List of capstone projects (112)

	Project Title	Advisor (s)	Project Description	Pre-requisites	Needed Equipments
A.	Wideband Indoor Channel Characterization	Dr. Saad Al-Ahmadi Dr. Asrar Sheikh Dr. Ali Muqaibel	Wideband indoor and indoor-to-outdoor channel characterization is very essential for the design and analysis of wireless communication schemes that operates over such channels. The availability of channel sounding equipment in the TRL lab makes it possible for our students to practice channel measurements and carry out subsequent modeling. In this project, the students are expected to conduct the measurements and use them in extracting the basic temporal and possibly spatial parameters of measured channels.	EE 370 and EE 315.	
B.	Near Field Communication (NFC) system for campus services	Dr. M. Mohandes, Dr. M. Deriche	In this project the student will utilized NFC technology to implement all campus services, including, identification, e-payment, access control, medical services, library and so on.		
C.	Investigation of the possibility of designing high Precision Thickness measurement tool.	Dr. A. Yamani	Ultrasonic thickness measurement is limited by the wavelength of the wave propagating inside the material and the instrument bandwidth limitation. In this project, it is intended to investigate the possibility of using signal processing techniques to reduce the narrow band limitation and thus increase the resolution of the measuring instrument.	MATLAB, EE406 desirable.	
D.	Automatic Product Quality Control Using NI Compact Vision System	Dr. Abdelmalek Zidouri	The aim of the project is to develop a suite of image processing algorithms that are not computationally expensive and which could be implemented in real time. The project will be implemented using the National Instruments Compact Vision System (NI CVS-1450) which was recently acquired by the EE Dept. The students can use recently implemented senior projects as reference.		Conveyor belt with motor
E.	Design of Printed antenna	Dr. Sheikh Sharif Iqbal	In recent the need for small and miniature antennas has increased due to the reduction of sizes of communication		

	for Wireless communication		devices. This project will design a printed antenna for wireless communication devices. Five (hour long) lectures will be delivered to introduce the basic concept and equations needed to design the antenna. Students will also receive hands-on training on the software simulator that will be used to simulate and optimize the antenna. The proposed antenna will be planar in nature and will operate in S-Band or X-band (to be decided later)		
F.	Experimental Evaluation of the Performance of Digital Communication System	Dr. Maan Kousa Dr. Ali Muqaibel	Build a complete digital communication system using TIMS modules. Design the various components of the system. The system will then be evaluated based on BER performance. The effect of noise and bandlimited channels will be examined. The experiment will cover baseband and passband modulation, binary and M-ary modulation, uncoded and coded systems. Experimental results will be verified with theorital equations and/or MATLAB simulation as appropriate Design Content: 1) Electronic circuits (power supply), display , decoders. 2) Use of Wireless transceiver chipset. 3) Microcontroller Circuit. 4) Software programming.	EE 370 it would be helpful if some students in the group had EE 417, though it is not a requirement)	
G.	Development of Wireless Controlled Display.	Dr. Ali Muqaibel	One of the common problems we face in our prayer rooms within our work place is the need to update the prayer iqama time frequently. It is usually done by posting papers with the prayer time. The paper must be changed frequently and by the authorized person. This lead to many problems! In this project the students will continue adding some	It is recommended that some students has finished EE390.	

			features to a wirelessly controlled display. The development may include adding some other wireless technologies like WiFi in addition to the Bluetooth based control. Adding authentication…etc and advanced features like brightness control…etc.		
H.	Digitally controlled RF power meter for cell phone coverage measurements	Dr. Oualid Hammi Dr.Mohammad Sharawi	In this project, the students will prototype an RF system that will be used for evaluating the wireless coverage quality inside KFUPM buildings. The system will cover at least two frequency bands. The RF front-end will be designed and combined with a digitally controlled RF power measurement device. The RF front-end will consist of one or more antenna(s) to be designed and fabricated by the students, along with commercial components to perform the filtering and signal amplification. The students will end up with a complete prototype that integrates both RF and digital parts. This prototype will be used to measure cell-phone and/or WiFi coverage in KFUPM buildings and identify weak spots.	Understanding of wireless communication systems. (EE370) Basic knowledge of RF and microwave will be beneficial. (EE422)	
I.	Design of a dielectric coated slotted circular cylinder impeded in a corner reflector	Dr. Hassan Ragheb Dr. Essam Hassan	Design a new antenna which consists of dielectric coated slotted cylinder impeded in a conducting corner reflector. Students will measure the radiation pattern of the antenna and compare it with the radiation from the coated slotted cylinder without reflector.		
J.	Microcontroller Based Power Factor Corrector Design	Dr. M. A. Abido Dr. Alaa Hussein	Power factor is the relation between the KW and the KVA drawn by an electrical load where the KW is the actual load power and the KVA is the apparent load power. It is a measure of how effectively the current is being	EE 390	

