King Saud University
College of Engineering
Electrical Engineering Department **Semester: 381**

Graduation Design Project Proposal Form

Project # P1

Project Title: Design of earthing system for a High Voltage Substation

Professor(s) Name(s): Nazar Hussain Malik and A.Aarainy

Number of Students: Two

Students Qualifications: The students should be oriented to power engineering and must have taken basic power courses and some elective courses in power. The group should also plan to take course EE446 if not taken already. They should have some experience about MATLAB or be willing to learn.

Statement of Problem: High voltage substations are used to step up or step down the voltage in an AC power system and include equipment such as transformers, bus bars and protection devices. At such installations, proper earthing or grounding is essential for proper safety and protection purposes. The grounding system has to meet the requirements specified in industry or IEEE standards. Thus a proper design is required based on the substation's voltage and power rating, the expected fault current level and soil characteristics of the area. In addition local utility or industry regulations have to be satisfied.

Brief Description of the Project: Since substations are integral part of a power system, proper design of the grounding system and its assessment is very important for power engineers. This project will expose the students to all relevant technical issues and will provide him with the opportunity to use his knowledge on the basics and gain skills in advanced design techniques required for such a job. He will also assess the design regarding various safety concerns.

Objectives:

The students group will focus to achieve the following objectives:

1. Specify the rating of a typical High Voltage substation and the relevant information about expected location and other system parameters.
2. Review relevant literature to identify the major design steps.
3. Perform the design and evaluate its performance regarding safety issues.
4. Use MATLAB programs for the design and its performance assessment.
5. Study the modifications that will be required if soil characteristics are different.
6. Prepare the final design report

Technical Approach and Expected Deliverables: Students will work in a regular manner to complete different aspects of this project in order to achieve the objectives listed above and suggested by the advisors. The expected deliverables will be a comprehensive report containing the details of design and assessment made.

King Saud University
College of Engineering

Electrical Engineering Department
Semester 1st/1438/39H

Graduation Design Project Proposal Form

Track	Power Engineering	Project no	P2
Project Title	Performance of three phase stand-alone induction generator under dc rectifier load		
Supervisor(s)	Prof. Abdulrahman I. Alolah		
Number of Students	Two	Students Qualifications	EE330 + Basic Matlab

Statement of Problem	Environmental concern and rapid depletion of conventional fossil fuels have resulted in extensive use of renewable energy resources for electrical power generation. Better utilization of renewable energy may be achieved by developing small-scale, autonomous power systems in favorable geographic locations. The system cost can be minimized by the use of cage-type, self-excited induction generators (SEIGs).
Brief Description of the Project	(i) Review of renewable energies and methods of energy recovery systems (ii) Advantages of induction generator (iii) Analysis of the system under study (iv) Results verification
Objectives	(1) Understanding renewable energy sources. (2) Understanding concept of induction generator operation. (3) Understanding rectifier circuits and control (4) Study of effect of system parameters on output voltage. (5) Design a variable excitation capacitor to fix output voltage.
Technical Approach and Expected Deliverables	(a) Development of a computer program to achieve the required analysis (b) Use of MATLAB, or a similar package, to confirm the analysis of (a) (c) Verify some results experimentally

King Saud University
College of Engineering

Electrical Engineering Department
Semester 1st/1438/39H

Graduation Design Project Proposal Form

Track	Power Engineering	Project no	P3
Project Title	Saudi Energy Efficiency Label for Electrical Appliances Part I: Efficiency of induction motors		
Supervisor(s)	Prof. Abdulrahman I. Alolah	Dr. Hany Alabady (Saudi Energy Efficiency Center)	
Number of Students	Two	Students Qualifications	EE330 + Basic Matlab

Statement of Problem	**The Energy Efficiency Label for electrical appliances is an awareness label that provides consumers with reliable ways to make comparisons of electrical appliances according to their efficiency in the consumption of electric energy, expressed in a number of stars shown on the label. The more stars are shown; the lower energy consumption is produced by the appliance. The Energy Efficiency Label also includes some basic information about the product (e.g. type of device, model and brand, electric energy consumption and test standard).**
Brief Description of the Project	(i) Review of Saudi energy labeling system (ii) Advantages and analysis of induction motors (iii) Efficiency of three and single phase induction motors (iv) Results verification
Objectives	(1) Understanding electric energy. (2) Understanding concept of induction motor. (3) Understanding efficiency of induction motors (4) Study of Saudi energy labeling system. (5) Comparison of star system.
Technical Approach and Expected Deliverables	(a) Development of a computer program to achieve the required analysis (b) Use of MATLAB, or a similar package, to confirm the analysis of (a) (c) Verify some results experimentally

King Saud University
College of Engineering
Electrical Engineering Department **Semester: 381**

Graduation Design Project Proposal Form

Project 496 **# P4**

Project Title:
Design requirements for electrical equipment to comply with the Saudi standards during the voltages change transition period.

Professor(s) Name(s): Abdullah M. Al-Shaalan and Abdulhameed Alohaly

Number of Students: Two

Students Qualifications: Nothing specific.

Statement of Problem:

The Kingdom of Saudi Arabia has issued the royal decree No. 324 of 20/9/1431 H approving a gradual plan to convert the electricity distribution voltages in residential and commercial areas from the existing dual voltage (127 and 220 volts) volts to the unique global standard voltage (230) volts. The change is poised to take place within a transition period of 25 years from the effective date of the decree. Also, by adopting the global voltage system 230, it will be possible for the Kingdom to export and import the electrical products without any restrictions to these commodities in the Kingdom's markets. The new utilization voltage will also allow for similarity with the GCC countries, which will have a positive outcome on the ease of trading and exchanging the electrical equipment and their marketing among these Countries.

