

18/1/2021

IMPORTANT ANNOUNCEMENT

SENIOR DESIGN PROJECT 1

All the students who registered for senior design project 1 (EE 4980), please form your group (each group must consist of **THREE** students) then select **five** of the following proposals by using the attached form, and submit it to the senior design project coordinator before or on **Wednesday 20/1/2021**.

If two groups select the same project, the priority will be given to the group with the higher average GPA.

If you have any further questions about the proposals, you can contact directly with the corresponding supervisors.

Dr. Maisara Mohyeldin Gasim

Senior design project coordinator

List of proposals:

No.	Title	supervisor
1	GSM based Home Automation System	Dr. Mahmoud Ahmed Abdelghany
2	Robotic Arm	Dr. Alaa El-Sayyad
3	Traffic Control using PLC Control System (Design and Implementation)	Dr. Ahmed Nassef
4	Electric Vehicle Charging System by Thermoelectric Generator	Dr. Kanagaraj
5	Wireless Channel Modeling of Sand Environment	Dr. Saud Al-Hajaj
6	Microcontroller and GSM utilization for Monitoring and Controlling Substation	Dr. Yousef Daradkeh
7	Design of a Solar-Powered Desalination System using HOMER software	Dr. Hegazy Rizk
8	Mobile Robotics	Dr. Saud Al-Hajaj
9	Arduino-based Chaotic Secure Communication System	Dr. Medien Zeghaid
10	Heartbeat Measurement System Using Arduino	Dr. Ehab Mahmoud Mohamed
11	Earthing System Study	Dr. Omer Mohamed Abdalla

PROJECT SELECTION FORM

No.	Student name	Student number	GPA	Student Signature	Phone number
1					
2					
3					

Write the number of the proposal in your priority order (write only the project number)

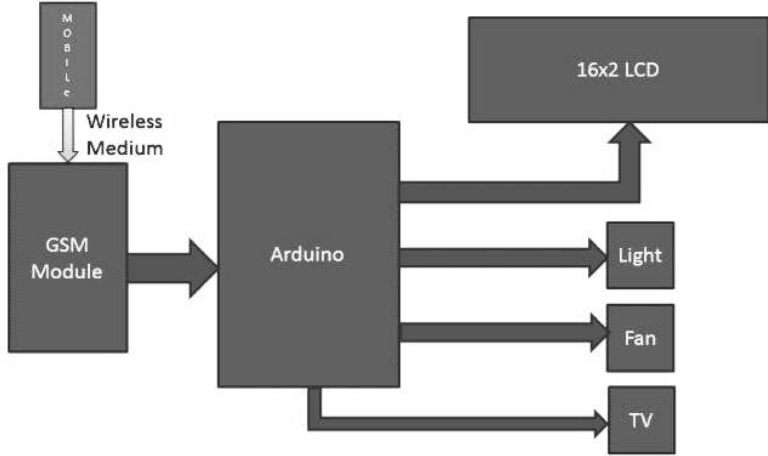
Priority	Project Number
First Priority	
Second Priority	
Third Priority	
Fourth priority	
Fifth priority	

(1)

GSM based Home Automation System

Power		Communications		Electronics	√	Control		Machines	
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Dr. Mahmoud Ahmed Abdelghany Khalil

