.edu">seonhopark@ufl.edu</a>
<b>Text:</b>	<p><i>Introduction to Modeling and Analysis of Stochastic Systems</i>, 2<sup>nd</sup> edition, by V.G. Kulkarni, published by Springer (2011).</p> <p>This book is available electronically through UF Libraries at: <a href="https://link.springer.com/book/10.1007%2F978-1-4419-1772-0">https://link.springer.com/book/10.1007%2F978-1-4419-1772-0</a></p> <p>It is easily accessible from the ufl.edu domain. For off-campus access, visit: <a href="http://cms.uflib.ufl.edu/offcampus">http://cms.uflib.ufl.edu/offcampus</a></p> <p>This link will point out two connecting options, one of which being through VPN (see details at end of this document.)</p>
<b>Lecture Notes</b>	Lecture notes/slides will be posted on Canvas
<b>Software</b>	<p>We will make use of both Excel and MATLAB.</p> <p>A MATLAB-based software is available from the author's website at <a href="http://www.unc.edu/~vkulkarn/Maxim/maxingui.zip">www.unc.edu/~vkulkarn/Maxim/maxingui.zip</a> .</p> <p>MATLAB is freely available to UF students through UF apps at: <a href="https://info.apps.ufl.edu/">https://info.apps.ufl.edu/</a></p> <p>MATLAB is easy to learn. Students who need a basic introduction can find it on the website of the MATLAB developer (Mathworks) at: <a href="https://www.mathworks.com/support/learn-with-matlab-tutorials.html">https://www.mathworks.com/support/learn-with-matlab-tutorials.html</a></p>
<b>Contact Information</b>	Farid AitSahlia Office: Stuzin Hall 301F Phone: (352) 392-5058 E-mail: <a href="mailto:farid.aitsahlia@warrington.ufl.edu">farid.aitsahlia@warrington.ufl.edu</a> OR <a href="mailto:farid1@ufl.edu">farid1@ufl.edu</a> Office Hours: By appointment

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## Course Description

This course introduces techniques that model the random evolution of systems over time. They are known as stochastic processes. The emphasis of this course is on application and analysis. Illustrations will be shown in domains such as telecommunications, inventory and production planning, manpower planning, machine reliability, meteorology, and finance. The textbook we will follow can be viewed as consisting of two concurrent strands, one mathematically formal (e.g., complete proofs of fundamental formulas) and the other focused on applications. We will make use almost exclusively of the latter and will further focus on computational implementation and case analysis.

The last topic for this course (see outline below) is mostly focused on decision trees, which are not covered in the textbook. As a result, I will post on Canvas related lecture notes and Excel spreadsheets that will emphasize practical applications.

## Assessment and Course Grade

Course grade will be calculated using the following weights:

Assignments	30	Individual/Group
Mid-term exam	30	Individual
Final Exam	40	During last day of class (individual)

Final course grades will be based on the following numeric scale indicating the number of total points needed to achieve each letter grade

Minimum Points	Course Grade
920	A
880	A-
840	B+
800	B
760	B-
720	C+
680	C
640	C-
600	D+
560	D
<500	D- to F

## Note UF grading policy and GPA

A = 4.0; A- = 3.67; B+ = 3.33; B = 3.0; B- = 2.67; C+ = 2.33; C = 2.0, C- = 1.67; D+ = 1.67; D = 1.0; D- = 0.67

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## Assignments

End-of-chapter problems will be assigned between the monthly meetings.

## Final Exam

The final exam will be cumulative. It will consist of numerical and qualitative conceptual questions. The questions will be very similar to the examples discussed in class and end-of-chapter problems. Students will be allowed the use of a calculator, including Excel, and a “cheat sheet.” No internet nor any other communications means will be allowed.

## Course Outline (tentative)

- **December 2, 2018: Probability concepts**

- Sample space
- Events and their probabilities
- Conditional probability
- Bayes rule
- Independence
- Common discrete and continuous random variables
- Expected value, variance and other moments
- Multivariate and marginal distributions

- **January 12, 2019: Discrete-Time Markov Chains (DTMCs)**

- Definition and examples
- Transition probability matrix
- Chapman--Kolmogorov equation
- Occupancy times
- Steady-state distributions
- Irreducible DTMCs
- Periodicity
- Cost models:
  - ✓ Expected total cost over a finite horizon
  - ✓ Long-run expected cost per unit time
- First passage times
- Case study: Credit card company

- **January 13, 2019: Poisson processes**

- The exponential distribution
- The Poisson random variable
- Superposition
- Thinning
- Compound Poisson processes

