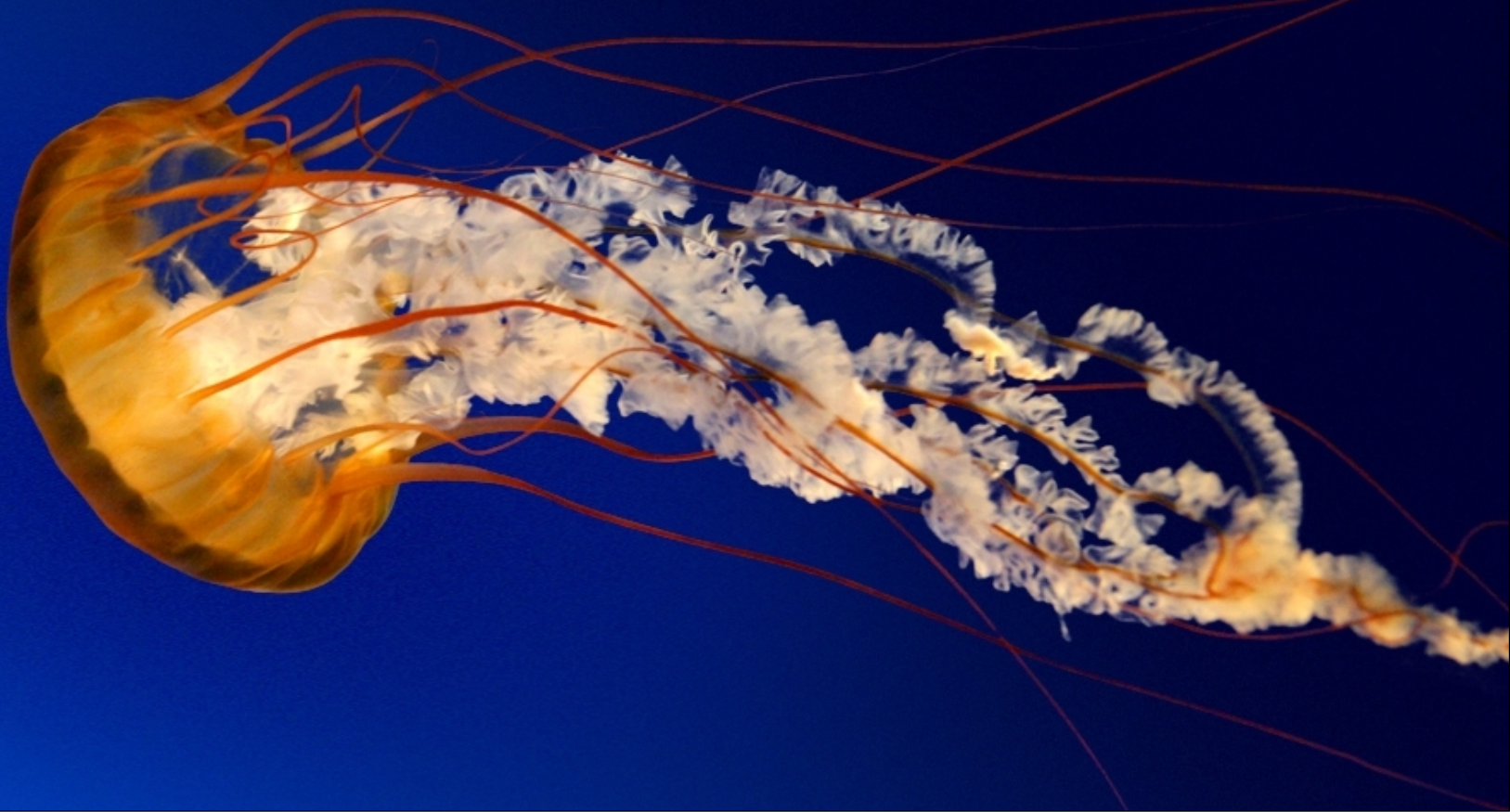


# Optimization Methods in Operations Research

Room 102

FRI. 13:30–17:05

Week 5、 7、 8、 9、 10



## Course Introduction

# About the Instructor

Zhang Yan

## Education

Ph. D. in Industrial Engineering

University of Xi'an Jiaotong University, 2010

B.A. in E-Commerce

University of Xi'an Jiaotong University, 2000

## Experience

Lecturer - 2011 - 2013

Associate professor 2014 -

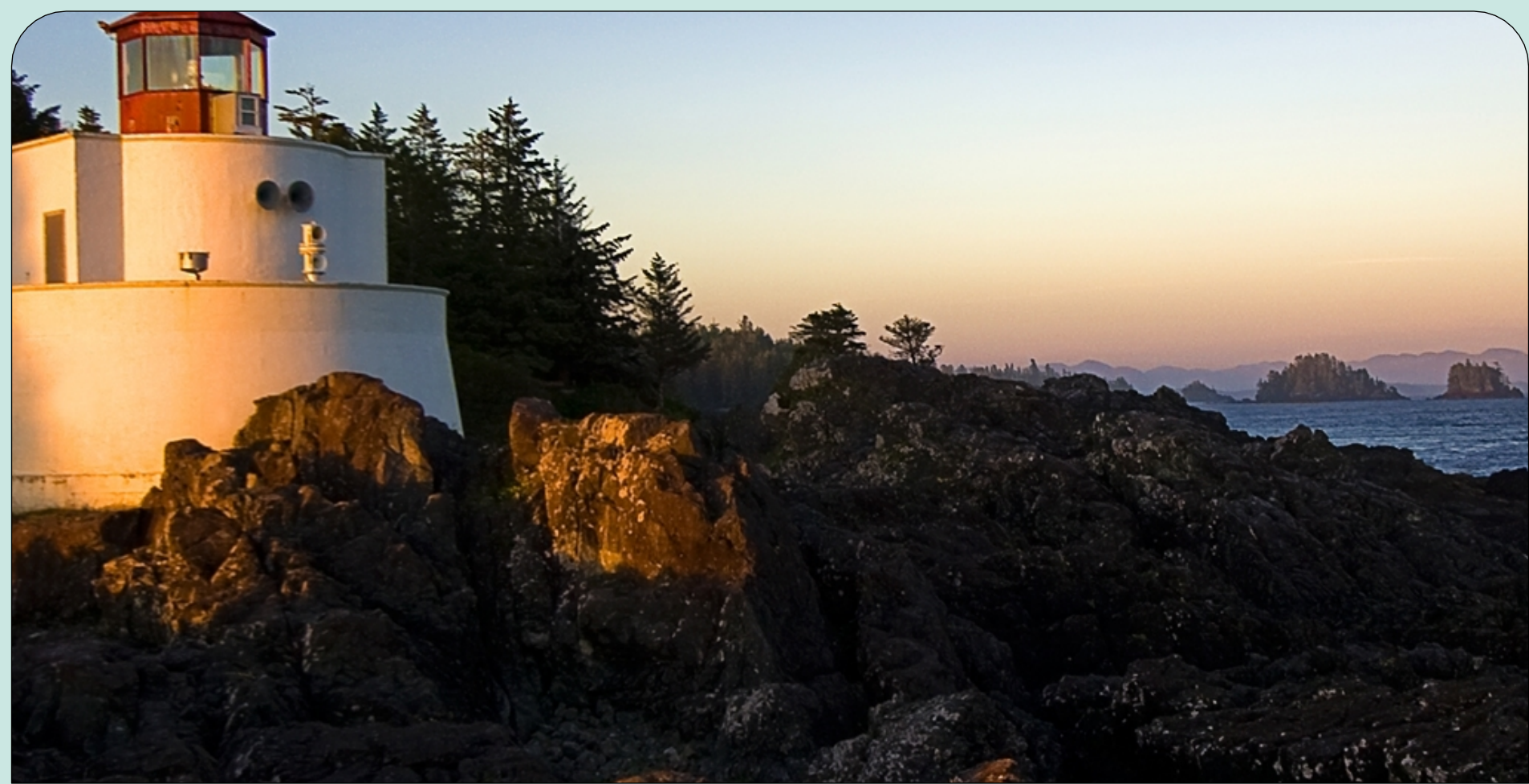
Transportation Management School, Dalian Maritime  
University, 2011

# Course Introduction

- Provides an introduction to optimization, building upon the fundamentals of linear algebra.
- Covers optimization methodologies, including linear programming, network optimization, integer programming, and decision tree.
- Applications to logistics, manufacturing, transportation, marketing, project management, and finance.

# Basis of Grade

- Class attendance and participation 20%
- Homework  
30%
- Project Report  
50%



# Introduction of Operations Research

# What is Operations Research (OR)?

- “The science of better”
  - ♦♦♦
- “The use of mathematical models, statistics and algorithms to aid in decision-making with the goal of improving or optimizing performance”
  - ♦♦♦
- “Research designed to determine the most efficient way to do something”
  - ♦♦♦
- “The application of scientific methods to improve the effectiveness of operations, decisions and management”

# Links to OR

- INFORMS –
- ORMS –
- Science of Better –



# Origins of OR

- During WWII, OR developed to allocate scarce resources to military operations
- After the war, OR introduced into industry
- Improvements in techniques
- Computer revolution

