

**Interests**    Aerospace Systems, High Reliability, Data Driven Design, 3D Manufacturing & Prototyping.

**Research**    Integrated Motor Drive, PCB Design, High Frequency & Power Dense Applications.

## EDUCATION

**2018 - pres.**    **Middle East Technical University** | 4th Year  
B.S., Electrical and Electronics Engineering. CGPA : 3.00  
Minor in Mechatronics. CGPA : 3.13




## SKILLS

<b>Language</b>	<b>Turkish</b>	Native		
	<b>English</b>	Advanced (C1)		
<b>Software</b>	C/C++	HTML/CSS	Python	MATLAB
	KiCad	Altium	LTSpice	Verilog HDL
	Autodesk Fusion 360	Siemens NX	CAM/Mach3	ROS
	Rhino/Grasshopper	Autodesk Maya	Blender	
<b>Other</b>	Linux/Unix, $\LaTeX$ , Adobe (Photoshop, Illustrator, After Effects), OpenOffice (Word, Excel), 3D Printing, Laser Cutting, CNC Milling, Turning.			

## PUBLICATIONS

- F. Karakaya, **Ö. Gülsuna**, and O. Keysan, "Feasibility of Quasi-Square-Wave Zero-Voltage-Switching Bi-Directional DC/DC Converters with GaN HEMTs" *Energies*, vol. 14, no. 10, p. 2867, 2021.
- F. Tokgöz, **Ö. Gülsuna**, F. Karakaya, G.Cakal and O. Keysan, "Mechanical and Thermal Design of an Optimized PCB Motor for an Integrated Motor Drive System with GaNFETs" submitted to *IEEE Transactions on Energy Conversion* under review.
- F. Tokgöz, **Ö. Gülsuna**, F. Karakaya, G.Cakal and O. Keysan, "Design of an Optimized Axial-Flux Permanent Magnet Machine with PCB Stator for an Integrated Motor Drive System with GaNFET" *International Conference on Power Electronics, Machines and Drives (PEMD 2022)* - Oral Presentation.

## EXPERIENCES

- 2022 - pres.**     **METU ROMER | Summer Practice**  
ROMER (Robotics and Artificial Intelligence Technologies Applications and Research Center) is a center in the making, bringing together robotics researchers with the industry in a multidisciplinary setting to advance robotics science and technology.  
    > RC 6x6 Autonomous Driven Car with SLAM and Auton. Navigation.  
    ROS   Sensor Fusion   Wheel Odometry   Velodyne LIDAR   Depth Camera   Jetson Nano
- 2019 - pres.**     **METU Power Lab | Undergraduate Student Researcher**  
Power Lab is a research group in the Department of Electrical and Electronics Engineering in METU. A place where motivated graduate and undergraduate students work in power systems, power electronics, and electric machines.  
    > Design of a PCB Motor with Integrated Driver.  
    > 5 kW DC Motor Driver design and implementation.  
    Magnetic Design   Thermal Design   PCB design   I<sup>2</sup>C   SPI
- 2018 - 2019**     **METU Robotics Society | Clean Energy Team (METU-CET)**  
Clean Energy Team, a group of fresh students who are eager to develop an electric vehicle with high performance in power and efficiency.  
    > Electronics Team Member, In charge of motor driving systems.  
        Project : Brushless DC (BLDC) Motor driver design and implementation.  
    > Participated in Shell Eco-marathon Europe 2019 (London).  
    > Participated in TUBITAK Efficiency Challenge 2019 (Istanbul).  
    Proteus   Matlab/Simulink   CCS C   CAN bus

## PROJECTS

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### RC 6X6 AUTONOMOUS DRIVEN CAR WITH SLAM AND AUTONOMOUS NAVIGATION APPLICATIONS

PROJECT | 2022

[github.com/ozgurgulsuna/ME462-MechatronicDesign](https://github.com/ozgurgulsuna/ME462-MechatronicDesign)

Started as the end term project of the course mechatronics design, spring 2021-22. Main goal is to convert 6x6 radio controlled car into ROS compatible research platform. This includes placing various sensors around the car, environment awareness and ultimately localization and autonomous navigation in outdoor environments.

