PROJECT ID	PROJECT TITLE	ABSTRACT	TEAM QUALIFICATIONS	ADVISOR	Students		
PRJ01	Solar Tracking	Solar trackers allow your solar panel to follow the sun for the optimum power production. However, efficiency of such systems are questionable since installing more panels might cost less than the solar tracker. In this project, it will be aimed to develop a solar tracking system with optimal power efficiency and optimal price. In the first part of the project, the system model will be created in a simulation program. In the second part of the project, the created model will be installed. The efficiency of the developed model will be compared with the conventional one.	**3 Students from one of the areas below :** **Control systems** **Power systems**	Assist. Prof. Dr. Abdülkadir Zirek Res. Assistant Dr. Oğuzkağan Alıç	**Beyza Nur Şahin**	**Simge İlgi Ulutekin**	**Gökçe Kolcubaşı**
PRJ02	Development of a Gesture Recognition Method with Proximity Sensors and its Applications	As the technology advances, people have a need to interact with smart systems more and more. Being in direct contact with such systems to control them is one of the conventional ways of interaction. In this project, the main aim is to develop an efficient method to identify gestures based on low-cost proximity sensors. Then, this method will be applied for a use case which may include the following (can be extended): •Controlling physical systems and machines, e.g., an entertainment system •Security Systems, e.g., locking and unlocking doors. •Smart home systems, e.g., controlling lights and illumination.	**3 Students from one of the areas below :** Embedded Systems Digital Systems Software Development Signal Processing Circuit Theory	Assist. Prof. Dr. Altan Onat	**Alper Bekar**	**Necmettin Yılmaz**	**Melike Akyüz**
PRJ03	Smart Shopping Cart	For a shopper, it is usually difficult to push and maneuver a shopping cart between the aisles. In order to mitigate this burden, a self-powered cart that autonomously follows the shopper needs to be developed. For a shopper, it is usually difficult to calculate the total amount to be paid at the cashier for a long list of items while shopping. In order to alleviate this burden, shopping cart must be capable of recognizing and registering an item while it is being placed in the cart and showing the total amount to shopper.	**3 Students from one of the areas below :** Digital Systems	Prof. Dr. Atakan Doğan	**Nilsu Melis Sönmez**	**Ferhat Şener**	**Kaan Kaplan**
PRJ04	Smart Chess Board	You will design and implement a chess board that can be used to educate new players and that also allows a player to play against a chess engine like Stockfish.	**3 Students from one of the areas below :** Digital Systems	Prof. Dr. Atakan Doğan	**Necdet Sümer**	**Eray Yılmaz**	**Can Atalay Korkut**
PRJ06	Human Activity Recognition using Smartphone Sensors	Human activity recognition (HAR) is the classification of people's activities and behaviors. Nowadays, HAR is an essential part of Ambient Intelligence and Ambient Assisted Living applications that focus on improving people's quality of life. In this project, it is aimed to use smartphone sensors for performing activity recognition. Smartphones are widely used by everyone and include embedded inertial measurement unit (IMU) sensors. In this project, several physical activities like walking, lying, crawling, standing, sitting, etc. will be classified using the sensor data provided by the accelerometer, gyroscope, and magnetometer in the smartphones. To achieve this, some research topics from signal processing to machine learning approaches for classification will be covered.	**3 Students from one of the areas below :** Signal Processing(1) Machine Learning (1) Embedded Systems/Software Development (1)	Assist. Prof. Dr. Can Uysal	**İlyas İlbey İslamoğlu**	**Görkem Tütüncü**	**Ozan Akyol**
PRJ07	Device-free Fall Detection Using RF Signals	Nowadays, the number of elderly people is increasing, which makes elderly care services more important. One of the biggest threats for the elderly living alone at home is falling. For this reason, the fall detection system is a very crucial and life-saving technology for the elderly population. Conventional fall detection systems limit people's comfort and life. In this project, a device-free fall detection system that detects the falling of a person using analysis of radio frequency (RF) signals while the person itself is not required to carry a wireless device is proposed. It is also aimed to design a system that will immediately alert carers/emergency services so that help can arrive quickly after the person has fallen.	**3 Students from one of the areas below :** Signal Processing/Machine Learning (1) Telecommunication (1) Software Development (1)	Assist. Prof. Dr. Can Uysal	**Kadir Yılmaz**	**Hayri Mert Kurt**	
PRJ08	5G antenna design	5G antenna using MIMO concept is designed by simulations.	**2 Students**	Prof. Dr. Cengiz Özzaim	**Kaan Gökçen**	**Mustafa Burak Çıtak**	