			converted into useful work output and more particularly is a good indicator of the effect of the load current on the efficiency of the supply system. A load with a power factor of 1.0 will result in the most efficient loading of the supply and a load with a power factor of 0.5 will result in much higher losses in the supply system. The objective of the project is to design a power factor continuous monitoring system for variable single phase loads. This can help the industrial utilities to monitor and improve their power factors. The project involves the following steps: - 1. Design a voltage measuring circuit. 2. Design a current sensing circuit. 3. Design a comparator circuit and calculate the phase shift. 4. Examining the performance of the designed monitoring system under different load power factors.		
K.	Design of a Stand-Alone Inverted Pendulum on a Cart	Dr. Hakan Koroglu Mr. Zeeshan Rizvi	This project aims at the design of an inverted pendulum on a cart. The design will be based on a general physical model of the system in which the system parameters (like, cart mass, rod length etc.) has to be chosen and an analog controller has to be designed. The choice of the parameters should be made in view of the fact that the system will be stand-alone and the analog controller will be implemented via an op-amp circuit that relies on batteries as power supplies. The goal of the controller is to stabilize the rod in upward position. The intended design method is observer-based controller synthesis. The main project work is to perform and test the design	Matlab, Simulink EE 380, EE305	

			with Matlab/Simulink. In case of a successful design at an early stage, implementation of the design might also be considered.		
L.	Behvioral modeling of RF transmitters for LTE applications	Dr. Oualid Hammi	Emerging LTE standard uses compact modulations (such as 64QAM) and advanced access techniques (e.g. orthogonal frequency-division multiplexing (OFDM)) to achieve high data rates and support large number of users. This results in amplitude modulated signals that are very sensitive to the nonlinear distortions generated by the transmitter's RF front-end and especially the power amplifier. In this project, the students will work on the modeling of these nonlinearities. First, the LTE standard will be studied and a real LTE signal will be generated using Advanced Design System Software. This signal will be used for the characterization of a power amplifier prototype. The measurement will then be processed in Matlab software to derive behavioral models of the power amplifier using existing structures. It is expected that the students introduce some improvements to existing behavioral models.	Understanding of wireless communication systems. (EE370) Students should be familiar with Matlab. Basic knowledge of RF and microwave will be beneficial. (EE422)	
M.	Design of a Stand-Alone Inverted Pendulum on a Cart	Dr. Hakan Koroglu Mr. Zeeshan Rizvi	This project aims at the design of an inverted pendulum on a cart. The design will be based on a general physical model of the system in which the system parameters (like, cart mass, rod length etc.) has to be chosen and an analog controller has to be designed. The choice of the parameters should be made in view of the fact that the system will be stand-alone and the analog controller will	Matlab, Simulink EE 380, EE305	

			be implemented via an op-amp circuit that relies on batteries as power supplies. The goal of the controller is to stabilize the rod in upward position. The intended design method is observer-based controller synthesis. The main project work is to perform and test the design with Matlab/Simulink. In case of a successful design at an early stage, implementation of the design might also be considered.		
N.	Design and implementation of System for Monitoring Level in Underground Storage Tank	Dr. Munir Mr. Eyas Al-Suhaibani	Level measurement in underground tank is essential in many applications. In this project students will use ultrasound sensors to sense the level and design the required conditioning circuit to display the level in the tank. Students will learn about real life complete measurement system	Will be better if at least one student taken EE 434	
O.	Smart Charging of Electric Vehicles with All-Green Energy in the Smart Grid Arena	Dr. Ali Al-Awami	The objective is to design smart strategies for charging a fleet of electric vehicles using energy generated from renewable energy sources, such as solar and wind. The design might involve the use of storage media as well. Several objectives will be investigated, such as maximizing utilization and maximizing fleet owner profitability.	Reasonable mastering of Matlab.	
P.	QoS Improvement for Satellite Communications	Dr. Kamal Harb Dr. Samir Abdul Jauwad	Satellite system proved to be the best method of communication for different areas when other communication systems could not be applied. This project will focus on improving the Quality of Service (QoS) for satellite system based on different atmospheric weather conditions. Students will be provided with the previous work done (projects, papers, etc.) and an explanation of the proposed scheme and analogy, and will be asked to improve satellite's system performance.	EE 370 and EE 315.	
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