

## **MATH 5653    Problem Solving 1: Counting and Combinatorics**

Credits: 3

**Prerequisite:** MATH 3003 or MATH 3243 or permission of instructor

**Text:** A First Step to Mathematical Olympiad Problems (Mathematical Olympiad Series) by Derek Holton, ISBN-13: 978-9814273879.

**References:** Problems of Number Theory in Mathematical Competitions (Mathematical Olympiad Series) by Yu Hong-bing, ISBN-13: 978-9814271141.

Combinatorial Problems in Mathematical Competitions (Mathematical Olympiad) by Yao Zhang, ISBN-13: 978-9812839497.

How to solve it: A new aspect of mathematical methods by George Polya and John Conway. The art of Problem Solving, Vol. 1 and 2 by Sandor Lehoczky and Richard Rusczyk.

**Course Description:** This is the first problem solving course in the area of counting and combinatorics. It is to expose students to middle and high school mathematics contest problems and to help them discover efficient problem solving strategies in counting. After they learn the basic results and tools in a particular topic in number theory, they are invited to solve typical problems, where hints will be provided by the instructor as needs be. Students will gradually be introduced to various classical problems.

### **Topics:**

1. Fundamentals of counting
2. Counting and probability
3. Pigeonhole principle
4. Sequences and series
5. Proofs by Induction
6. Number theory

**Learning Outcomes:** The students are expected to be able

1. to use the pigeonhole principle
2. to use Fermat's little theorem to solve related problems
3. to solve simple Diophantine equations
4. to use divisibility criteria
5. to construct proofs by contradictions and by induction
6. to solve congruence equations

**Grading:** Grades will be based on accuracy, originality, simplicity of the solution, and meeting deadlines.

Homework 40%, Assignments 20%, Tests 40%.

## **COMMON LANGUAGE FOR COURSE SYLLABI**

Students, please carefully review the following information at the link

<https://www.westga.edu/student-services/counseling/assets-counseling/docs/common-language-for-course-syllabi.pdf>

It contains important material pertaining to your rights and responsibilities in this class. Because these statements are updated as federal, state, university, and accreditation standards change, you should review the information each semester.