

# IE 48005 Digital Manufacturing SPRING 2021

**Instructor:** Emre Özlü (eoazu@sabanciuniv.edu), Office: Manufacturing Research Lab

**Live Lecture Hours and Locations:**

Tue 13:40-14:30 <https://sabanciuniv.zoom.us/j/4489189741>

Wed 16:40-18:30 <https://sabanciuniv.zoom.us/j/4489189741>

**Office hours:** Tuesdays by email appointment.

**Credits:** 3

### Objectives

The overall objective of this course is to introduce the basics of digitalization and applications in manufacturing. The students will gain knowledge on the basics of analog to digital conversion, sensors and data acquisition, digital twins and data integration in manufacturing environment. They will also gain ability to collect and analyse data and further use it to predict several decision parameters at the most basic level.

### Course Description

This course is designed for students who are interested in digitalization in manufacturing environment. It provides a background starting from the digitalization at shop floor level to the analysis of the gathered data to support decision making process. In the first lectures, the methods and hardware for data collection are covered. Labview is used for practical demonstrations and applications. The necessary calculations for conversion of the analog signal to digital signal are taught. After these basics, the evolution of the manufacturing science is reviewed and the link with the digitization is defined. As a next step, several digitalization methods are covered under the Digital Twin topic. Finally, digital transformation is reviewed from a more general perspective. The topics covered during the course will be applied through a term project. The students will make two presentations; one for reporting their progress and one for their final report they will submit.

### References

- will be supplied throughout the semester.

### Tentative Schedule

Week	Class	Topic
1	1	Introduction to the Course
	2	Analog vs Digital Data
2	3,4	Data Acquisition & Analog to Digital Conversion
3	5,6	Data Acquisition Applications
4	7,8	Data Collection with Sensors
5	9,10	Data Collection with Sensors
6	11, 12	Manufacturing Science and History
7	13,14	Digital Twins and Applications
8	15,16	Digital Process Twins in Manufacturing
9	19, 20	Digital Machine Tool Twins
10	21,22	Digital Fabrication
11	23,24	Data Integration
12	25,26	Digital Transformation Concepts and Technologies
13	27, 28	<b>Term Project Presentation#2 (Final)</b>

## **Term Project**

The students are expected to select or will be assigned a topic from manufacturing environment that needs to be improved through digital technologies. Then they will select necessary digital technologies and propose the solution method. The output can be a practical application or a thorough investigation of the solution from literature. The grading of the project depends on the final presentation and final project report.

## **Quiz**

There will be 3 types of quizzes:

1. A reading paper/assignment will be given to students each week. A quiz associated with the topic of the reading assignment will be held the following week. A total of 6 quizzes are planned to be held.
2. Quizzes related with Labview will be available. A total of 2-3 quizzes are planned to be held.
3. Pop-up questions will be raised during the lecture and quiz grades will be given upon answers from students.

## **Grading:**

Term Project	30 %
Quiz	40 %
Final Exam	30 %

The student must obtain minimum of 25% from the final exam and must complete the term project or will directly receive an F grade from the course. Plagiarism will not be tolerated and will be punished up to failure in the course.