To be filled in by Supervisor	Panel's Comment
<p>1- Building a home automation system, where one can control the home appliances, using the simple GSM based phone.</p> <p>2- Improve Arduino programming skills.</p> <p>3- Improve PCB Layout and implementation.</p>	
<p>Mobile phone is a revolutionary invention of the century. It was primarily designed for making and receiving calls & text messages, but it has become the whole world after the Smart phone comes into the picture. In this project we are building a home automation system, where one can control the home appliances, using the simple GSM based phone, just by sending SMS through his phone. In this project, no Smart phone is needed, just the old GSM phone will work to switch ON and OFF. In this project, Arduino is used for controlling whole the process. Here we have used GSM wireless communication for controlling home appliances. We send some commands like light on, light off and so on for controlling AC home appliances. After receiving given commands by Arduino through GSM, Arduino send signal to relays, to switch ON or OFF the home appliances using a relay driver. When we send SMS to GSM module by Mobile, then GSM receives that SMS and sends it to Arduino. Now Arduino reads this SMS and extract main command from the received string and stores in a variable. After this, Arduino compare this string with predefined string. If match occurred, then Arduino sends signal to relay via relay driver for turning ON and OFF the home appliances. And relative result also prints on 16x2 LCD by using appropriate commands.</p>  <pre>graph TD; Mobile[MOBILE] -- Wireless Medium --> GSM[GSM Module]; GSM --> Arduino[Arduino]; Arduino --> LCD[16x2 LCD]; Arduino --> Light[Light]; Arduino --> Fan[Fan]; Arduino --> TV[TV];</pre>	
<p>1. Arduino UNO 2. Global System for Mobile (GSM) module operation principle.</p>	
<p>EE3121, EE3171, EE3541,</p>	
<p>1. Arduino UNO 2. 12V 4 channel relay module 3. Backlight LCD 16x2 4. GSM module SIM900A 5. Cables and connectors.</p>	
<p>The main expected result is to design and implement a system allowing user to control home based appliances through SMS along with acknowledgements.</p>	

(2)

Proposed Title : **Robotic Arm**
Supervisor : Alaa Elsayad

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1. Developing a Complete Electrical Engineering Project	
	2. Acquiring the required programming skills for real application	
	3. Practicing technical writing in professional and ethical methods.	
Synopsis (Some background and elaborate what should a student do)	<p>Arduino is an open-source platform used for building electronics projects. It is programmable circuit board work a microcontroller accompanied by programming language work as Integrated Development Environment (IDE) that runs on a computer to write and upload computer code to the physical board. Arduino boards have become very popular to build electronics projects. They simply use USB cable to load new code onto the board. The programming IDE uses a simplified version of C++, making it easier to learn to program. Besides, Arduino breaks out the functions of the micro-controller into a more accessible package. This proposal is to use Arduino board and other equipment to build a full-automated robotic arm. Robotic arms are very common in industries where they are mainly used in assembly lines in manufacturing plants. The proposed Robotic Arm will be automated to do certain tasks like object detection and product assembly. Components will include a microcontroller (we have used Arduino UNO), servo motors, and peripheral sensors and other equipment</p>	
Scope(s)	1 Arduino Boards and its Integrated Development Environment (IDE)	
	2 Object Detection approach and Production Assembly systems	
	3 Testing and Performance Evaluation	
	4 Documentation and Technical writing	
Equipment(s) Required	Arduino UNO) and servo motors, and peripheral sensors	

Expected Result(s)	A fully automated robotic arm using Arduino UNO and Servo motor	
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(3)

Proposed Title: Traffic Control using PLC Control System (Design and Implementation)

Pre-requisites: EE3511 (Automatic Control Systems) and EE3521 (Automatic Control Lab.)

Supervisor: Dr. Ahmed Nassef

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1- Ability to use PLC in Engineering applications; 2- Ability to program PLC using ladder diagram 3- Ability to design an Engineering process; 4- Ability to build up the hardware and wiring connections	
Synopsis (Some background and elaborate what should student do)	- Student should have some knowledge about PLC and how to program it. - At the end of the project, student should have been able to use, program and implement a PLC based engineering application	
Scope(s)	Industrial Engineering application	
Equipment(s) Required	- PLC; - 12V or 24V DC Motors; - Sensors (limit switches, photo detectors, etc.); - Wiring leads; - Metal bars; - Belts; - Relays; - 12V and 24V DC supplies.	

(4)

Proposed Title : Electric Vehicle Charging System by Thermoelectric Generator

Specialization :

Power		Communications		Electronics		Control	
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Supervisor : Dr. Kanagaraj. N