PROJECT ID	PROJECT TITLE	ABSTRACT	TEAM QUALIFICATIONS	ADVISOR	Students			
PRJ09	AI-based Smart Zoom for Military Applications	Increasing the spatial resolution of an image or video can be a very important application in security or military applications. For example, a drone for military surveillance (UAV) needs expensive and bulky lens systems to produce high-resolution images with good detail from a safe altitude. For this reason, it will be of great benefit to replace this lens system with artificial intelligence supported software in order to provide high resolution images. The most basic form of this process is called upsampling and is accomplished by interpolation methods. These methods do not use multiple images or external data as they try to estimate the values of new pixels using only the existing data in the image. Super resolution, on the other hand, aims to obtain a high-resolution version of an input image, solving the same problem by using available information from multiple images of the same scene. In recent studies, machine learning methods are emerging to enable the use of data from large databases to obtain a high resolution image. In this project, potential teams will develop AI architectures for super-resolution applications and optimize them so they can run on edge devices.	**3 Students from one of the areas below :** Computer Vision (1) Machine Learning (1) Image Processing (1)	Assoc. Prof. Dr. Cihan Topal	**Esra Kanbur**		**Ahmet Alperen Polat**	**Alpcan Gürpınar**
PRJ10	AI-based Smart Zoom for Military Applications	Increasing the spatial resolution of an image or video can be a very important application in security or military applications. For example, a drone for military surveillance (UAV) needs expensive and bulky lens systems to produce high-resolution images with good detail from a safe altitude. For this reason, it will be of great benefit to replace this lens system with artificial intelligence supported software in order to provide high resolution images. The most basic form of this process is called upsampling and is accomplished by interpolation methods. These methods do not use multiple images or external data as they try to estimate the values of new pixels using only the existing data in the image. Super resolution, on the other hand, aims to obtain a high-resolution version of an input image, solving the same problem by using available information from multiple images of the same scene. In recent studies, machine learning methods are emerging to enable the use of data from large databases to obtain a high resolution image. In this project, potential teams will develop AI architectures for super-resolution applications and optimize them so they can run on edge devices.	**3 Students from one of the areas below :** Computer Vision (1) Machine Learning (1) Image Processing (1)	Associate Prof. Dr. Cihan Topal	**Fahri Fırat**		**Adnan Deniz Saraç**	
PRJ11	A much safer world	The purpose of this project is to design & develop an autonomous robot vehicle to spot a possible mine in a terrain. Here the robot must move in a terrain condition and search the square area defined by the user.	**4 Students from one of the areas below :** 2 Students for hardware support 2 Students for software support	Assoc. Prof. Dr. Emin Germen	**Kutay Kara**	**Abdullah Solmaz**	**Mehmet Haluk Arıkan**	**Enes Beydilli**
PRJ12	Let's be in tune	The purpose of this project is to design & develop hardware to make the guitar strings always in tune. If the note is not in tune, the mechanical system will react to lose or tighten the string for perfect pitch.	**3 Students from one of the areas below :** 2 Students for hardware support 1 Student for DSP software design	Assoc. Prof. Dr. Emin Germen	**Yiğitalp Özcan**		**Mert Arslan**	**Deniz Kaya**
PRJ13	On-Chip Waveguide Investigation Using Optical Fiber Alignment System	The project aims in continuation of the development of automated self-alignment system which will enable coupling of laser light into an integrated optical chip. The same system will also guide the laser light into an Optical Spectrum Analyzer (OSA) and/or photodetector. The hardware to be controlled simultaneously consists of two 3-D motorized stages, diode laser controller, photodetector, and Optical Spectrum Analyzer. The project will be conducted in a research lab environment.	**2 Students from one of the areas below :** Electronics: Electronics Design; Optoelectronics Interest and success in EEM210 and EEM403 are critical for the implementation of the project.	Prof. Dr. Feridun AY	**Göksel Çam**			

PROJECT ID	PROJECT TITLE	ABSTRACT	TEAM QUALIFICATIONS	ADVISOR	Students			
