



上智大学  
SOPHIA UNIVERSITY

# Welcome to **PERG!**

“**Precision Engineering Research Group**”

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by Emir Yilmaz

Online University Visit

# Agenda



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## 1. Introduction

Self Introduction  
Faculty & Department

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## 2. Our Team

Members

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## 3. Research Themes

A brief introduction

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## 4. Techno Center

A brief introduction

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## 5. Demonstration

Electric Discharge machining Assisted Turning

# Self Introduction

**1991**



Born and raised in Turkey

**2010 - 2014**



Mechatronics Engineering  
Sabanci University, B.Sc.

**2014 - 2015**



Project Engineer  
Ford Motor Company

**2020 - 2021**



Postdoctoral Fellow  
Thermal Engineering Lab.  
Sophia University

**2008 - 2009**



Rotary Youth Exchange  
Moss Landing, CA, USA  
4<sup>th</sup> year in high school

**2013**



Exchange Semester  
@ Tokyo Metropolitan  
University

**2015 - 2020**



M.Sc. & Ph.D.  
Sophia University  
**Green Science &  
Engineering Program**

**2021 ~**



Assistant Professor  
Sophia University

## Department of Materials and Life Sciences

By understanding basic of substances and contributing to the creation and technological development of new materials, students will enjoy a new discovery of materials and life that is in harmony with nature to make contribution to humanity.

[DETAILS →](#)

## Department of Engineering and Applied Sciences

Students study science and engineering in an integrated manner to become creative expert who can promote the harmonious development of industrial technology and natural science.

[DETAILS →](#)

## Department of Information and Communication Sciences

Our goal is to develop a deep understanding of humans and society through "communication", to organize the knowledge, wisdom, and experience of humans and society as information, and to organically combine them into creative ideas that can be returned to society.

[DETAILS →](#)

## Green Science/Engineering (English Courses in Science and Technology)

Two English courses opened in 2012. All classes, reports, research guidance, etc. will be conducted in English to tackle the global issue of global environmental problems.

[DETAILS →](#)

# Dept. of Engineering & Applied Sciences

## Mechanical engineering area

- Control engineering
- Dynamics engineering
- Fluid mechanics
- Materials science
- **Precision engineering**
- Strength of materials
- Thermal engineering

# What is Precision Engineering?

## a subdiscipline of mechanical engineering


- concerned with **designing of machines, fixtures, and other structures** that have exceptionally low tolerances, are repeatable and stable over time
- with the inclusion of
  - electrical & electronics engineering,
  - software engineering,
  - optical engineering and many more
- ❖ applications in machine tool design, MEMS-NEMS, optoelectronics design & many other fields