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- **February 9-10, 2019**

- Mid-term exam
- Computational lab session
- Simulation with Arena

- **March 16, 2019: Queueing theory**

- Queueing systems examples
- Single station queues
- Little's Law
- Networks of queues: Jackson Networks
- Case study: Health care facility

- **March 17, 2019: Decision Making under Uncertainty**

- Decision criteria
- The role of risk aversion
- Utility theory
- Single-stage decision problems
- Multi-stage decision trees
- Valuing the option to wait to decide

- **April 13, 2019: Final exam**

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## **The following is from the University of Florida *Code of Student Conduct*:**

*The academic community of students and faculty at the University of Florida strives to develop, sustain and protect an environment of honesty, trust and respect. Students are expected to pursue knowledge with integrity. Exhibiting honesty in academic pursuits and reporting violations of the Academic Honesty Guidelines will encourage others to act with integrity. Violations of the Academic Honesty Guidelines shall result in judicial action and a student being subject to the sanctions in paragraph XI of the Student Conduct Code. The conduct set forth hereinafter constitutes a violation of the Academic Honesty Guidelines (University of Florida Rule 6C1-4.017).*

### ***Cheating***

*The improper taking or tendering of any information or material which shall be used to determine academic credit. Taking of information includes, but is not limited to, copying graded homework assignments from another student; working together with another individual(s) on a take-home test or homework when not specifically permitted by the teacher; looking or attempting to look at another student's paper during an examination; looking or attempting to look at text or notes during an examination when not permitted. The tendering of information includes, but is not limited to, giving of your work to another student to be used or copied; giving someone answers to exam questions either when the exam is being given or after taking an exam; giving or selling a term paper or other written materials to another student; sharing information on a graded assignment*

### **Plagiarism**

*The attempt to represent the work of another as the product of one's own thought, whether the work is published or unpublished, or simply the work of a fellow student. Plagiarism includes, but is not limited to, quoting oral or written materials without citation on an exam, term paper, homework, or other written materials or oral presentations for an academic requirement; submitting a paper which was purchased from a term paper service as your own work; submitting anyone else's paper as your own work.*

### **So that there is no confusion, here are my expectations**

1. Students are encouraged to work with their classmates, whether to study or collaborate on assignments. Should you work with others on a given assignment, you should mention it when you submit it (this will have no adverse effect on your grade.)
2. Plagiarism, as defined above, is not acceptable.

### **Access to Library Resources**

As a student at the University of Florida, you have free access to many of the online services that usually require a subscription. However, you will either need to access these services through a Library-related computer, or go through a "Proxy Server" using your

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GatorLink account username and password. To access the online Business Library section of the Smathers Library, go to

<http://www.uflib.ufl.edu/cm/business/>

On the right of the top line, click on Remote Logon. This will take you to a page that allows you to connect to on-campus services using the Library Proxy Server:

<http://www.uflib.ufl.edu/ufproxy.html>

At the bottom right of the screen, fill in your GatorLink Account Username and Password, and then click Login. This will take you back to the Smathers' Library page, but using the Proxy Server:

<http://www.uflib.ufl.edu.lp.hscl.ufl.edu/ufproxysuccess.html>

In the middle of the page you will see "Start". Go to the dropdown menu under "Or..." and choose "Business (Online)". This will take you back to the online Business Library, but through the Proxy Server:

<http://www.uflib.ufl.edu.lp.hscl.ufl.edu/cm/business/>

You could also click on "UF Libraries' Home Page", then "Libraries & Collections" under "About the Libraries", and then "Business Reference" under "Smathers Library (East)".

## **USING VPN**

The UF VPN Service is designed to allow University Faculty, Staff, and Students to securely "tunnel" into campus over other networks, such as their home internet connection, and access services as if they were on campus. It is ideal for using the Business Library and UF Libraries resources from off-campus. If you are reading journal articles and searching library databases from home you'll want to install the VPN.

### **Install & configure the VPN**

1. Make sure you have a [Gatorlink account](#).
2. [Download the VPN software](#) for your computer's operating system
3. Follow the instructions to install and configure the VPN
  - [Windows 98/ME/NT/2000/XP/Vista \(including firewall guide\)](#)
  - [Linux Kernel 2.2-2.6](#)
  - [Macintosh OS 10.1-10.4](#)
  - [Macintosh OS 8/9](#)
  - [Palm/PocketPC](#)

### **Using the VPN & Business Library resources**

1. Log in to the UF VPN with your [Gatorlink account](#).
2. Go to the [Business Library Home Page](#) and use all the libraries resources (including databases and online journals) as if you were on campus