Syllabus, MAD 3305, Class Number 82149, Fall 2021

Book: Jean-Claude Fournier, Graph Theory and Applications, ISBN: 978-1-84821-070-7

Synopsis: The origins of Graph Theory can be traced in the works of Leonard Euler who, in 1763, used graphs to answer a question related to the Konigsberg Bridges. The simple discrete mathematics construct of vertices and edges (which can be directed, multiple, and weighted) turned out to be extremely useful in a wide variety of problem solving in math. In particular, graphs help nicely visualize, and effectively classify important structures in Algebra and Geometry (such as Lie Algebras and exceptional divisors to mention only two names). This led to the development of the theory of graphs.
Nowadays, graphs are considered as the simplest nontrivial version of simplicial complexes. But even this simple version has a rich theory and amazing applications. The more one knows about graphs, the bigger the chance they can be successful in solving important and non-trivial practical or pure mathematical problems.
The course MAD 3305 has the modest goal to introduce the basics of the theory of graphs, and cover some interesting and illuminating applications thereof. This we will do by covering as much as time permits from chapters 1-8 of the book cited above.
The basic concepts related to graphs (simple and non-simple, directed or not) are introduced and studied: isomorphism, connectedness, blocks, planarity. Arboretra (a.k.a. rooted trees) are specifically emphasized on due to their wide use in optimization problems. The goal of the course is to show how graphs can be used in different areas of math, and to discuss the algorithmic aspect of this usage. The classical search algorithms are thoroughly discussed. The main applications are related to coloring, optimal path finding, matching, and flows. If the time permits, the Eulerian and Hamiltonian graphs will be discussed (both abstractly and from algorithmic viewpoint) as well (Chapters 9 and 10).

A word of warning: MAD 3305 is an upper division course. This means that everything we state during lectures will be proved rigorously. Keep in mind that some of the proofs can be intricate – that's a feature of the theory of graphs! This means in turn that the participants in the class should have an idea of what math proof is (the course MAA 3200 Intro to Advanced Math, or equivalent to it, would help a lot. Also, some basics of MAD 2114 Discrete Math, or equivalent, would be very valuable, too. This doesn't mean that devoted and diligent students will not be successful without having the mentioned courses under their belts! These have to be prepared though to work more and learn the things from those courses on the go.

Exams: There will be two midterms (tentatively, after we cover Chapter 3, and after we cover Chapter 6), and a Final Exam (a comprehensive one). There will be several (15 minute) Quizzes as well. The precise time for the Quizzes and for the Exams will be announced a week prior to the day they happen.
Homework: Homework Assignments will be posted regularly on the web page of the class. Some of the exercises from these assignments will be graded – each assignment will specify the problems which have to be turned in as well as the due date for that.

Grading policy: The overall grade of the students will be formed by taking
10% of the HW grades, 20% of the Quizzes' grades, 30% of the average of the Midterms' grades, and 40% of the Final Exam grade. The overall grade of the student above is determined now by the scale:

$0.92 < S$:	A	$0.89 < S < 0.92$: A-	$0.87 < S < 0.89$: B+
$0.82 < S < 0.87$: B		$0.79 < S < 0.82$: B-	$0.77 < S < 0.79$: C+

0.67 < S < 0.77 : C	0.65 < S < 0.67 : C-	0.62 < S < 0.65 : D+
0.57 < S < 0.62 : D	0.55 < S < 0.57 : D-	S < 0.55 : F

Important Remark: The class is scheduled to be taught face-to-face, but if need be, it will be lectured remotely via Zoom. The students will be notified of any such change in a timely fashion.

Academic Misconduct Statement

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

Academic Misconduct includes: **Cheating** – The unauthorized use of books, notes, aids, electronic sources; or assistance from another person with respect to examinations, course assignments, field service reports, class recitations; or the unauthorized possession of examination papers or course materials, whether originally authorized or not. **Plagiarism** – The use and appropriation of another's work without any indication of the source and the representation of such work as the student's own. Any student who fails to give credit for ideas, expressions or materials taken from another source, including internet sources, is responsible for plagiarism.

To learn more about the academic integrity policies and procedures visit integrity.fiu.edu

Accessibility and Accommodation

The Disability Resource Center collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The DRC provides FIU students with disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact the Center at 305-348-3532 or visit them at the Graham Center GC 190.

For additional assistance please contact FIU's Disability Resource Center

Important note: The Instructor reserves the right to make any changes he considers academically advisable. Any such changes will be announced in advanced in class or by posting them to the e-mail accounts of the students. The students are responsible to be aware of the changes announced this way.