# Our Team

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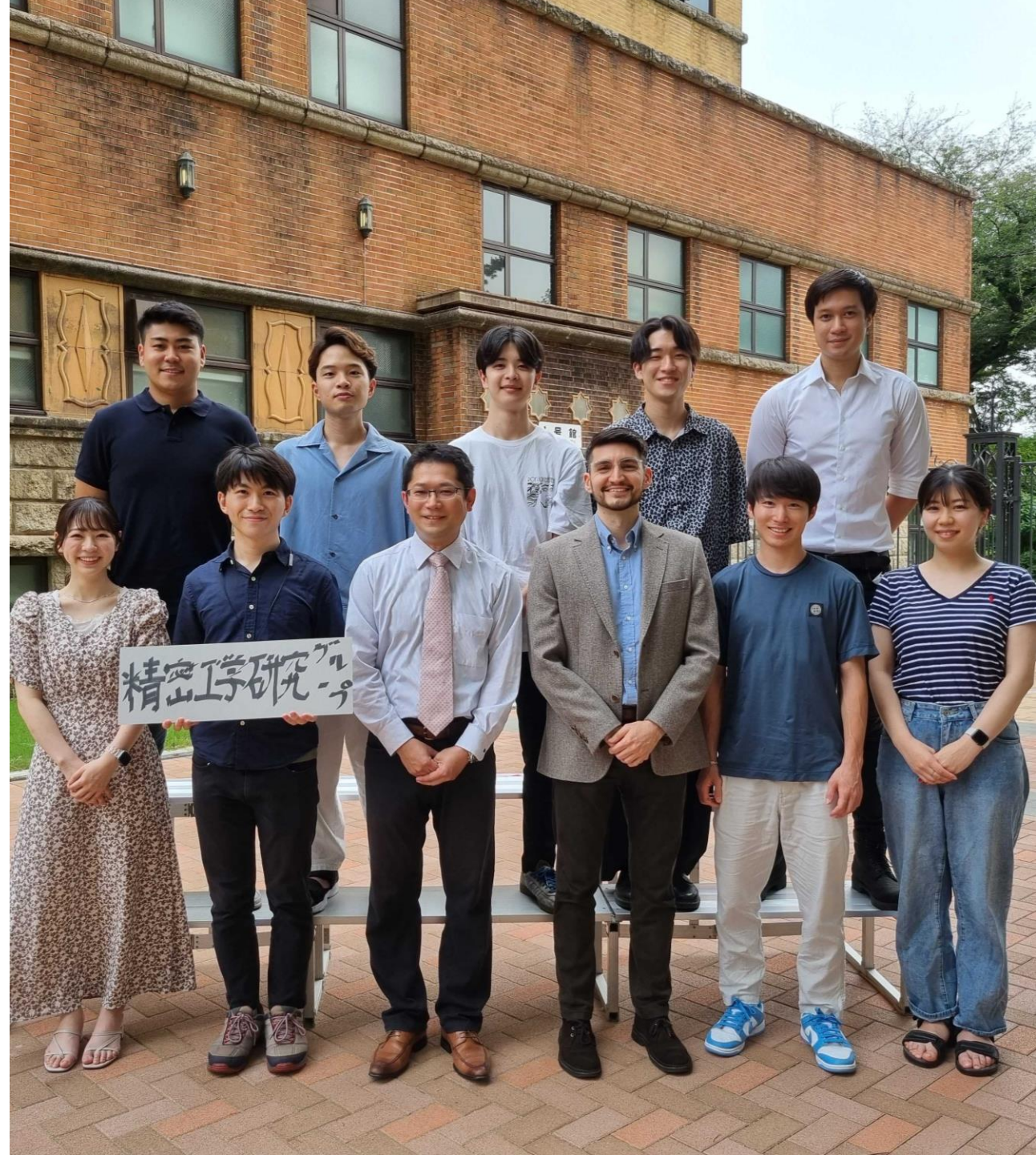
## Precision Engineering Research Group

Associate Professor – Hidetake Tanaka 

Assistant Professor – Emir Yilmaz 

### ❖ As of Fiscal Year 2022:

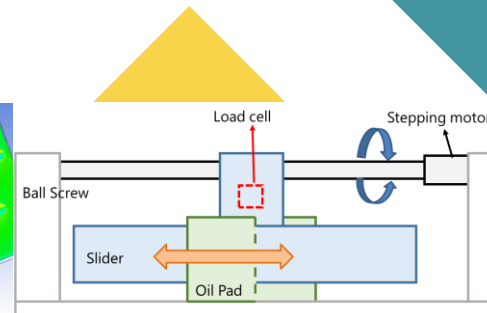
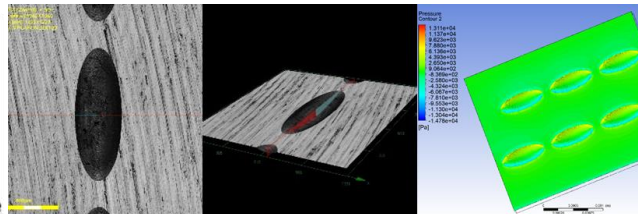
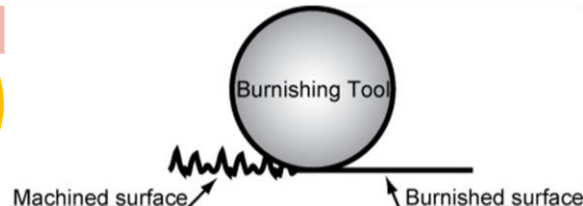
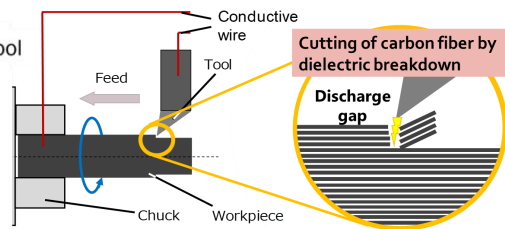
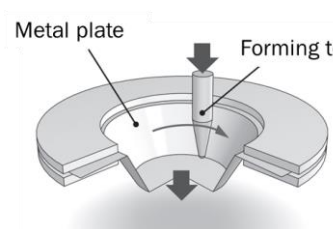
- Ph.D.: 1 student
- M.Sc.: 3 students  
- B.Sc. (4<sup>th</sup> year): 6 students 



# Research Themes

variety of topics related to...