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	To design an electric vehicle battery charging system using thermoelectric elements.	
	Make use of the waste heat energy from the vehicle to generate electricity.	
	To study the feasibility of the proposed system through simulation and prototype experimental setup	
	Reduce the consumption of petroleum products and protect the environment.	
Synopsis (Some background and elaborate what should student do)	Electric cars have become very popular nowadays and most of the leading car manufacturing companies are already started to produce electric cars. With the wide usage of the electric car around the world, it is necessary to provide a solution for power to refuel those electric cars easily. This project aims to design an electric car charging system by thermoelectric elements. The proposed system will make use the waste heat energy from the vehicle to generate electric power. The generated electrical energy will be stored in a battery bank system to run the car. The charging system will have two options for charging the battery, the internal thermoelectric elements or from the external power supply. The whole system operation will be controlled by an electronic circuit for the smooth operation. A prototype model will be designed to test the applicability of the proposed project after the simulation study. This project design also includes a battery monitoring system to ensure trouble-free operation.	
Scope(s)	<ul style="list-style-type: none"> • Eco-friendly electric car charging system using renewable energy sources. • Freely available thermal energy will be utilized effectively for electricity generation. • The proposed system will reduce the cost and time required for battery charging. • Use of controller circuit will ensure the whole system operation. 	
Prerequisites	Knowledge on Microprocessor/Microcontroller, Power system, Circuit design and Simulation software.	
Equipment(s) Required	Thermoelectric elements, Charge controller, 8-bit microcontroller, Battery, converter circuit, Circuit breaker, PCB board etc.	

Expected Result(s)	The electric car battery charging system could be designed and tested for practical implementation. By the use of renewable energy sources and electric car, environmental pollution could be controlled.	

Proposed Title : Wireless Channel Modeling of Sand Environment

Specialization

Power

Communications

*

Electronics

Control

Machines

Supervisor :

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1- Creating the capability of the student to understand and recognize the wireless communications and how to deal with real communications.	
	2- Measuring the loss of sand environment.	
	3- Write a scientific paper and creating a new model for Sand environment..	
Synopsis (Some background and elaborate what should student do)	Investigating the wireless loss of the surrounding environment such as Sands is main goal of this senior project. Students will gather and create a prototype of a wireless communications in the lab using all main communications components such a transmitter and receiver to conduct a wireless channel measurement with high frequency bands to learn the behavior of the signal propagation. Then, student will move the equipment to the outside area to conduct a real measurement.	
Scope(s)	1- Conducting a wireless channel measurement in the sand environment.	
	2- Extracting other statistical parameters such a path loss and delay.	
	3- Building a wireless model for the sand environment.	
Prerequisites		

Equipment(s) Required	1- Transmitter 2- Receiver (Could be USRPs) 3- Two Antennas 4- Cart to move the equipment and other related parts.	
Expected Result(s)	1- Creating a new wireless model for the availability of the frequency band. 2- Writing a scientific paper with the support of senior project supervisor.	

Overall Comment by Panels

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Panel Name

- 1.
- 2.

Signature:

Date:

(6)

Proposed Title : “Microcontroller and GSM utilization for Monitoring and Controlling Substation”

Specialization :

		Communications		Electronics					
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Supervisors : Dr. Yousef Daradkeh

Project's:	Microcontroller and GSM utilization for Monitoring and Controlling Substation	Panel's Comment
Objective(s)	1. Enhancement of quality of power.	
	2. To maintain uninterrupted supply.	
	3. Real time monitoring.	
	4. Remote sensing.	
Synopsis (Some background and elaborate what should student do)	Electricity is extremely beneficial and contributively form of energy. In the industries specifically, its importance is progressive. The power systems are very huge, heavily non-linear and dynamic networks. But the modern power system's common design is a comprehensively distributed energy sources and charges. The classification of electrical power systems can be done into two sub-systems i.e. distribution and transmission. The distribution network possesses high complexity due to which it has become essential for every utility company to come up with a method to automate its substation in order to enhance its competence and quality of supplied power. The proposed project will address this issue by obtaining remote electrical parameters like current, frequency, and voltage and through GSM network, submit these real-time values using GSM phone/modem as well as power station temperature. Further, this project has been outlined by operating an Electromagnetic Relay for protecting the electrical circuits. Every time the predefined values are surpassed by the electrical parameters, activation occurs in this Relay. SMS can be sent by the users containing commands to	

	remotely read the electrical parameters. This will be realized by setting the time in SMS format. It is possible for this onboard computer to efficiently carry out the communication with various sensors employed. Into the controller, some set of assembly instructions can be expelled with the help of this memory. And the functionality of controller relies on some specific assembly instructions. Embedded C++ code to be able to download it to the Arduino Board language has been employed for designing the controller.	
Scope(s)	Embedded system programming.	
Equipment(s) Required	<ol style="list-style-type: none"> 1. Micro controller 2. Power Supply 3. Display 4. GSM modem 5. Current measurement circuit 6. Voltage measurement circuit 7. Frequency measurement circuit 8. Load 	
Expected Result(s)	Frequency =50 HZ and Temp = 70 °C.	