# Operations of OR

- OR techniques may be used to solve problems
- related to how to coordinate the activities of an
- organization.
- Type of organization is irrelevant.
- OR successfully applied to a wide range of industries
- Manufacturing
- Transportation
- Construction
- munication
- Finance
- Health care
- Etc.

# Examples of OR Problems

- OR techniques may be used to solve every-day problems:
  - What and how much to buy at the market
  - Find the best parking on campus
  - What classes to register for
  - How to allocate studying time for different classes
  - Packing your luggage
  - How to arrange furniture in a room
  - Pick a job from a long list of offers



# OR Modeling Approach

# Research of OR

- OR uses scientific research methodology:
  - 1. Define problem and gather data
  - 2. Formulate mathematical model
  - 3. Develop a computer-based procedure for deriving solutions from the model
  - 4. Test the model
  - 5. Prepare for the ongoing application of the model
  - 6. Implement

# 1. Problem Definition

- A crucial process – GIGO
- Ascertain **appropriate objectives** from management
- Concerned with the **entire organization**
- **Data gathering**

## 2. Model Formulation

- Problem identified with **decision variables**
  - How many `units` to buy/sell...
  - How much `time` to spend on a task...
- Measure of performance is the **objective function**
  - What is the goal?
  - Usually: Max/min profit/cost/time/units
  - A function of the decision variables
- Restrictions of values of decision variables set in **constraints**
  - Min acceptable profit
  - Max available resources
- **Parameters** are the constants of the model
  - function and the constraints

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