- **Carbon Fiber Reinforced Plastics (CFRP)**
  - CAD/CAM aided evaluation and improvement of CFRP formation
  - **E**lectric **D**ischarge machining **A**ssisted **T**urning (**EDAT**) of CFRP
- **Surface Engineering/Finishing**
  - Analytical study of diamond tip burnishing process
  - Study on surface roughness effect on heat transfer enhancement via air bubbles
  - CFD analysis for surface micro-texture design optimization to reduce friction force
- **Tribology**
  - Sliding surface friction measurement/reduction system





# Techno Center

## Largest machining center in Chiyoda district!



- Built in 1962
  - used for manufacturing of experimental equipment necessary for research & education
    - ❖ hard to build materials/objects can be realized at Techno Center!
  - practical education is provided to students through various lectures & projects
    - ✓ available machinery can be used after necessary education given by the Techno Center staff
1. all processes from technical drawing creation to processing can be performed at the Techno Center
  2. can prepare your own experimental equipment thanks to abundant machinery **at the same campus!**
  3. Student Formula - [Sophia Racing Club](#)










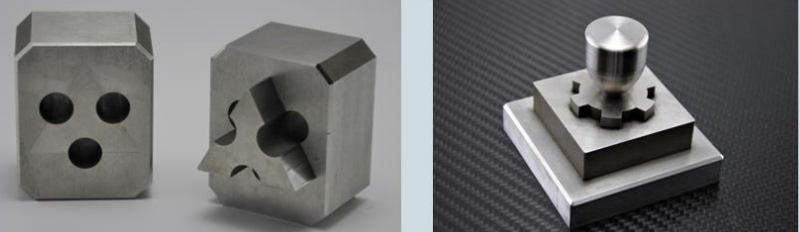
# Techno Center

## Available machinery

- Numerical control (NC) Lathe
  - Takisawa - TAC510
- 5-Axis Vertical Machining Center
  - OKUMA - MU-400VA
  - MAZAK - Integrex 200Y
- Wire Discharge Machining Machine
  - Sodick - AGL360L
- Electrical Discharge Machining Machine
  - Okuma ED-S302



# General Machining Process Equipment

NC Lathe	Cylindrical shape and precision processing of rotating bodies
	
5-axis machining center	Processing of any complex shape
	
Wire discharge machine	Cutting of high hardness materials and complex shapes
	



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# Let's move to the demonstration!

