Instructor: Estie Arkin, esther.arkin@stonybrook.edu, Note - currently I do not plan to be on campus, but if this changes my office is Math Tower P-134B, 632-8363,

Office hours: We will use the official class meeting times as office hours Monday Wednesday 2:40-4pm. If more are needed, I will be happy to set them up. I also welcome questions by email.

TA: Cory Levin cory.levin@stonybrook.edu office hours Monday and Wednesday 11am-noon Charles Weng Charles.Weng@stonybrook.edu office hours Tuesday 12:30-2:30pm. Anders Johnson Anders.Johnson@stonybrook.edu office hours Monday and Wednesday 12:45-1:45pm. Luxin Zhang Luxin.Zhang.1@stonybrook.edu office hours Thursday 7-9am. Shayak Ghosal shayak.ghosal@stonybrook.edu office hours Thursday 1:30-3pm.

Lectures: Monday, Wednesday 2:40-4pm Pre-recorded modules will be available before class, please watch. The designated class time alternate between going over more examples, homework solutions and answer students questions, (so please try to “attend” live, if possible) and office hours to answer individual students questions or concerns.


Homeworks: Homework will be assigned weekly (approximately), posted on blackboard, to be turned in via blackboard before the due date and time. Each homework must be submitted through Blackboard as a single PDF file. Homework that does not meet these expectations will not be graded and will not receive credit. There will be approximately 10 homework sets, equally weighted, and I will drop the lowest two scores before computing your average. Homework cover sheet: Homework 0 is a cover sheet (available on blackboard) which should be filled out and applies to all homeworks submitted by a student. A student that does not turn in the cover sheet (Homework 0) will get a score of zero on all homework assignments. No late homework will be accepted. (Since I drop the 2 lowest scores, missing a homework due to illness should not be a problem.) You may discuss homework problems with other students taking the course, with the TA, and with the instructor. The work that you turn in should always be your own write-up, and you should show that you personally understand everything that you write. Please make certain that your writing is neat and clear, and that you have expressed your reasoning, not just the final answer.

Exams: There will be three exams. The first two midterms will be during class time tentatively Wednesday March 3, and Wednesday April 7. The third exam (final) is Thursday May 13, 11:15-12:45, and is non cumulative. All exams are closed notes and book, however, you will be allowed a “cheat sheet”. This is a 4 by 6 index card that must be hand written by you (not typed, not xeroxed), and it will be turned in with your exam. All cell phones must be turned off during exams, and placed inside you bag! No calculators are allowed. Exam times are by NY (Stony Brook) time, Exams will be online, details will be posted on blackboard. Most likely we will use the respondus lockdown browser.

Grades: Your total average score will be computed based on 10% homework, 30% per midterm. Please note that there will be no extra credit option. I will use your total average score to assign a letter grade; about 30% A’s, 35% B’s, 25% C’s, and 10% D’s and F’s.

Course Outline:
Graph Theory Basic definitions, models, isomorphism, Planar graphs, Euler, Hamilton circuits, coloring, Trees, Shortest paths, minimum spanning trees, traveling salesperson.
Enumeration and Counting: Basic counting principles; Arrangements and selections, Binomial coefficients, permutations, combinations, Generating functions, Recurrence relations/Divide and conquer, Inclusion-Exclusion formulas.

Learning Outcomes
1.) Strengthen logical reasoning skills to solve combinatorial problems using:

- elements of propositional calculus;
- proof by contradiction;
- logical consequences of assumptions.
2.) 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).

3.) 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.

4.) 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.

5.) Apply counting strategies to solve discrete probability problems.
6.) Use specialized techniques to solve combinatorial enumeration problems:
   • generating functions;
   • recurrence relations;
   • inclusion-exclusion principle.

**Student Accessibility Support Center Statement:** If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

**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 is 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:** Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards 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. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

**Technical Needs (Hardware and Software):** The following list details a minimum recommended computer set-up and the software packages you will need to access and use:
• Hardware:
  - PC (Windows 7, 8, or 10) or Macintosh (OS X/macOS 10.10 or higher).
  - 4 GB RAM.
  - A high-speed internet connection. Note that public WiFi (e.g., Starbucks) and internet service provider hotspots (e.g., optimumwifi or xfinitywifi) are not recommended.
  - Printer and scanner. A cell phone or tablet camera can do the scanning, with apps such as Office Lens or CamScanner (there are many others).
  - Speakers (either internal or external) or headphones. Headphones are strongly recommended to reduce the risk of feedback during communications.
  - Microphone (either internal or external).
  - WebCam or other camera (interfacing with your computer) for producing video.

• Software (additional tools may be needed). Remember to use your Stony Brook email or NetID when configuring specialized software:
  - An up-to-date Internet browser, such as Chrome, Firefox, Explorer/Edge (Windows), or Safari (macOS). A complete list of supported browsers and operating systems can be found on the My Institution page when you log in to Blackboard.
  - PDF viewer, such as Adobe Reader.
  - Zoom. Stony Brook has a site license for Zoom; you can find information on downloading, installing, and using Zoom at https://it.stonybrook.edu/services/zoom/students.
  - Respondus LockDown browser and Monitor, for taking quizzes and exams. Stony Brook has a site license for these packages; see https://download.respondus.com/lockdown/download.php?id=772113517.

Technical Assistance: If you need technical assistance at any time during the course or to report a problem with Blackboard you can:

• Visit the Stony Brook University Student Help Desk Page, http://www.stonybrook.edu/helpme

• Phone:
  - (631) 632-2358 (technical support and Blackboard issues)
  - (631) 632-9800 (client support, wifi, software and hardware)

• Create a ticket at http://service.stonybrook.edu.

Students who need assistance with their personal devices can contact DoIT’s service desk at (631) 632-9800 or submit an online request. For more information, visit: https://it.stonybrook.edu/students