

Graduation Design Project Proposal Form

Project # E1

Project Title: Design, Manufacturing and Characterization of a low cost silicon pn junction solar cell
Professor(s) Name(s): Dr. Mohamed Ramy; Dr. Nacer Debbar
Number of Students: Two
Students Qualifications 1. Willing to get involved in extensive experimental work. 2. Should have completed EE310.
Statement of Problem Solar cells are nowadays widely used for power generation. Saudi Arabia, being rich in solar energy, is now developing solar cells based on conventional manufacturing technologies. Development of low cost solar cells is vital for solar power to compete with traditional power generation methods. This project will deal with the design, manufacturing and characterization of a low cost pn junction solar cell using conventional silicon wafers.
Objectives 1- To design and simulate a silicon pn junction solar cell. 2- To manufacture a silicon solar cell using microfabrication techniques. 3- To characterize the performance of the fabricated solar cell.
Technical Approach <ul style="list-style-type: none">• Literature review on device structures, operational concept and fabrication techniques of silicon pn junction solar cells.• Design of the solar cell device structure. Proper choice of materials: silicon wafers, dopant material, and antireflection coating film.• Simulation of a silicon pn junction solar cell using dpvdm simulation software for photovoltaics. Simulation will take into consideration available/acquirable materials as well as achievable doping concentrations, and junction depths.• Simulation of the antireflection coating for the solar cell.• Manufacturing the solar cell using microfabrication techniques: spin/dip coating, dopant diffusion, etching and coating techniques. Low cost fabrication techniques will be favored.• Characterizing the solar cell performance: current-voltage characteristics and efficiency.• Comparing experimental and simulation results.
Expected Deliverables <ul style="list-style-type: none">• Simulation results.• A working prototype of a pn junction solar cell• Solar cell characterization results.

Project # E2

Project Title:	Design and implementation of Oil Wells Monitoring System.
Professor(s) Name(s):	Dr. Nacer Debbar & Dr. Mohamed Ramy
Number of Students:	Two
Students Qualifications:	<ol style="list-style-type: none">1- Should have completed EE310 and EE401,2- Certain knowledge of simulation packages for electronic circuits3- Certain knowledge of logic design.
Statement of Problem	<p>In oil fields, corporations need monitoring of oil production from within their base without the need to walk through the field. This electronic system will tackle such a need.</p>
Brief Description of the Project	<p>The project involves the design of a control system to monitor the output of field of 16 oil wells. The output of each well is measured with a flow meter that outputs a binary digit number corresponding to one of the following four flow conditions:</p> <ol style="list-style-type: none">1. 00 no flow2. 01 33.3 % flow3. 01 33.3 % flow4. 11 100 % flow <p>In the first phase the team will identify the different tasks required by the system. They will then formulate the design problem in block diagram form. Using software packages they simulate the system and re-adjust the design as necessary until a working system that meets all requirements is achieved.</p> <p>In the second phase, the team will work to implement a prototype of the system. They will shop for needed components and make a cost estimate of the system. The prototype will finally be tested to ensure that the desired results are achieved. In case, the performance is not found to be up to the mark, the design cycle will be repeated.</p>

Objectives

The project is intended to:

- 1- give students a hands-on experience of designing complex electronic systems,
- 2- illustrate to students how to use state of the art techniques and technologies learned in the program to realize a working system
- 3- expose students to projects that are multi-disciplinary in nature: Electronics, mechanical engineering, optoelectronics, digital signal processing, etc.

Technical Approach and Expected Deliverables

System Requirements:

- 1) The system should use the 60 Hz, 110 power lines for power supply and timing.

Deliverables:

- Block diagram of system design
- Simulation of all electronic circuits
- A working prototype

Technical Requirements:

- Good circuit design skills. Knowledge of digital circuits, logic levels, and interfacing of digital ICs is essential. This system requires also some analog design skills related to opamps and signal conditioning.
- Electronic circuit simulation using the available software.

