

# MTM4501-Operations Research

Gökhan Göksu, PhD

Week 1




# Contact Information and Course Evaluation Criteria

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- ▶ Midterm I: 35 %
- ▶ Midterm II: 25 %
- ▶ Final Exam: 40 %
- ▶ Office Hours: Monday, 13:00-16:00

# Course Content and Textbooks

- ▶ Definition of OR and Its History
- ▶ Decision Theory and Models
- ▶ Network Analysis
  - ▶ Minimum Spanning Tree Algorithm
  - ▶ Shortest Path Algorithm
  - ▶ Maximum Flow Algorithm
  - ▶ Project Planning with PERT-CPM
- ▶ Inventory Management Models
- ▶ Queue Models

 H. A. Taha, Operations Research: An Introduction, 8/e, Pearson Education, 2008.

 W. L. Winston, Operations Research Applications and Algorithms, Second Edition, Duxbury Press, California, 1991.

 H. A. Taha, Çeviren ve Uyarlayanlar: Ş. A. Baray, Ş. Esnaf, Yöneylem Araştırması, 6. Basımdan Çeviri, Literatür Yayınevi, 2000.

# Definition of OR

- ▶ Operations Research (OR)
  - ▶ European School: "Operational Research (OR)"
  - ▶ American School: "Operations Research (OR)"
  - ▶ In Turkish, we say "Yöneylem Araştırması (YA)"
- ▶ Management Science: "OR/MS" or "ORMS"
- ▶ Problem Solving & Decision Science
- ▶ "Operations research" is the scientific approach to the decision-making process of designing and operating a system in the best way, usually when scarce resources must be allocated. It is a system of interconnected components working together to achieve a specific goal.

# Phases of an OR Study

- ▶ Formulation of the Problem
- ▶ Examining the System
- ▶ Establishing the Mathematical Model of the Problem
- ▶ Validating the Model
- ▶ Choosing a Suitable Option
- ▶ Presentation of Results to the Decision Maker
- ▶ Implementing and Monitoring the Recommendation

# History of OR

- ▶ In the late 1930s, OR was first used in the United Kingdom.
- ▶ In 1936, the British Royal Air Force (RAF) established Bawdsey Research Station in Suffolk.
  - ▶ Pre-war radar studies
    - ▶ Correct and effective use of the information obtained, such as the route and control of aircraft
  - ▶ A special force has been established for British air defence.
- ▶ Four more new radar stations were established in 1938.
  - ▶ The problem of verifying and coordinating conflicting information obtained from different stations arose.
- ▶ In order to solve the problem and measure the effectiveness of the work, a research group was formed, chaired by A. P. Rowe.
- ▶ The process of investigating the military operations was called "Research into Military Operations", in short "Operational Research".
- ▶ The expanding working group began using the Stanmore Research Station as its headquarters in the summer of 1939.

# History of OR

- ▶ During the war, Stanmore Research Center evaluated the feasibility of additional aircraft forces against German forces in France, using OR techniques, and made a presentation to the prime minister Winston Churchill, with graphs showing the infeasibility, resulting in an avoidance in the strength reduction of the air force by not sending additional forces to the region.
- ▶ The Operational Research Section (ORS) was established in 1941 and the group carried out studies until the end of the war.
- ▶ In Türkiye, the first OR studies began on June 1, 1956, with the "Operations Research" (Tur: *Harekat Araştırması* at that time) group consisting of reserve officers (Tur: *yedek subay*) formed at the General Staff (Tur: *Genel Kurmay*) with the efforts of Colonel (Tur: *Albay*) Fuat Uluğ.
- ▶ Research was conducted on mobilization and air defense issues with the support received from abroad.
- ▶ The first OR course in Türkiye was given at ITU Faculty of Mechanical Engineering in 1960-61 by Prof. İlhami Karayalçın.
- ▶ In 1966, the name *Harekat Araştırması* was changed to *Yöneylem Araştırması*.