#	Project Title	Brief Description	Course Advisor
1	Design and Implementation of Application Specific Programmable Logic Controller	The project aims to design and implement an Application-Specific Programmable Logic Controller (PLC) tailored to the control requirements of a selected industrial automation application. The scope includes defining system requirements, designing the PLC hardware architecture, selecting and interfacing the microcontroller, digital/analog I/O modules, communication interfaces, power supply, and protection circuitry. The project will also cover the adaptation of OpenPLC control software, including the execution of user-defined logic, I/O management, timers, counters, and basic communication functions. A prototype PLC will be manufactured and integrated with a representative industrial process to demonstrate its functionality. The system will be tested for reliability, response time, I/O performance, and communication capability, and its performance will be evaluated against the defined application requirements.	Prof. Dr. Fatih Üstüner
2	Design and Implementation of a General Aviation Flight Simulator	The project aims to design and implement a General Aviation Flight Simulator Cockpit System using existing flight simulation software. The primary focus will be on developing the physical flight controls and cockpit instrumentation required to provide a realistic pilot interface. The scope includes the design and implementation of controls such as the yoke, rudder pedals, throttle, trim controls, switches, and other essential cockpit controls, together with associated sensors, actuators, and electronic interfaces. The project will also include the development of a representative cockpit instrument panel, integrating displays and indicators for parameters such as airspeed, altitude, heading, attitude, engine status, and other essential flight information. The hardware will be interfaced with the provided flight simulation software to enable real-time bidirectional communication between pilot inputs and simulated aircraft responses.	Prof. Dr. Fatih Üstüner
3	Analysis of Electromagnetic Field Coupling to Cables for Different Cable Types and Terminal Impedances	The project aims to investigate the electromagnetic field coupling to cables under different cable configurations and termination conditions. The study will examine how cable type, geometry, shielding, length, and terminal impedance affect the induced voltage and current resulting from external electromagnetic fields. The scope includes developing analytical and/or numerical models, performing electromagnetic simulations, and conducting laboratory measurements on selected cable types and termination configurations. The results will be compared to evaluate coupling mechanisms, frequency-dependent behavior, shielding effectiveness, and the influence of terminal impedance. The project will provide practical guidelines for cable selection and termination in electromagnetic compatibility (EMC) applications.	Prof. Dr. Fatih Üstüner
4	Design and Implementation of an EMI Power Filter Matched to a DC/DC Power Converter	The project aims to design and implement an EMI power filter specifically matched to a DC/DC power converter to reduce conducted electromagnetic interference while maintaining efficient power conversion. The scope includes characterizing the converter's input/output noise and identifying the dominant differential-mode and common-mode interference components. Based on these characteristics, an appropriate filter topology and components will be selected and designed, considering attenuation requirements, impedance matching, power rating, insertion loss, efficiency, and stability. The filter will then be implemented as a hardware prototype and experimentally evaluated with the DC/DC converter using appropriate laboratory measurement techniques. The performance of the filtered and unfiltered converter will be compared in the frequency and time domains to assess the achieved EMI reduction and overall power-system performance.	Prof. Dr. Fatih Üstüner
5	Design and Implementation of an Laboratory Grade RF Signal Generator	The project aims to design and implement a laboratory-grade RF signal generator capable of producing stable and configurable RF signals over a defined frequency and power range. The scope includes the design and integration of key RF and electronic subsystems, including the frequency synthesis, signal generation, amplification, attenuation, output switching, power supply, and control interfaces. The system will provide user-configurable parameters such as frequency, output power, modulation type, and modulation parameters, as applicable to the selected design. Particular emphasis will be placed on frequency accuracy and stability, output power accuracy, spectral purity, harmonic and spurious performance, and impedance matching. The completed prototype will be characterized using laboratory RF measurement equipment, and its performance will be evaluated against defined laboratory-grade specifications.	Prof. Dr. Fatih Üstüner
