**Course and Contact Information:**

Course: EMSE 3760.10 – EMSE 6760.10 - Discrete Systems Simulation

Semester: **FALL 2024** # of Credit Hours: 3.0

Meeting Time: Mondays from 12:45pm to 3:15PM

Location: Tompkins 405 (in person)

**Instructor:**

Name: J. René van Dorp, Professor Phone: 202-994-6638

Campus Address: 800 22nd Street, Office 2800, Washington DC 20052

E-mail: dorpjr@gmail.com

Office hours: Wednesdays 1:00PM to 4:00PM - by appointment via link on my faculty-page.

**Course Description:**

An introduction will be provided to the application and theoretical background of systems simulation. Topics include modeling systems dynamics using discrete events, the modeling of service systems through simulation. Theoretical topics include random variable generation, model verification and validation, statistical analysis of output. Simple simulation problems will be introduced using Microsoft Excel. A high-level simulation package SIMIO will be utilized for more complex simulation problems.

**Total of 112.5 Student Engagement Hours are divided over:** 2.5 hours of **in person** class instruction + two exams over 15 weeks. Homework and reading assignment is estimated at a minimum of 4.5 hours per week over 13 weeks of class preparation. Studying/preparing for each exam is estimated at a minimum of 8 hours per each exam (Midterm Exam + Final Exam). Each exam is a 2 and a half hour long exam. **Total estimated minimum student engagement: 112.5 hours.**

**Prerequisite Requirement:**

APSC 3115 Engineering Analysis III

**Required Text:**

"Simio and Simulation, Modeling, Analysis, Applications" 6th Edition by

W.David Kelton, Jeffrey S. Smith and David T. Sturrock.

https://textbook.simio.com/books/SASMAA6.php

**Required Software:**

MS EXCEL– Available in Tompkins 405.

@RISK – Available in Tompkins 405.

SIMIO – Available in Tompkins 405. A student version of the software is available from:

http://www.simio.com/academics/simio-academic-simulation-products.php

Required Equipment for Virtual Learning: Webcam and Microphone

**Remote Access SEAS Computer Lab:**

https://seascf.seas.gwu.edu/remote-access-labs

**Recommended Text:**

"Discrete Event Simulation" by Banks, Carson and Nelson, Prentice Hall.

https://www.amazon.com/Discrete-Event-System-Simulation-Jerry-Banks/dp/0136062121

**Learning Outcomes:**

As a result of completing this course, students will be able to:

1. Use MS EXCEL to simulate a simple queuing system
2. Model dynamic service systems, e.g. an ATM operation or an Urgent Care Clinic, using the SIMIO simulation software environment
3. Use data to specify probability distributions for the input parameters of the service system
4. Verify a simulation model using known queuing theoretical results.
5. Evaluate systems design scenarios by applying statistical methods on output metrics

**Method of Instruction:**
One hour and 20 minutes **in person** lecture including homework discussion, followed by a 10 minute break. One hour **in person** lecture including breakout session to start with simulation exercises in class. **Students are expected to spend a minimum of 4.5 hours (i.e. 1.5 hours per credit hour) on assigned reading as per the class schedule and homework assignments outside the class-room. Reading assignments will have to be completed before class. Homework will have to be completed and handed-in on Blackboard and as per the assignment schedule on Blackboard.**

**Grading:**
10% - Class Attendance & Participation
20% - Homework
30% - Midterm Exam
40% - Final Exam

**Homework Policy:** For each homework problem a student may be called upon to discuss their solution, so you must be prepared! The rest of the class should be involved in the discussion. Your level of effort will be graded. Not handing in a homework problem will result in **0 points.** Homework problems that are handed in on-time and demonstrating an adequate level of effort will be awarded **1 point** or **more points** depending on the level of effort required to complete a homework assignment and as indicated in the homework set assignment. Partial points can be awarded for homework problems not demonstrating adequate effort. **Homework problems that are handed in late receive 0 points**. You should each prepare electronic files of your homework in case you are called upon to show your work to the rest of the class.

**Reading Assignments:**
Reading will be assigned according to the class schedule in this syllabus.

**Midterm and Final Exam:**

Students will complete an **in-class simulation Midterm Exam using Microsoft Excel + SIMIO** (using a lab computer or the student's laptop) and **an in-class Final Exam using SIMIO.** Students will submit with their Midterm Exam and Final Exam electronic files that will be graded. Theoretical questions will be answered in an exam booklet.