PRJ14	A Wireless Sensor Network disguised as a parking management system: Wireless Surface-Mount sensors for detecting parking space occupancy	Searching for a parking space is more painful than ever for today's drivers. In large cities, drivers spend an average of 15 hours a year searching for parking spots on the streets, in parking lots, or garages, and that causes much frustration and stress. Well, besides wasted time, not to mention wasted fuel and unnecessary emissions. The increasing rate of private car usage in the urban areas makes car parking one of the main concerns for transport and traffic management all over the world. A cost-effective, easy-to-use parking management system can reduce parking requirements by 20-40% while improving user convenience and helping to achieve other objectives. Smart parking management aims to leverage advanced sensing and monitoring technologies to optimize the usage of parking spots. There are many different intelligent parking management systems nowadays. However, with a growing scarcity of available urban land and the number of cars proliferating, there is still a need for smarter, cost-effective, and sustainable solutions. A smart parking system is simply a system that collects and disseminates real-time parking space availability data. So, can we turn an existing parking lot into a smart parking lot without laying any wires? Wireless sensors detect and report parking space occupancy, thus enabling active parking management features, such as search and navigation. This project aims to design a wireless surface-mount sensor module that is trivial to install. Once the unit is down, it should start transmitting after a few steps and will join the wireless network that it is registered on. After surrounding the entire area with sensors, the parking management system will be completed with an interface on an IoT platform that will visualize the collected information.	**3 Students from one of the areas below :** Signal processing, Software development, Control systems, Embedded systems, Telecommunications	Asisst. Prof. Dr. H. Ersin Erol	**Abdullah Mesut Güler**		**Özkan Fatih Şeker**	**Onur Tekin**
PRJ15	Control Applications on Delay Systems	Coupled tanks are widely used in process control applications in order to mix certain liquid materials while keeping the level of the specific liquids in the tank at desired level. In this project, several PI controllers will be designed for the experimental coupled tank. Then, performance of these controllers will be compared in the experimental setup.	**3 Students from one of the areas below :** Control Systems	Assist. Prof. Dr. H. Ulaş Ünal	**Fahrettin Beyazıt Tokat**		**Ahmet Alperen Özbek**	**Mehmet Ali Topaloğlu**
PRJ16	Autonomous Vehicle Design	In this project, an autonomous vehicle will be designed to satisfy certain tasks which will be determined depending on success of OKTA (otonom kara temizleme araci) and discussions with the firms covering the hardware/sofrware costs of OKTA.	**4 Students from one of the areas below :** It is expected from the students having interests at least in Embedded systems, image/signal processing, control and instrumentation, digital systems.	Assist. Prof. Dr. H. Ulaş Ünal	**Mehmet Berke Şimşek**	**Berat Altındal**	**Mustafa Can**	**Erhan Durmuş Tamer**
PRJ17	Autonomous Vehicle Design	In this project, an autonomous vehicle will be designed to satisfy certain tasks which will be determined depending on success of OKTA (otonom kara temizleme araci) and discussions with the firms covering the hardware/sofrware costs of OKTA.	**4 Students from one of the areas below :** It is expected from the students having interests at least in Embedded systems, image/signal processing, control and instrumentation, digital systems.	Assist. Prof. Dr. H. Ulaş Ünal	**Batuhan Talat Bilim**			
PRJ18	Recognition of bird species from their sounds using frequency analysis and deep learning	Purpose of this project is to recognize specific bird species from their sounds. Frequency analysis is necessary to filter bird sounds from ambient sounds. Therefore, frequency analysis will be used for preprocessing. The filtered bird sounds will be used to train an appropriate deep network architecture. After obtaining a sufficient deep network architecture, trained neural network will be integrated with preprocessing algorithm and tested with new bird sounds.	**3 Students from one of the areas below :** Signal Processing (1 Student), Machine Learning (1 Student) Telecommunication (1 Student)	Assist. Prof. Dr. Mehmet Fidan	**Anıl Çalışkan**	**Ayşegül Ayaz**	**Nisa Begüm Keskin**	
PRJ19	Electrical Characterization of a Memristor and its 2D Material Based Implementation	Purpose of this project is to understand and characterize a memristor which is fabricated by using 2 dimensional materials in the MIDAS laboratory of Eskişehir Technical University. Mainly. Firstly, 2 dimensional materials are going to be characterized using the optical microscope and Raman Spectroscopy. An autonized measurement system will be realized. The probe station in the lab will be utilized for electronic transport measurements of the device. Team members are going obtain the current-voltage (I-V) characteristics and main performance parameters of the memristor.	**3 Students from one of the areas below :** The interest and success in EEM210 and EEM321 are critical for the implementation of the project. An academic interest is also of importance as it is possible to publish a scientific paper, which will be determined by the progress of the team.	Prof. Dr. Nihan Kosku Perkgöz	**Gizem Deniş Akkaş**		**Hatice Hozer**	**Numan Yaman**