Overall Comment by Panels

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Panel Name

- 1.
- 2.

Signature:

Date:

(7)

Proposed Title : Design of a Solar-Powered Desalination System using HOMER software

Specialization :

Power	✓	Communications		Electronics		Control		Machines
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Supervisor : Hegazy Rezk

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1 Training on how to use the HOMER software;	
	2 Define different water desalination technologies;	
	3 Design solar photovoltaic system.	
Synopsis (Some background and elaborate what	Fresh water availability is essential for the economic development. In desert climate, where naturally occurring fresh water is scarce, seawater and/or brackish water from wells are often more abundant. Since water	

should student do)	<p>desalination approaches are energy intensive, a strong motivation exists for the design of cost-effective desalination systems that utilize solar energy.</p> <p>HOMER software application is used to design and evaluate technically and financially the options for off-grid and on-grid power systems for stand-alone and grid-connected applications. It allows you to consider a large number of technology options to account for energy resource availability and other variables.</p> <p>In this project the students will do the following:</p> <ol style="list-style-type: none"> 1. Train on how to use the HOMER software 2. Understand the working principle of PV technology 3. Study the different water desalination technologies 4. Improve programming skills 5. design a complete case study 	
Scope(s)	<p>1 Electrical Power Engineering</p> <hr/> <p>2 Renewable Energy</p>	
Equipment(s) Required	Commercial HOMER software; Personal computers;	
Expected Result(s)	A complete design of a specific case study for solar-powered desalination system using HOMER software	

(8)

Proposed Title : Mobile Robotics

Specialization :

Power		Communications	*	Electronics		Control	*	Machines	
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Supervisor :

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1- Design and implement a wireless communication system	
	2- Controlled the robot via a wireless communication technique	

	3- Creating the capability of the student to understand and recognize the wireless communications and how to deal with real communications.	
Synopsis (Some background and elaborate what should student do)	The students will start thinking of how to create a robot and control it via different wireless techniques such as Dual Tone Multiple Frequency (DTMF). Students shall control the direction of the robot using a phone by pressing any number to let the robot goes forward, backward, right and left using the numbers on the phone's screen. By pressing the cellphone keys, a signal will be transferred to the robot carrying the instructions of the direction using DTMF frequency. Then finally, the robot will be capable to decode the received signal and follow the direction.	
Scope(s)	Wireless Communication Systems Robotics and Control Systems	
Prerequisites	EE 3200 and Embedded system programming course.	
Equipment(s) Required	2- DC motors 3- A cell phone 4- Raspberry pi 5- Other robot components	
Expected Result(s)	3- Creating a robotic system 4- Applying the knowledge of wireless communication systems 5- Controlling the direction of the robot via a phone. 6- Communicate the bot using communication techniques.	

Overall Comment by Panels

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Panel Name

Signature:

Date:

- 1.
- 2.

(9)

August 20, 2020

Proposed Title : **Arduino-based Chaotic Secure Communication System**

Specialization

Power		Communications	√	Electronics	√	Control		Machines	
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Supervisor : **Dr. Medien Zeghid**

