

**AMS 301 Finite Mathematical Structures**

**INSTRUCTOR:** Suil O  
Assistant Professor, Department of Applied Math & Statistics, SUNY Korea

**CLASS:** Mon, Wed 5:00 pm - 6:20 pm, Room: C107

**OFFICE:** Academic Building B523

**OFFICE HOUR:** Tu 3 pm - 5 pm, Th 10 am - noon, or by appointment.  
I also welcome questions by email.

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**TA:** Haneul Lee

**OFFICE:** Academic Building B517

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**OFFICE HOUR:** Mon, Wed 3:30 - 4:30 pm

**Text:** Alan Tucker, *Applied Combinatorics*, (6th ed.), Wiley  
subtext: Douglas B. West, *Introduction to Graph Theory*, (2nd ed.), Prentice Hall  
John M. Harris, Jeffrey L. Hirst, Michael L. Mossinghoff, *Combinatorics and Graph Theory*, Springer

**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.

**Homework:** Homework will be assigned weekly (approximately), posted on blackboard. Each homework needs to be turned in on the due date at the beginning of lecture. There will be approximately 10 homework sets, equally weighted, and I will drop the lowest two scores before computing your average. **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. But 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.**

**Tests**

Midterm: Wednesday, April 4, in class  
Wednesday, May 16, in class

Final: Thursday, June 21, 9:00 am - 11:30 am

## Grading of Tests and Homework

Your total average score will be computed based on 5% Attendance, 15% Homework, 20% per midterm, and 40% Final (cumulative). The final letter grade is assigned using the scale :

A: 93-100, A-: 90-92, B+: 87-89, B: 83-86, B-: 80-82, C+: 77-79,  
C: 73-76, C-: 70-72, D+: 67-69, D: 63-66, D-: 60-62, F: < 60

## Learning Outcomes

1. 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.

### **Academic Integrity**

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. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

### **Americans With Disabilities Act**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Academic Affairs. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

### **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 Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

### **Course Evaluations**

Stony Brook University values student feedback in maintaining the high quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of-the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the the following link to access the course evaluation system: <http://stonybrook.campuslabs.com/courseeval/>

### **Attendance Policy**

- (1) All students of SUNY Korea are required to attend every class.
- (2) Unexcused absences will affect seriously the students final grade in the course.
- (3) If a student has over 20% unexcused absence, the students final course grade will be an F.

Example)

- i) If the class is a 150 minute class, and is held once a week, the 4th unexcused absence of a student will lead to an F grade of the course.
  - ii) If the class is a 75 minute class, and is held twice a week, the 7th unexcused absence of a student will lead to an F grade of the course.
  - iii) If the class is a 50 minute class, and is held three times a week, the 10th unexcused absence of a student will lead to an F grade of the course.
  - iv) In Intensive English Course (IEC), if a student misses the class more than 40 hours in a semester, the student will receive an F grade on the course.
- (4) Students should report the reason of absence to the instructor in advance, or immediately after the absence.
  - (5) When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.
  - (6) The instructor of the course reserves the right to excuse absences.
  - (7) The course instructor may excuse the absence if the submitted documentation fulfills the conditions below.
    - i) Extreme emergencies (e.g. death in the family)
    - ii) Severe medical reasons with doctors note (Not a slight illness)
    - iii) Very important events (e.g. national conference, official school event)
  - (8) At the end of semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

### Tentative course schedule

Week	Date	Section	Material Covered
1	2/26	1.1	Graph Models
		1.2	Isomorphisms
	2/28	1.2	Isomorphisms (Continued)
		1.3	Edge Counting
2	3/5	1.4	Planar Graphs
		2.1	Euler Cycles
	3/7	2.2	Hamilton Circuits
3	3/12	2.2	Hamilton Circuits (Continued)
	3/14	2.3	Graph Coloring
		2.4	Coloring Theorems
4	3/21	3.1	Properties of Trees
5	3/26	3.2	Search Trees and Spanning Trees
	3/28	3.3	The Traveling Salesperson Problem
6	4/2		Review
	4/4		Exam 1
7	4/9	5.1	Two Basic Counting Principles
	4/11	5.2	Simple Arrangements and Selections
8	4/16	5.3	Arrangements and Selections with Repetitions
	4/18	5.4	Distributions
9	4/23	6.1	Generating Function Models
	4/25	6.1	Generating Function Models (Continued)
10	4/30	6.2	Calculating Coefficients of Generating Functions
	5/2	6.2	Calculating Coefficients of Generating Functions (Continued)
11	5/7	7.1	Recurrence Relation Models
	5/9	7.2	Solution of Linear Recurrence Relations
12	5/14		Review
	5/16		Exam 2
13	5/23	8.1	Counting with Venn Diagrams
14	5/28	8.2	Inclusion-Exclusion Formula
	5/30	8.2	Inclusion-Exclusion Formula
15	6/4	8.3	Restricted Positions with Rook Polynomials or Matching Theory
16	6/11		Review