PROJECT ID	PROJECT TITLE	ABSTRACT	TEAM QUALIFICATIONS	ADVISOR	Students		
PRJ20	Characterization of a 2-Dimensional Material Based Phototransistor with temperature dependence	Purpose of this project is to understand and characterize a phototransistor which is fabricated by using 2 dimensional materials in the MIDAS laboratory of Eskişehir Technical University. Mainly. The probe station in the lab will be utilized for electronic transport measurements of the device. Team members are going obtain the current-voltage (I-V) characteristics and main performance parameters of the phototransistor including photoresponsivity, ON-OFF ratio, detectivity, mobility and etc. The I-V measurements will also include temperature dependence.	**3 Students from one of the areas below :** Electronics: Electronics Design The interest and success in EEM210 and EEM321 are critical for the implementation of the project. An academic interest is also of importance as it is possible to publish a scientific paper, which will be determined by the progress of the team.	Prof. Dr. Nihan Kosku Perkgöz	**Enes Özdemir**	**Ahmet Muhittin Özer**	**Eray Güney**
PRJ21	Indoor navigation using LiDAR	Purpose of this project is to design and develop necessary hardware, software and algorithms to implement an indoor navigation system using LiDAR. Teams are going to design and implement the entire system.	**3 Students from one of the areas below :** Telecommunication or Signal Processing (1) Digital Systems (2)	Prof. Dr. Nuray At	**Mesut Gazi Tunç**	**Nurefşan Sağır**	**Özge Cengiz**
PRJ24	Simulation of Triboelectric Energy Harvesters Performance	The aim of this project is to simulate the triboelectric energy harvester performance. The working principle of triboelectric energy harvester is based on statistic charging of two surfaces. When two materials that differ in being electron donor or acceptor undergo periodic contact and separation, the generation and transfer of electrostatic charges cause a potential difference between oppositely charged surfaces thus driving an alternating current flowing through an external load. Here, students are expected to analyze the performance of energy harvest devices via simulation in terms of material selection, design structure.	**2 Students from one of the areas below :** Electronics (2 Students)	Assist. Prof. Dr. Seval Kinden	**Melcan Türünç**		
PRJ25	Design of an ML based smart charging reservation system for EV parking lot.	In metropolitans, the problem of finding available parking slots has changed as finding available parking slots having charging stations due to increasing electric vehicle (EV) deployment. Smart management systems can be used in this manner for obtaining an optimum parking slot in EV parking lots (PLs) considering EV users' preferences. This purpose of this project is designing a smart reservation system considering the behavior of EV users, parking slot availability (PSA), state of charge (SoC) value of EVs, and PL usage history of EV users. To do this, a machine learning (ML) algorithm will be used in the smart reservation system.	**3 Students from one of the areas below :** Strong programming capability is suggested. Also, Machine Learning and probabilistic data processing is necessary capability for this project.	Assist. Prof. Dr. Sıtkı Güner	**Ali Çetinkaya**	**Tunahan Vuruş**	**Enes Pala**
PRJ26	Design of a Battery Management System with active balancing topology.	The Battery Management System (BMS) works as the brain of a battery pack. In this way, the control and management of the battery pack during charging and discharging are ensured. Cell balancing circuits of BMSs are important in order to extend the life of the batteries and to obtain maximum energy from the battery pack. The active balancing technique is not widely used because other balancing techniques are cheaper and simpler systems than active balancing topology. Active balancing topologies transfer energy from higher-performing cells to lower-performing cells to balance the voltage between battery cells using an inductor-capacitor or transformer-capacitor combination, or energy storage elements such as a switched capacitor or switched inductor. In this project, it is aimed that the battery packs have a longer life and optimum efficiency by using the active balancing topology of the BMS.	**3 Students from one of the areas below :** Strong programming capability is suggested. Also, power electronics is necessary capability for this project.	Assist. Prof. Dr. Sıtkı Güner	**Sezer Çetin**	**Alper Mandacı**	**Tuna Aykut**