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Track	Electronic Engineering		Project no	E3
Project Title	GPS/GIS based Car Monitoring System (GPGIS)			
Supervisor(s)	Prof. M. Abouelela , Dr. Bandr Elmashary			
Number of Students	Two	Students Qualifications	EE401 + EE353	
Statement of Problem	<p><i>The concept of intelligent transportation system (ITS) is gaining interest worldwide including the ministry of transportation in several countries. Traffic Monitoring Systems had been developed and approved by the several ministries of transportation and interior all over in the world. Although they relatively succeeded to force drivers to respect traffic rules (speed limit, and street signals), it would not be able to rectify their driving behavior, nor monitoring them continuously and everywhere. This project aims at proposing an implementing a monitoring system that will be installed in the vehicle. This system measures and record driver bad behavior using a data acquisition approach based on several discrete data types: vehicle speed, acceleration, waving and sudden stops .etc.. . The proposed system is a μ-controller based system that receives and store data representing the driver behavior. This data may be transferred using internet links to a central or regional monitoring location where the driver behavior can be evaluated. Warning message will be sent to drivers from this location with precaution of being punished if they continue their bad behavior. The warning message may be generated and displayed locally from the system installed in the vehicle. The GPS (Global Positioning System) module in addition to the GIS (Geographical Information System) layer maps were found to be able to determine most of these behavior .Other sensors are also may be used for extra monitoring. The system needs an internet connection in order that we can download the GIS maps and use the GPS.</i></p>			
Brief Description of the Project	<p>In this work we aim at developing a simple and low cost μ-controller based system that increases the efficiency of ITS by rectifying the behavior of vehicle drivers. Several sensors will be used within the car area that can detect driver bad behavior and encode them using μ- controller. The resulted encoded digital messages are transferred to a central office daily. A copy of these messages can be accessed by the driver himself in order to be aware about his bad action .A Web based communication link will be designed and use to connect both car and the central office . The system function will depend mainly on using a GPS module and a software for the GIS traffic sign maps for identifying most of the driver behaviors.</p>			
Objectives	<p>(1) Understanding different Types of sensors used in measurements and instrumentation .</p>			

	<p>(2) Design and test adaption circuits that interface several types of sensors with μ- controller .</p> <p>(3) Learning the principles of using μ- controller in embedded systems and the associated software tools.</p> <p>(4) Developing a driving software and GUI for the car monitoring system</p> <p>(5) Design and implementation of a suitable communication link to transfer data to the central office.</p> <p>(6) Learning how to use available software for GPS and GIS.</p>
<p>Technical Approach and Expected Deliverables</p>	<p>(a) Practicing techniques for attaching different types of sensors to a μ-controller boards.</p> <p>(b) Developing the software needed to complete the system operation .</p> <p>(c) Processing the collected data from sensor and preparing daily report.</p> <p>(d) Design the webpage that display the behavior of each car driver.</p> <p>(e) Integrating the above system components into one equipment that can be fixed in the car housing.</p>

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Project # E4

Project Title: Load management for solar energy powered systems
Professor(s) Name(s): Mohamed Alturaigi and Mohamed Abouelela
Number of Students: Two
Students Qualifications Basic knowledge of electronics and microcontrollers and programming skills using C language
Statement of Problem Nowadays Photovoltaic (PV) energy conversion is one of the most used alternatives to generate power to avoid problems are pollution, cost, energy losses, etc. Energy saving is one of the objectives that have to be taken into consideration when designing new building. One basic principle in power saving is load management . The PV source is only available during day hours. Energy has to be stored if used by night . The storage element cost is very high relative to other system components . Load management is needed to consume most of the generated power during the day hours and hence reduce the size of the storage elements . The energy losses due to the lake of energy management in buildings overloads the power system and may cause power shutdown. The Availability of low-cost sensing and processing modules as well as recently developed efficient wireless communication protocols for building automation applications provide the basic enabling tools for the application domain of smart buildings and load management.
Brief Description of the Project The proposed project employs tools and techniques of modern sensing, processing, and networking to develop optimized energy usage solutions for solar powered houses . The plan consists of development efforts across two major topics: 1. Development of distributed sensor-based techniques and embedded algorithmic processes to measure, detect, estimate, and manage energy consumption in a given building. 2. Development of local-area wireless communication and networking systems and adaptation of available protocols to enable the distributed sensing and processing devices to interact with each other .
The Objectives are to: 1- Help users to manage their power consumption 2- Reduce Energy losses in modern building by adding more smart features. 3- Realizing approximate efficient energy consumption during the day hours to avoid using extra energy storage element .

Technical Approach and Expected Deliverables

A microcontroller based system will developed where the sensor reading can be acquired and proceed. The microcontroller will also provide an interfacing with the RF modules through its UART. A software will be developed to control the system functions and allow different communication channels for each sensor .

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Project # E5

Project Title: Design of optical fiber communication link
Professor(s) Name(s): Dr. Ehab Awad, and Dr. Mohamed Ramy
Number of Students: Two
Students Qualifications: General knowledge in electronics and/ or communications.
Brief Description of the Project: <p>A typical fiber optical communication link consists of transmitter, optical fiber, and receiver. At the transmitter end, the electrical data is modulated on LED or Laser light. At the receiver end, a photo-detector is used to convert optical data back into electrical signal, which is then demodulated.</p> <p>In this project, a simple fiber optic communication link will be designed and built. The students will buy the components and assemble it by themselves. An input data channel will be modulated onto light and transmitted over an optical fiber link using amplitude modulation technique. At optical fiber end, the receiver will detect the transmitted data and demodulate it using a photodiode to extract the original transmitted data.</p>
Objectives: <p>In this project the students will learn about:</p> <ol style="list-style-type: none">1- Optical fiber.2- Optical communication link.3- Optical amplitude modulation.4- Transmitters and receivers.
Technical Approach and Expected Deliverables: <p>By the end of project, the students will:</p> <ol style="list-style-type: none">1- Design an optical communication link.2- Build a communication link3- Transmit and receive optical data.4- Write a technical report.