**Grade Feedback:**

I will provide regular feedback on home work and exam grades via a graph and table with the grades. Your percentage grade scores will be posted in Blackboard so you can compare your performance to that of the class overall performance.

**Lecture Notes:**

Electronic copies of the lecture notes can be downloaded from my Faculty web-page at:

http://www.seas.gwu.edu/~dorpjr/EMSE273/Intro.html

## Class Schedule: Subject to change, please check the schedule regularly

| Session | Date | | Class Topic | Reading Assigments | Homework Assignments |
|---|---|---|---|---|---|
| 1 | 8/26/2024 | Monday | Basic Probability Review, Intro to Simulation, Basics of Queuing Theory | Chapter 1, Chapter 2 | Homework Set 1. Max Effort Points: 8 |
| | 9/2/2024 | Monday | NO CLASS - LABOR DAY | | |
| 2 | 9/9/2024 | Monday | Basics of Queuing Theory, Kinds of Simulation, Simple Queue Simulation in Excel | Chapter 2 | Homework Set 2. Max Effort Points: 8 |
| 3 | 9/16/2024 | Monday | Simulating a Simple Queue in MICROSOFT EXCEL | Chapter 3 | Homework Set 3. Max Effort Points: 7 |
| 4 | 9/23/2024 | Monday | SIMIO - ATM Simulation | Chapter 4 | Homework Set 4. Max Effort Points: 7 |
| 5 | 9/30/2024 | Monday | SIMIO - Intermediate Modeling | Chapter 5 | Homework Set 5. Max Effort Points: 7 |
| 6 | 10/7/2024 | Monday | SIMIO - Intermediate Modeling | Chapter 5 | Homework Set 6: Max Effort Points: 10 |
| 7 | 10/14/2024 | Monday | MIDTERM REVIEW, Input Specification | | |
| 8 | 10/21/2024 | Monday | Midterm Exam - in Class (Session 1 - 7 + Handouts and Spreadsheets) | | |
| 9 | 10/28/2024 | Monday | Discuss Midterm Solution, Pseudo Random Number Generation | Chapter 7- BCN, Notes RN Generation | Homework Set 7. Max Effort Points: 6 |
| 10 | 11/4/2024 | Monday | Input Analysis, SIMIO - Modeling an EMERGENCY DEPARTMENT | Chapter 6, Chapter 7 | Homework Set 8. Max Effort Points: 8 |
| 11 | 11/11/2024 | Monday | SIMIO - Modeling an EMERGENCY DEPARTMENT | Chapter 7 | Homework Set 9. Max Effort Points: 8 |
| 12 | 11/18/2024 | Monday | SIMIO - Modeling an EMERGENCY DEPARTMENT | Chapter 7 | Homework Set 10. Max Effort Points: 7 |
| | 11/25/2024 | Monday | NO CLASS - THANKS GIVING BREAK | | |
| 13 | 12/2/2024 | Monday | SIMIO - Animation and Entity Movement | Chapter 8 | Homework Set 11. Max Effort Points: 8 |
| 14 | 12/9/2024 | Monday | SIMIO - Animation and Entity Movement, FINAL REVIEW | Chapter 8 | |
| 15 | 12/16/2024 | Monday | Final Exam - In Class (Sessions, 9 - 14) | | |

**Use of Electronic Course Materials and Class Recordings**

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for non-course related purposes unless express permission has been granted by the instructor. **Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct.** Please contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions. Please contact Disability Support Services if you have questions or need assistance in accessing electronic course materials.

**Academic Integrity Code**

Academic integrity is an essential part of the educational process, and all members of the GW community take these matters very seriously. As the instructor of record for this course, my role is to provide clear expectations and uphold them in all assessments. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, and otherwise violate the Code of Academic Integrity. If you have any questions about whether particular academic practices or resources are permitted, you should ask me for clarification. If you are reported for an academic integrity violation, you should contact Conflict Education and Student Accountability (CESA), formerly known as Student Rights and Responsibilities (SRR), to learn more about your rights and options in the process. Consequences can range from failure of assignment to expulsion from the University and may include a transcript notation. For more information, refer to the CESA website at students.gwu.edu/code-academic-integrity or contact CESA by email cesa@gwu.edu or phone 202-994-6757.