ROS Sensor Fusion Velodyne LIDAR Jetson Nano Depth Camera Python C++

### FPGA IMPLEMENTATION AND OPTIMIZATION OF A NETWORK QUALITY OF SERVICE ALGORITHM

PROJECT | 2022

[github.com/ozgurgulsuna/EE314-NetworkQueueing-on-FPGA](https://github.com/ozgurgulsuna/EE314-NetworkQueueing-on-FPGA)

Design, optimization, and implementation of a queueing algorithm. An exemplary decision function is constructed and tested in a simulation environment. Later weights are optimized using a genetic algorithm, more precisely NSGA-II, in a multi-objective manner. At last, implemented on FPGA with inputs from buttons and output to the user using the VGA interface

Optimization NSGA-II FPGA Altera Cyclone V Matlab Python

### DESIGN OF A TEMPERATURE CONDITIONING SYSTEM USING MODIFIED ANALOG PID CONTROLLER

PROJECT | 2022

[github.com/ozgurgulsuna/EE313-TermProject](https://github.com/ozgurgulsuna/EE313-TermProject)

Designing a responsive and accurate temperature controller is challenging due to the complexity of thermal systems and the asymmetry between the heating and cooling operations. This project focuses on the design, simulation and prototyping of an autonomous temperature conditioning system using a modified PID method.

Analog Electronics Asymmetric PID Controller KiCad Term Project Thermal Modeling

### DESIGN OF A PCB MOTOR WITH INTEGRATED DRIVER

PROJECT | 2021

[ozgurgulsuna.com/pcbmotor.pdf](https://ozgurgulsuna.com/pcbmotor.pdf)

*Abstract*—This document presents an integrated printed circuit board (PCB) motor design that is specifically optimized for compactness and power dense applications. Featuring Gallium Nitride switches and high switching frequencies to overcome the high current ripple which is a result of using PC board windings.

GaN High-Frequency PCB Motor Altium Integrated Drive C++ TMSF28375

### DC MOTOR DRIVER EXPERIMENTAL SETUP

PROJECT | 2020

[ozgurgulsuna.com/dcdriver.png](https://ozgurgulsuna.com/dcdriver.png)

Designed as a laboratory equipment, this driver controls DC motors with a generator as an input source. It has a maximum voltage of 250 volts and current of 30 amperes at the peak power of 5kW. An integrated AVR microcontroller is used to establish the serial communication. Onboard isolated DC-DC converter powers its control stage. Its protective features consist of under-voltage, over-current, short circuit, over-temperature protection, and many more.

PCB Design (KiCad) LTSpice Mechanical and Thermal Design AVR C++

### 6 WATT FLYBACK DC-DC CONVERTER

PROJECT | 2019

[ozgurgulsuna.com/flybackconverter.png](https://ozgurgulsuna.com/flybackconverter.png)

This low power bias supply is designed to provide power to a DC Motor driver's controller and gate drivers. It has primary and secondary side 12V outputs so that only a single supply can be utilized in isolated energy conversion systems. Quasi-Resonant (QR) flyback topology is used to increase efficiency.

PCB Design (KiCad) LTSpice Transformer Design QR (Quasi Resonant)

### BRUSHLESS DC MOTOR CONTROLLER

PROJECT | 2019

[ozgurgulsuna.com/rivdriver.png](https://ozgurgulsuna.com/rivdriver.png)

A custom-designed motor driver for our battery-electric vehicle "R-IV", which participated in the Shell Eco-marathon. This controller has an input voltage level up to 72V, and its nominal input is 50.4 V. The maximum current rating is 20 A. Controller and power stages of the driver are optoisolated. The onboard current sensor is used for closed-loop control. Mechanical construction consists of an aluminum case, and bolts are used as cable connectors.

Power & Control Stage Design Proteus AVR C++ CAN-Bus PID

### POLARGRAPH

EXHIBITION | 2017 & 2019

[ozgurgulsuna.com/polargraph](https://ozgurgulsuna.com/polargraph) [Presented at TIW! 2017](#), [METU 2019](#)

Polargraph, a drawing-bot which draws over any surface using pen-like utensils. It has its uniqueness in the way that it generates drawings. Couple of exhibition and numerous drawings.

Processing(Java) C++ Inkscape Raspberry Pi