6	Project topics suggested by students, provided they meet the course criteria	-	Prof. Dr. Fatih Üstüner

7	Design of mutual coupling measurement systems.	Wireless power transfer can be treated as a special case of air core power transformers, thus coupling efficiency is an important parameter. The project is based on mechanic and electrical design for measurement of the coupling coefficient of various wiring structures. The project should include mechanical design for the adjustment of distance and misalignments between the windings. Electrical design should be capable for variable frequency measurements.	Prof. Dr. Mehmet Hakan Hocaoğlu
8	Design of Lithium battery management system.	Due to their sensitive natures, cells of lithium batteries should be balanced during charge and discharge cycles. Project should apply any known active balancing systems during charge and discharge.	Prof. Dr. Mehmet Hakan Hocaoğlu
9	Design of Excel based short circuit calculation tool	Calculate the short circuit current and individual contribution of each branch in the system for any given system topology. System topology should be given in standard IEEE format.	Prof. Dr. Mehmet Hakan Hocaoğlu
10	Transformer Derating under Harmonic Loads: Excel-Based Calculation Tool According to IEEE C57.110-2008	Current components at multiples of the fundamental frequency that cause additional losses and heating in transformers. IEEE C57.110-2008: Defines safe operating limits and derating procedures for transformers under harmonic currents. Reduction of a transformer's nominal load capacity due to harmonic effects.	Prof. Dr. Mehmet Hakan Hocaoğlu
11	Excel based line parameters calculation tool	Line parameters are dependent on physical layout of the O/H lines and cables' structures. Develop an Excel based calculators to convert physical variables to an electrical one. Devoloped tool should consider earth return path and use symmetrical component theory.	Prof. Dr. Mehmet Hakan Hocaoğlu
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13	IMU-Based Position Tracking of a Handheld Detector	Development of an IMU-based position and orientation estimation system for a handheld detector. Accelerometer, gyroscope and, if available, magnetometer measurements will be acquired and processed to estimate the detector's motion and scanning trajectory. Sensor fusion techniques such as complementary or Kalman filtering will be investigated to reduce noise and drift. The estimated trajectory will be visualized and experimentally evaluated using predefined detector movements.	Prof. Dr. Mehmet Sezgin
14	Waveform Generation and Analysis Using Software Defined Radio (SDR)	Generation, transmission and analysis of different waveforms using a Software Defined Radio (SDR) platform. The student will generate continuous-wave and digitally modulated signals such as AM/FM, BPSK, QPSK or QAM using GNU Radio, MATLAB or Python and transmit them through an SDR device. The generated signals will be analyzed in both time and frequency domains. Signal bandwidth, spectrum, SNR and modulation parameters will be experimentally evaluated.	Prof. Dr. Mehmet Sezgin
15	Athlete Behaviour Analysis Using Image Processing	Development of an image/video processing system for automatic analysis of athlete behaviour and movements. Video sequences will be processed to detect and track a person and extract relevant motion or pose information. Image processing and/or deep-learning-based pose estimation techniques may be used to recognize selected actions such as walking, running, jumping or predefined sport-specific movements. The performance of the developed system will be evaluated using recorded video sequences.	Prof. Dr. Mehmet Sezgin
16	Deep Learning-Based Data Classification	Design and implementation of a deep-learning-based classification system for engineering data. A suitable dataset consisting of sensor signals, images or other measurement data will be selected and preprocessed. Different neural network architectures such as MLP, CNN or lightweight deep-learning models will be trained and compared. Classification performance will be evaluated using accuracy, precision, recall, F1-score and confusion matrices, with particular attention to computational complexity and practical applicability.	Prof. Dr. Mehmet Sezgin
17	One-Shot Learning-Based Classification	Development of a one-shot/few-shot learning system capable of recognizing classes from a very limited number of training samples. Metric-learning approaches such as Siamese Networks or embedding-based classification will be investigated and implemented. The method will be tested on an appropriate image or signal dataset under different numbers of available training samples. Its performance will be compared with a conventional supervised classification approach to demonstrate the advantages and limitations of one-shot learning.	Prof. Dr. Mehmet Sezgin
