IZMIR INSTITUTE OF TECHNOLOGY
CIVIL ENGINEERING DEPARTMENT

CE 581 – DYNAMICS OF SUSTAINABLE SYSTEMS
SYLLABUS
FALL 2024

Class Meeting Time: Wednesdays 9:45 – 12:30

Location: TBD

Instructors: Asst. Prof. Dr. Tolga ERCAN – Email: tolgaercan@iyte.edu.tr

Office Hours: By appointment only

Description: By providing general knowledge and skills on the method of system dynamics, enabling students to develop solution models for current sustainability and engineering problems using this method.

Textbook and References:

- Small System Dynamics Models for Big Issues: Triple Jump Towards Real--- World Complexity. Pruyt, E., 2013, Delft: TU Delft Library. ISBN/EAN: 978---94---6186---195---5 (*will be provided in PDF*).

- Business Dynamics: Systems Thinking and Modeling for a Complex World, Sterman, J., McGraw---Hill/Irwin.

Learning Outcome:
This course uses dynamic modeling as an experimental platform to study and analyze the dynamics of socio-technical problems in the engineering and construction industry. The course has two broad objectives: The first one is to learn dynamic systems approach and systems simulation as a methodology to study and understand complex, dynamic problems as they relate to sustainability. The second objective of the course is to expose the students to a variety of real dynamic problems related to civil infrastructure systems and the built environment, and how to analyze the social, economic, and environmental issues as they relate to sustainability.

Grading Policy:

- Modelling Homework (**20% of GRADE)**
- Paper Reviews and Critics (**20% of GRADE)**
- Midterm Exam: **20% of GRADE (Take Home - Modelling)**
- Final Class Project (Presentation and Research Paper: **30% of GRADE**

Date	Week	Lecture Content
2/10/2024	Week 1	Introduction to System Dynamics
9/10/2024	Week 2	System Dynamics and Sustainability
16/10/2024	Week 3	Qualitative Modeling
23/10/2024	Week 4	Causal Loop Diagrams
30/10/2024	Week 5	Modeling Process
6/11/2024	Week 6	Quantitative Model Formulation
13/11/2024	Week 7	Stocks, flows, auxiliaries
20/11/2024	Week 8	Time, Step and Ramp functions
27/11/2024	**Week 9**	Delays and Smoothing **(Take Home Midterm)**
4/12/2024	Week 10	Lookups and Pulses
11/12/2024	Week 11	Verification and debugging
18/12/2024	Week 12	Sensitivity, uncertainty, and robustness
25/12/2024	Week 13	Policy Analysis – **Class Project Presentations**
1/1/2025	Week 14	**New Year NO Class**
6/1/2025 – 17/1/2025	**Final Exams Week**	**Research Paper Submission - TBD**