



ÇANKAYA UNIVERSITY
Department of Industrial Engineering

IE 458 – Mathematical Models in Defense Systems

Spring 2017

Instructor:

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Course Schedule:

Tuesday 13:20- 14:10 (HA-01)
Wednesday 12:20-14:10 (PA-01)

Textbook:

Washburn A. and M. Kress, *Combat Modeling*, Springer Science+Business Media, 2009.
Download Microsoft Excel workbooks file [CombatModeling1.zip](http://faculty.nps.edu/awashburn/washbudn.htm) from URL:
<http://faculty.nps.edu/awashburn/washbudn.htm>

Reference Books:

Wagner D.H., W.C. Mylander and T.J. Sanders, *Naval Operations Analysis*, Naval Institute Press; 3rd edition, 2002.
Przemieniecki J.S., *Mathematical Methods in Defense Analysis*, AIAA Inc., 2nd edition, 1994.
Jaiswal N.K., *Military Operations Research: Quantitative Decision Making*, Kluwer Academic Publishers, 1997.
Lecture slides may include materials from reference books and other sources in addition to the textbook.

Course Description:

Applications of operations research tools and techniques to defense related problems. Introduction to military operations research including important design characteristics of defense related sensors, systems and weapons. Effect of information and technology in the presence of guided munitions and sensors.

Course Objective:

This course is designed to provide students with an overview of military operations research and addresses at a introductory level the generally accepted principles and models of Operations Research applied in a defense analysis context. Emphasis is given to practical applications. The course provides an overview of methodologies, and resources for the operations analysts.

At the end of the course, students will:

- Become familiar with the major classes of problems encountered in defense analysis,
- Learn how OR techniques are applied in a military context,
- Identify important design characteristics and parameters of defense systems and sensors,
- Develop an understanding of trade-offs between basic physical, mechanical and operational design properties and parameters of alternative systems.

Tentative Course Schedule:

Week	Subject
Week 1	Introduction to Defense Analysis
Week 2	Shooting without feedback
Week 3	Shooting with feedback
Week 4	Target defense: weapon-target allocation
Week 5	Detection theory
Week 6	Radar detection
Week 7	Sonar detection
Week 8	Lateral range curves and sweep width
Week 9	Search and patrol
Week 10	Missile allocation
Week 11	Force disposition
Week 12	Unmanned aerial vehicle routing
Week 13	Deterministic Lanchaster models
Week 14	Stochastic Lanchaster models

Course Web Page:

A web page will be available for this course at <https://webonline.cankaya.edu.tr>. You will need to access this web page for announcements about class, lecture notes, and assignments. A copy of the lecture slides will be posted on Moodle at the beginning of every week. These lecture slides may not contain all the discussion, examples, and the solutions of the problems solved in the class; you are expected to use the slides to go over the plan of the week and to take notes during the class.

Grading:

Midterm	30 %
Final Exam	40 %
Project	15 %
Homework (2)	15 %
Total	100 %

Classroom Policy:

Every student is expected to respect the other students' right to learn. Any behavior which distracts or disturbs the other students or the instructor, or disrupts class in any way is unacceptable and will not be tolerated.

Make-up Policy:

A make-up examination for the midterm and the final exam will only be given under highly unusual circumstances (such as serious health or family problems). The student should contact the instructor as early as possible and provide the instructor with proper documentation (such as a medical report certified by Çankaya University's Health Center). A make-up exam may have a different format and may contain different type of questions than the regular exam.

Attendance:

Attendance will be taken every lecture hour. It is strongly recommended to attend all the lecture hours to understand the course material.

Conditions that lead to the letter grade "NA":

- Not attending the Midterm Exam (or its makeup) or the Final Exam (or its makeup);
 - If you fail to take the midterm exam (or its makeup), you will NOT be able to take the final exam and you will receive the letter grade NA.
 - If you fail to take the final exam (or its makeup) you will receive the letter grade NA.