**University policy on observance of religious holidays**

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see "Religious Holidays" at provost.gwu.edu/policies-procedures-and-guidelines

## Support for students outside the classroom

### Virtual academic support

A full range of academic support is offered virtually in fall 2020. See coronavirus.gwu.edu/top-faqs for updates.

Tutoring and course review sessions are offered through Academic Commons in an online format. See academiccommons.gwu.edu/tutoring

Writing and research consultations are available online. See academiccommons.gwu.edu/writing-research-help

Coaching, offered through the Office of Student Success, is available in a virtual format. See studentsuccess.gwu.edu/academic-program-support

Academic Commons offers several short videos addressing different virtual learning strategies for the unique circumstances of the fall 2020 semester. See academiccommons.gwu.edu/study-skills. They also offer a variety of live virtual workshops to equip students with the tools they need to succeed in a virtual environment. See tinyurl.com/gw-virtual-learning

### Writing Center

GW's Writing Center cultivates confident writers in the University community by facilitating collaborative, critical, and inclusive conversations at all stages of the writing process. Working alongside peer mentors, writers develop strategies to write independently in academic and public settings. Appointments can be booked online. See gwu.mywconline.

### Academic Commons

Academic Commons provides tutoring and other academic support resources to students in many courses. Students can schedule virtual one-on-one appointments or attend virtual drop-in sessions. Students may schedule an appointment, review the tutoring schedule, access other academic support resources, or obtain assistance at academiccommons.gwu.edu.

**Disability Support Services (DSS)** 202-994-8250

Any student who may need an accommodation based on the potential impact of a disability should contact Disability Support Services to establish eligibility and to coordinate reasonable accommodations. disabilitysupport.gwu.edu

**Counseling and Psychological Services** 202-994-5300

GW's Colonial Health Center offers counseling and psychological services, supporting mental health and personal development by collaborating directly with students to overcome challenges and difficulties that may interfere with academic, emotional, and personal success. healthcenter.gwu.edu/counseling-and-psychological-services

**GW Campus Emergency Information**

GW Emergency Services: 202-994-6111
For situation-specific instructions, refer to GW's Emergency Procedures guide.

**GW Alert**

GW Alert is an emergency notification system that sends alerts to the GW community. GW requests students, faculty, and staff maintain current contact information by logging on to alert.gwu.edu. Alerts are sent via email, text, social media, and other means, including the Guardian app. The Guardian app is a safety app that allows you to communicate quickly with GW Emergency Services, 911, and other resources. Learn more at safety.gwu.edu.

**Protective Actions**

GW prescribes four protective actions that can be issued by university officials depending on the type of emergency. All GW community members are expected to follow directions according to the specified protective action. The protective actions are Shelter, Evacuate, Secure, and Lockdown (details below). Learn more at safety.gwu.edu/gw-standard-emergency-statuses.

**Shelter**

- Protection from a specific hazard
- The hazard could be a tornado, earthquake, hazardous material spill, or other environmental emergency.
- Specific safety guidance will be shared on a case-by-case basis.

**Action:**

- Follow safety guidance for the hazard.

## Evacuate

- Need to move people from one location to another.
- Students and staff should be prepared to follow specific instructions given by first responders and University officials.

  **Action:**
  - Evacuate to a designated location.
  - Leave belongings behind.
  - Follow additional instructions from first responders.

## Secure

- Threat or hazard outside of buildings or around campus.
- Increased security, secured building perimeter, increased situational awareness, and restricted access to entry doors.

  **Action:**
  - Go inside and stay inside.
  - Activities inside may continue.

## Lockdown

- Threat or hazard with the potential to impact individuals inside buildings.
- Room-based protocol that requires locking interior doors, turning off lights, and staying out of sight of corridor window.

  **Action:**
  - Locks, lights, out of sight
  - Consider Run, Hide, Fight

- **Classroom emergency lockdown buttons**
  Some classrooms have been equipped with classroom emergency lockdown buttons. If the button is pushed, GWorld Card access to the room will be disabled, and GW Dispatch will be alerted. The door must be manually closed if it is not closed when the button is pushed. Anyone in the classroom will be able to exit, but no one will be able to get in.