AMS 301: Finite Mathematical Structures (Fall 2017)

Instructor: Zhenhua Liu

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Office Hours: Tue/Thu 12-1pm, Math Tower 1-118.

Teaching Assistant:

- Graduate TA: Jessica Maghakian; Email: jessica.maghakian@stonybrook.edu; OH: Wednesday 10am-12pm
- Min Shen; Email: min.shen@stonybrook.edu; OH: Friday 11am-1pm
- Nuonan Shi; Email: nuonan.shi@stonybrook.edu; OH: Monday 3-5pm
- Xuechun Li; Email: xuechun.li@stonybrook.edu; OH: TBD
- Yihan Wang; Email: yihan.wang@stonybrook.edu; OH: Monday 11am-noon, 3-4pm
- Chenyan Ji; Email: chenyan.ji@stonybrook.edu; OH: Friday 9-11am

*TA OH is in Harriman 010

Lectures: Tue/Thu 4pm to 5:20pm, Earth and Space Sciences (ESS) 001

3 credits, Letter Grade

Prerequisite: AMS 210 or MAT 210 or AMS 361 or MAT303.

Course Description:

Introduction to graph theory and combinatorial analysis. The emphasis is on solving applied problems rather than on theorems and proofs. Techniques used in problem solving will include generating functions, recurrence relations, and network flows. This course develops the type of mathematical thinking that is fundamental to computer science and operations research.

Textbook: (Required) Applied Combinatorics, by Alan Tucker, 6th edition, John Wiley & Sons. ISBN: 9780470458389

Assessment: Homework (30%, lowest HW score dropped) + Midterm Exam (30%) + Final Exam (40%). Up to 5-point bonus for course feedback questionnaire around 4th week and other significant contributions to the class.

Exam dates:

Midterm dates: Tuesday October 16, 2018 (Exam dates may change according to course progress)

Final date: Tuesday, December 18, 2018, 2:15pm-5pm

Topics:

1. Basic concepts of graphs, graph models and isomorphism
2. Euler and Hamilton circuits and their applications

3. Graph coloring and its applications
4. Trees, their use in searching
5. Network algorithms
6. Problems with permutations and combinations
7. Generation Functions
8. Recurrence Relations
9. Inclusion-Exclusion principle

Learning Outcomes:

- Strengthen logical reasoning skills to solve combinatorial problems using:
    - elements of propositional calculus;
    - proof by contradiction;
    - logical consequences of assumptions.
- Learn to find multiple (equally valid) ways to solve a combinatorics problem:
    - apply a top-down strategy (breaking a problem into parts and subparts);
    - apply a bottom-up strategy (solving special subcases and building up).
    - learn to solve problems from first principles, rather than looking for existing templates or formulas.
    - solve a complementary problem;
    - use different strategies to categorize subcases of a problem;
    - use different techniques (e.g., generating functions, inclusion-exclusion).
- Learn basic graph theory results and apply them in problem-solving:
    - isomorphism;
    - planar graphs;
    - Hamilton circuits and Euler cycles;
    - graph coloring;
    - trees and ways to search them;
    - basic network algorithms.
- Use formulas for counting basic combinatorial outcomes to construct solutions to more complex combinatorial enumeration problems:
    - permutations, with and without repetition;
    - combinations, with and without repetition.
- Apply counting strategies to solve discrete probability problems.
- Use specialized techniques to solve combinatorial enumeration problems:
    - generating functions;
    - recurrence relations;
    - inclusion-exclusion principle.

Student Accessibility Support Center (SASC) Statement:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact the Student Accessibility Support Center (SASC), ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

[In addition, this statement on emergency evacuation is often included, but not required:
Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the staff at the Student Accessibility Support Center (SASC). For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities]

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at
http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management Statement:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.