Project's:	To be filled in by Supervisor		Panel's Comment
Objective(s)	1 Design of a Secure Communication System		
	2 An Experimental Realization of a Chaos-Based Secure Communication Using Arduino		
	3 chaos theory for Security		
Synopsis (Some background and elaborate what should student do)	<p>Communication security is one of the most important concerns in societies today. With the advent of global networks and digital communication techniques, cryptographic techniques that were once reserved for military and state affairs now cover several areas such as banking, private companies, medical organizations, etc.</p> <p>In recent years, several encryption techniques have been proposed to improve the secrecy of information transition. Chaos-based encryption techniques are highly studied due to the random and highly unpredictable nature of chaotic signals. In this project, a chaos-based secure communication system will be designed. The security system will use the logistics map which is a mathematically simple and chaotic model under certain conditions. The input data signal will be modulated using a simple Delta modulator and encrypted using a chaotic map and transmitted via the mobile GSM system to the receiver. On the receiver side, the encoded data received will be decrypted using the same chaotic function. Finally, the proposed design will be tested experimentally using Arduino shields which are simple yet powerful development kits that allow the implementation of the communication system for testing purposes.</p>		
Scope	1- Communication System		
	2- Security		
	3- Chaos		
	4- Arduino		
Prerequisites	communication principles and systems; electronics devices; microprocessors		
Equipment(s) Required	Arduino Transmitter, Arduino Receiver, GSM or Channels, Delta modulator, Delta Demodulator,... Software Specifications: MC Programming Language- Embedded C		
Expected Result(s)	Arduino-based Chaotic Secure Communication System		

Overall Comment by Panels

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Panel Name

Signature:

Date:

- 1.
- 2.

(10)

Proposed Title : **Heartbeat Measurement System Using Arduino**

Specialization

		Communications		Electronics				
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Supervisors : Dr. Ehab Mahmoud Mohamed

Project's:	Heartbeat Measurement System Using Arduino	Panel's Comment
Objective(s)	5. Understand embedded system programming.	
	6. Design and implement the Heartbeat measurement system.	
	7. Writing down the source code used in Heartbeat measurement system.	
Synopsis (Some background and elaborate what should student do)	<p>Heartbeat measurement is considered as one of the important vital signs indicating the health condition of the patient as well as normal people. Conventionally, heartbeat can be measured manually using stopwatches via counting the number of heartbeats for one minute. However, integrating the heartbeat measurement with other vital sign measurements such as blood pressure and SPO2 in a single compact electronic device turns to be more efficient. In this project, the students will design, implement, and construct a Heartbeat measurement system using Arduino programming. The principle behind the working of the Heartbeat sensor is Photoplethysmograph. According to this principle, the changes in the volume of blood in an organ is measured by the changes in the intensity of the light passing through that organ. Usually, the source of light in a heartbeat sensor would be an IR LED and the detector would be any Photo Detector like a Photo Diode, an LDR (Light Dependent Resistor) or a Photo Transistor. Thus, throughout this project, the students will learn the principle of the Heartbeat measurement including the Heartbeat sensor and other circuit components in addition to programming the Arduino board to successfully measure the heartbeat of the human.</p>	
Scope(s)	Embedded system programming.	
Equipment(s) Required	9. Heartbeat sensor. 10. 2 Arduino Nano chips. 11. LCD. 12. PC.	
	Design and implementation of the Heartbeat measurement system with a declaration of its normal operation.	

Expected Result(s)		
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Overall Comment by Panels

Panel Name

Signature:

Date:

- 1.
- 2.

(11)

Proposed Title : Earthing System Study

Power	√	Communications		Electronics		Control		Machines	
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Supervisor : Omer Mohamed Abdalla

Project's:	To be filled in by Supervisor	Panel's Comment
Objective(s)	1- To study and be able to apply Electrical System Grounding	
	2- To understand the Equipment Grounding	
	3- To understand the Functional Earthing	
Synopsis (Some background and elaborate what should student do)	<p>The project is aiming to study and understand the importance of the system grounding in low-voltage systems and the adopted IEC Terminology (Types of TN networks, TT networks and IT networks). Also the project will covers the High-voltage system earthing techniques by focusing on the solid-earthed neutral, Resistance-earthed neutral.</p>	
Scope(s)	1 -The study will covers the cost the system.	

	2 – The safety	
	3-The the electromagnetic compatibility of the system	
	4- The regulations: The students will be acquainted with the US National Code, Australia, France, and India Codes.	
Prerequisites	Good knowledge of the EE 3400	
Equipment(s) Required	Fluke 971 Megger Tester.	
Expected Result(s)	To design and check a grounding system.	

Overall Comment by Panels

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Panel Name

Signature:

Date:

- 1.
- 2.