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Project # E6

Project Title: Water/Gas leakage Detection and Control using Android and GSM
Professor(s) Name(s): 1. Prof. Mohamed Alturaigi 2. Dr. Mohamed Abbas
Number of Students: Two
Students Qualifications Capable of dealing with hardware and software
Statement of Problem Gas and/or Water leakage fast detection is an important issue for safety and economy of life nowadays. The delayed detection of water leakage might lead to the damage of home furniture and , in sometimes, it might be dangerous to home foundations. Furthermore, the price of potable water is not low, which might cause unnecessary high water bill. In fact the problem becomes more prominent in the countries that do not have plenty of water resources. The kingdom is an example. Gas leakage detection is not less important than water leakage detection , though the causes might be different. None-early detection of gas leakage might cause big disasters. starting from big fires to people death.
Brief Description of the Project In this graduation project, the students should develop a detection , warning and control system to do the following tasks: 1- Detect whether there is a gas/water leakage. 2- Send an instant message to the owner (house hold) to take an appropriate action. 3- Close some valve/ open windows or turn on an alarm serine if necessary. The system will be built using Arduino micro-controller in conjunction with suitable sensor. in addition, the system will incorporate a GSM module for full duplex communication purpose . The user can therefore send a command to the controller to close some valves and or open windows, etc...
Objectives The project will be run in two phases. By the end of the first phase the team should <ol style="list-style-type: none">(1) Capable of understanding the operation of Gas and /or Water leakage sensor.(2) Set the block diagram and explain the operation of the detection system.(3) Present the simulation results and Write the required documents.(4) Defend his work in front of examining committee The second phase of the project will be the implementation of the system designed and simulated in the first Term.

Technical Approach and Expected Deliverables

The approach of the project is as follows:

- 1- the student will revise the characteristics of Gas/Water sensor.
- 2- Propose the system block and discuss the proposal with the super visor.
- 3- Revise the utilization of Microcontroller .
- 4- Simulate the proposed circuit to check the correctness of the implementation.
- 5- Write the report thesis and defend the first stage

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Project # E7

Project Title: Heart Rate Monitoring and Tracking System for Elderly using Android and GSM.
Professor(s) Name(s): 1. Dr. Mohamed Abbas 2.
Number of Students: Two
Students Qualifications Capable of dealing with hardware and software
Statement of Problem Worldwide , Cardiovascular diseases (CVDs) are considered the leading cause of death. More and more people are dying every year from CVDs than from any other cause. An estimated 31% of all global deaths is due to Cardiovascular diseases 2012. The ratio represents 17.5 million people. Of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke.[1]. In the Kingdom of Saudi Arabia, Cardiovascular diseases represent the leading cause of death.[2,3] According to reports from 2008 to 2010, total of 50,213 men and 42,790 Saudi women with the disease visited primary healthcare centers. Providing good quality of life of the people suffering from heart diseases is a noble goal. Giving more freedom for those people to freely move around while keep an eye on them could be a way to achieve the goal. People with CVDs could be suddenly heart attacked. Interfering those cases quickly can save their lives..
Brief Description of the Project In this graduation project, within two phases, it is intended to develop a wearable device to detect the heat rate, oxygen level of the person under monitoring. Upon the detection of abnormality, the device will send a warning message to a responsible person, who can interfere and rescue the life of person under monitoring. The device will be composed of heart signal and oxygen level sensors. The sensor signals will be processed by an Arduino microcontroller to detect whether a problem exists. Up on the detection of a problem the system will send a message including the status and GPS information of the person under monitoring to a nurse station/patient 'relative . The system will use GSM and Android technology.

Objectives

The project will be run in two phases. By the end of the first phase the team should

- (1) Capable of understanding the operation of heart rate and blood oxygen sensors
- (2) Set the block diagram and explain the operation of the detection system.
- (3) Present the simulation results and Write the required documents.
- (4) Defend his work in front of examining committee

In the second phase, the project will be implemented and test results will be collected

Technical Approach and Expected Deliverables

The approach of the project is as follows:

- 1- the student will revise the characteristics of heart rate/oxygen sensors.
- 2- Propose the system block and discuss the proposal with the supervisor.
- 3- Revise the utilization of Microcontroller .
- 4- Simulate the proposed circuit to check the correctness of the implementation.
- 5- Write the report thesis and defend the first stage

References

- [1] *World Health Organization | Cardiovascular Diseases (CVDs) Fact sheet*
<https://www.who.int/mediacentre/factsheets/fs317/en/>
- [2] *World Health Organization, Saudi Arabia*
https://www.who.int/nmh/countries/sau_en.pdf
- [3] *Ministry Of Health (MoH) | Cardiovascular Diseases Cause 42% of Non-Communicable Diseases Deaths in the Kingdom*
<https://www.moh.gov.sa/en/ministry/mediacenter/news/pages/news-2013-10-30-002.aspx>