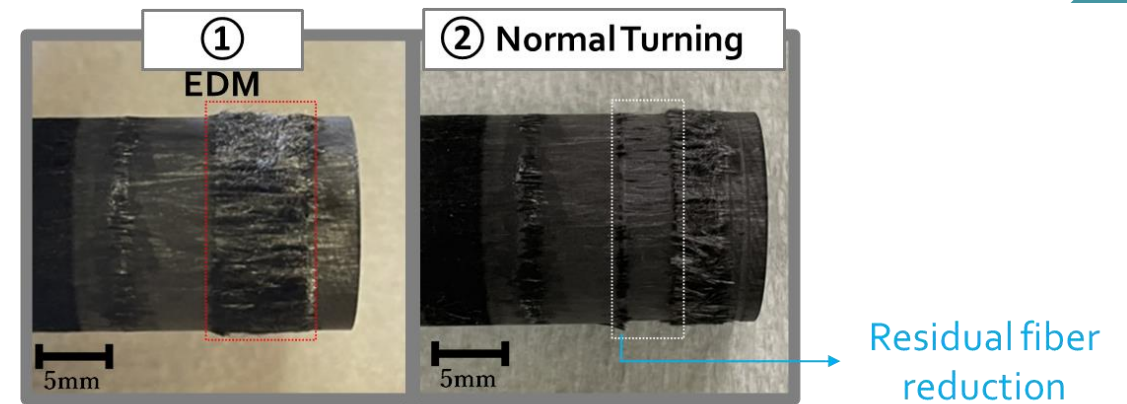
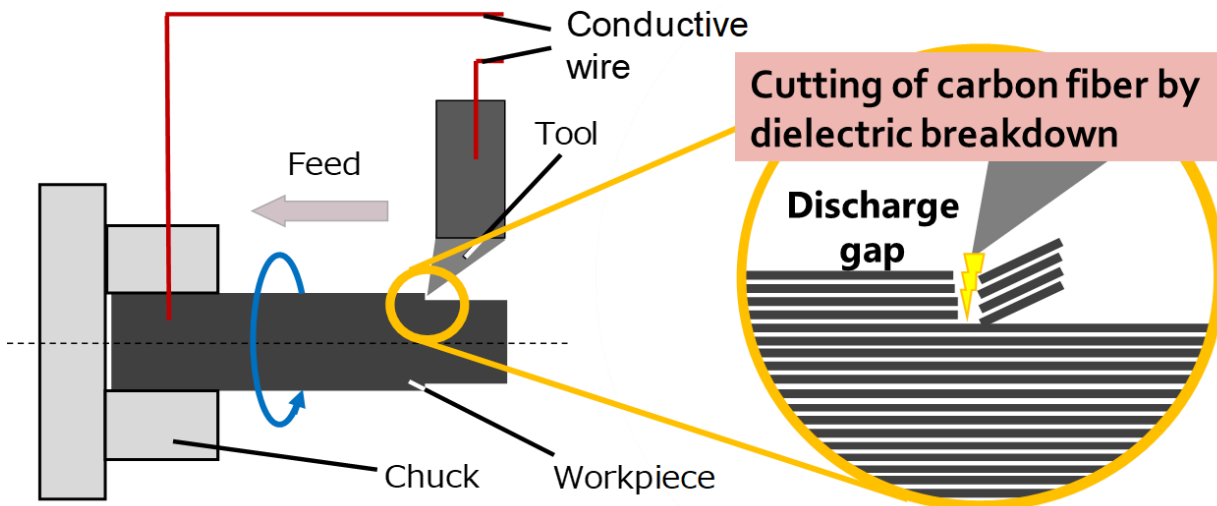
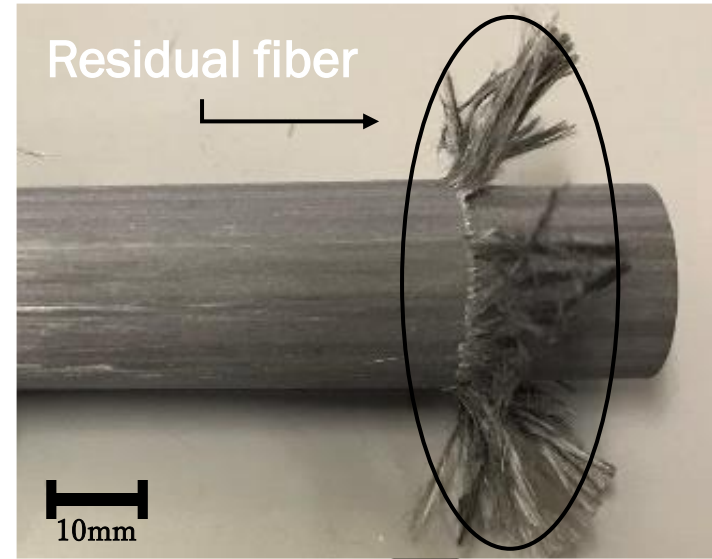
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# Electric Discharge Assisted Turning Demonstration

## CFRP : Carbon Fiber Reinforced Plastic

- CFRP usage is very common but considered hard to machine material!
- Conventional methods result in bad surface finish & additional processes are necessary
- Carbon is also a conducting material
  - using this fundamental knowledge → **EDAT** process





Sophia — Bringing the World Together



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# Thank you!

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We are waiting for your applications 😊

More information on:

<http://www.eas.sophia.ac.jp/>

<https://pweb.cc.sophia.ac.jp/yilmaz/>

