Queueing Streams and Data Communications  
EEL 6507  Section 0001

**Class Periods:** Tuesdays, period 4 (10:40am-11:30am) and Thursdays, period 4-5 (10:40am-12:35pm)

**Location:** Larsen Hall 0239

**Academic Term:** Spring 2022

**Instructor:**
Name: Yuguang “Michael” Fang  
Email Address: fang@ece.ufl.edu
Office Phone Number: 352-846-3043
Office Hours: Tuesdays, 9:30am-10:30am, NEB 435

**Teaching Assistant/Peer Mentor/Supervised Teaching Student:**
Please contact through the Canvas website
- TBA

**Course Description**
Introduction to basic queuing models and performance analysis of multiple access protocols. Special topics include IoT, cyber-physical systems, multi-access edge computing, emerging AI for wireless and wireless for AI. (3 credit hours)

**Course Pre-Requisites / Co-Requisites**
EEL 5544 or instructor’s consent.

**Course Objectives**
Students will learn the fundamental tools for various queueing systems including M/M/1 and its variants, M/G/1, G/M/1 and priority queues, multi-dimensional queueing models, queueing networks, and matrix geometric approach. They will grasp the modeling skill for performance evaluation of various networks and computing systems and corresponding resource management. (3 credits)

**Materials and Supply Fees**
No.

**Required Textbooks and Software**
- **Title:** Data Networks
  - **Author:** Dimitri P. Bertsekas and Robert G. Gallager
  - **Publication date and edition:** Prentice-Hal, 1992, 2nd edition
  - **ISBN number**

(If course notes derived from various published sources are used, provide information above for each source)
(If course notes are developed by the instructor, so state)

**Recommended Materials**
- **Title:** Queueing Systems I
  - **Author:** Leonard Kleinrock
  - **Publication date and edition:** John Wiley & Sons, 1975.
  - **ISBN number**

**Course Schedule**
Week 1: Syllabus explained
Week 2: Introduction to communications networks
Week 3: Probability basics
Week 4: Markov chain theory
Week 5: Markov chain theory
Week 6: Queuing model basics and Little's Law
Week 7: M/M/1 and its variants
Week 8: M/G/1, G/M/1 and priority queues
Week 9: M/G/1, G/M/1 and priority queues/Midterm
Week 10: Time-reversibility and multi-dimensional queueing models
Week 11: Queuing networks: Jackson’s theorem and product form
Week 12: Queuing networks: Jackson’s theorem and product form
Week 13: Queueing networks: Generalizations of Jackson’s theorem
Week 14: Multi-access control and ARQ
Week 15: Matrix geometric approach and emerging topics

Attendance Policy, Class Expectations, and Make-Up Policy
Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://catalog.ufl.edu/graduate/regulations/

Course attendance is required.

Evaluation of Grades

**Assessment Guidance from the ECE Graduate Committee:** Course evaluation components should include:

1. At least one component that individually evaluates each student’s understanding of course material and ability to apply concepts.
2. At least one evaluation activity that takes place in class.
3. When a project is involved, evaluation rubrics should be explicitly stated.
4. When team work is expected, individual student contribution verification method should be explicitly stated.

If an in-class exam is administered then 1 and 2 are fulfilled. In the case of a project, a project report that is graded per the stated evaluation rubrics and states which work was done by each student in the project team will address both 3 and 4.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Total Points</th>
<th>Percentage of Final Grade</th>
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</thead>
<tbody>
<tr>
<td>Homework Sets (4)</td>
<td>100 each</td>
<td>20%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>100</td>
<td>35%</td>
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<tr>
<td>Final Exam</td>
<td>100</td>
<td>45%</td>
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<td>100%</td>
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Grading Policy

Overall average >90% is guaranteed an A, >80% is guaranteed at least B, etc. There is no minus grade for graduate section.

More information on UF grading policy may be found at: http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is
important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

**Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at [https://gatorevals.aa.ufl.edu/students/](https://gatorevals.aa.ufl.edu/students/). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via [https://ufl.bluera.com/ufl/](https://ufl.bluera.com/ufl/). Summaries of course evaluation results are available to students at [https://gatorevals.aa.ufl.edu/public-results/](https://gatorevals.aa.ufl.edu/public-results/).

**In-Class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

**University Honesty Policy**

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code ([https://sccr.dso.ufl.edu/process/student-conduct-code/](https://sccr.dso.ufl.edu/process/student-conduct-code/)) specifies a number of behaviors that are in violation of this code and the possible sanctions. If you have any questions or concerns, please consult with the instructor or TAs in this class.

**Commitment to a Safe and Inclusive Learning Environment**

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:
Health and Wellness

<table>
<thead>
<tr>
<th>Covid-19 Protocols:</th>
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<tbody>
<tr>
<td>• You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.</td>
</tr>
<tr>
<td>• If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test &amp; Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email <a href="mailto:covid@shcc.ufl.edu">covid@shcc.ufl.edu</a>) to be evaluated for testing and to receive further instructions about returning to campus.</td>
</tr>
<tr>
<td>• If you are withheld from campus by the Department of Health through Screen, Test &amp; Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.</td>
</tr>
<tr>
<td>• UF Health Screen, Test &amp; Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test &amp; Protect website for more information.</td>
</tr>
<tr>
<td>• Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.</td>
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U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.
University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.


Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