18	AI-Based Fault Detection from Vibration Signals	This project focuses on detecting and classifying faults in rotating or electromechanical systems using vibration measurements and artificial intelligence techniques. Vibration signals obtained from motors, fans, bearings or publicly available datasets will be analyzed in the time and frequency domains. Features such as RMS value, variance, kurtosis, spectral components and frequency-domain energy may be extracted, or alternatively raw signals/spectrograms may be directly processed using deep-learning methods. Machine-learning or deep-learning models will then be trained to distinguish normal and faulty operating conditions. The developed methods will be compared using classification accuracy, precision, recall, F1-score and confusion matrices, and their suitability for practical condition-monitoring applications will be discussed.	Prof. Dr. Mehmet Sezgin
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24	AI-Based Smart Energy Management System for a Solar-Powered EV Charging Station	The project will develop an intelligent energy management system that coordinates PV generation, battery storage, grid power, and EV charging to minimize electricity costs and peak demand. Machine learning or optimization algorithms such as Genetic Algorithm, PSO, or NSGA-II can be used to determine optimal charging and discharging schedules. The system can be modeled and tested in MATLAB/Simulink using realistic solar irradiance, electricity tariffs, and EV charging profiles.	Prof. Dr. Nedim Tutkun
25	Digital Twin of a Grid-Connected Solar PV and Battery Energy Storage System	This project will develop a digital twin that continuously represents the operating condition of a grid-connected PV–battery system using real-time or simulated measurements. The digital twin can be used to monitor system performance, detect abnormal operating conditions, and predict energy production and battery behavior. MATLAB/Simulink, IoT communication, and data visualization can be integrated to create a practical and innovative prototype.	Prof. Dr. Nedim Tutkun
26	AI-Based Maximum Power Point Tracking for Photovoltaic Systems Under Partial Shading	The project will investigate an intelligent MPPT controller capable of extracting maximum power from PV panels under rapidly changing irradiance and partial-shading conditions. Artificial Neural Networks, Fuzzy Logic, Reinforcement Learning, or metaheuristic optimization can be compared with conventional methods such as Perturb and Observe and Incremental Conductance. The proposed controller will be implemented in MATLAB/Simulink and evaluated according to tracking efficiency, response time, and power fluctuations.	Prof. Dr. Nedim Tutkun
27	Smart Home Energy Management with Vehicle-to-Home (V2H) Technology	This project will design a smart home energy management system in which an electric vehicle can act as a controllable energy storage unit and supply electricity to household loads when appropriate. An optimization algorithm will determine when the EV should be charged from the grid/PV and when it should discharge to reduce electricity costs and peak demand while maintaining user comfort. The system can be developed in MATLAB/Simulink and evaluated under different electricity tariffs, PV generation profiles, and household consumption scenarios.	Prof. Dr. Nedim Tutkun
28	AI-Based Predictive Maintenance System for Electric Motors	The project will develop an intelligent condition-monitoring system capable of detecting and classifying common electric motor faults such as bearing defects, winding faults, and mechanical imbalance. Current, voltage, vibration, or acoustic signals can be collected from a motor test setup and analyzed using machine-learning techniques such as CNN, SVM, or Random Forest. The final system can provide an early-warning mechanism and demonstrate how AI can reduce unexpected failures and maintenance costs in industrial electrical systems.	Prof. Dr. Nedim Tutkun
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30	Design of an Inner/Outer-Rotor Brushless DC (BLDC) Motor	This project aims to determine the fundamental dimensions, winding configuration, and operational parameters of an inner/outer-rotor BLDC motor suitable for in-wheel applications.	Dr. Esra Çelik
31	Electromagnetic Design of a Permanent Magnet Motor	In this project, it is aimed to perform the comprehensive electromagnetic design of a permanent magnet motor, focusing on the evaluation of its magnetic equivalent circuit and the reduction of cogging torque.	Dr. Esra Çelik
32	Dynamic Modelling of an Electromechanical System	This project involves deriving the mathematical model of an electric machine, analyzing its transfer function, and simulating its step response and overall dynamics using MATLAB/Simulink.	Dr. Esra Çelik
33	Coupled Electromagnetic and Thermal Modelling of a PMSM	In this project, it is aimed to develop a multi-physics simulation model that combines the finite element electromagnetic analysis of a PMSM motor with its thermal performance under continuous load.	Dr. Esra Çelik