Brief Description of the Project:

The proposed project will try to undertake several testing methods to verify the applicability of imported equipment designed for 230 volts and operated under 220 volts and vice-versa, as stated above, The complete change will be achieved through a transition period of 25 years. During this period, some equipment designed for 230 volts might be operated on 220 and vise versa. This project will try to design a criteria based on a series of tests for the operation of the electrical equipment under these two voltages to ensure both user`s safety and equipment performance.

Objectives:

1) Ensuring the safe and efficient operation of equipment, either manufactured locally or imported, operated under different voltages during the transition period for voltage change set by the royal decree.
2) Design appropriate Saudi standards for voltage (230) volts for working under 220-volt supply and vice versa in terms of safety, durability, and efficiency during the transition period set by the royal decree.

Technical Approach:

The project approach will depend on performing a series of laboratory tests using popular domestic equipment (air-conditioners, lamps, fans, motors, heaters, etc.), These tests can be done in the Electrical Engineering laboratories as well as collaboration with the Saud Arabian Standards Organization (SASO).

Expected Deliverables

1) Assurance of safe, dependable and efficient performance of electrical equipment to work from 220 and 230 volt sources during the transition period specified in the royal decree.
2) Prepare standards to be adopted and applied for the design of electrical equipment either manufactured locally or imported from abroad.
3) Easily transferring during the transition from using dual voltages (127 and 220 volts) to the using of the unified, global and standardized 230 volts as a single source.

4) Conformity with voltages utilized in the GCC countries which will facilitate and ease the exchange of electrical products among them.

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Electrical Engineering Department **Semester: 381**

Graduation Design Project Proposal Form

Project 496 **# P5**

Project Title:
Design of appropriate protection measures for human beings, livestock, and environment against risks of electromagnetic radiation emitted from devices, equipment and transmission lines.

Professor(s) Name(s): Abdullah M. Al-Shaalan and Mohammed S AL-Numay

Number of Students: Two

Students Qualifications: Preferably, finished EE444 (Power System Planning).

Statement of Problem:

The issue of the effects caused by the electromagnetic radiation emitted from devices, equipment and electrical transmission lines on human beings, livestock, and the environment has become an issue of great controversies and debates among academia, researchers, medics and all interested persons for a long time. The research efforts in this regard, have not been able to reach clear results and decisive decisions to remove the ambiguity that has surrounded this vital subject for a long time.

This subject as, particularly, being so closed for the health of the individuals and to the surrounding environment safety that all being kind lives in. Therefore, this project will try intensively to scrutinize and comprehend most of the research carried out in this area and to and analyze all information, data and results that have been accessed and obtained in the field of exposure to electromagnetic fields.

Brief Description of the Project:

This project aims at compiling and collecting a comprehensive information, data, studies and results related to the effects of electromagnetic fields on human beings, livestock and the environment as being exposed to that field. The electromagnetic radiation sources include high voltage transmission lines, electrical equipment and appliances.

Objectives:

1) Identifying the safe distance from the transmission lines that known as the Right-of-Way (ROW).
2) Measure and proper and safe distance from some electric devices such as: TV, PC screen, cellular phones, microwaves and other domestic appliances.
3) Reinforce medical opinions, observations and stances towards these issues.
4) Reducing the effects of the phenomenon known as the "electromagnetic compatibility" which causes interference between the adjacent devices in proximity.
5) Enhancing and ensuring safety measures, precautions and design of electrical devices.

Technical Approach

To achieve the prescribed objectives of this project, the following tasks shall be carried out:

1) Collecting the largest number of reports, research and standard specifications that dealt with the phenomenon of electromagnetic fields and their effects on humans and the surrounding environment.
2) Benefiting from the Saudi standards issued on electromagnetic radiation and their effects on humans and the environment, as well as the use of international standards issued by the International Electrotechnical Commission (IEC) and the International Standard Organization (ISO).
3) Undertaking an extensive survey by using measuring gadgets to measure and record the radiation quantities emitting from all the mentioned sources of electromagnetic waves.

Expected Deliverables:

1) Arriving at securing measures and precautions in the design of electrical transmission lines, equipment, appliances, devices to reduce their electromagnetic radiation and hence mitigating their harmful effects on users and on the environment.
2) Finding proper solutions to the "electromagnetic compatibility" in equipment design and operation.
3) Enriching the studies and research in this area of interest.

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Graduation Design Project Proposal Form

Project # P6

Project Title:

Design of a PV-Powered System for Cabin Cooling of Automobiles Parked in the Sun.

Professor(s) Name(s): 1. Prof. Saad Alghuwainem
2. Prof. Yasin Khan

Number of Students: Two

Statement of Problem

Many car users are faced with a hot interior after a certain hours of parking in open space or unshaded parking area. The heat under such parking conditions may cause the car cabin and interior temperature to reach up to 80 ^{o}C average. The accumulation of thermal energy inside the vehicle with undesired temperature rise would cause the interior parts to degrade because they normally are subjected to wear and tear. Degradation may shorten the life span of the various components inside the car, especially electronic devices. Passengers are also being affected with the thermal condition inside the vehicle itself. The car user is forced to wait for a period of time around 2 –5 minutes before getting into car to let the interior condition cool down either by rolling the window or running the air conditioner system (A/C) at high speed that really stresses the A/C system considerably and increase fuel consumption

Brief Description of the Project

This project will study this problem and design a photovoltaic powered cooling system to maintain the parked car interior temperature at safe values.

Objectives

The design specific objectives include:

(1) Sizing of the PV panel,
(2) Suitable location of the PV panel.
(3) Suitable location of cool air outlet.
(4) Suitable type of cooling medium.
(3) Building a prototype system

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Graduation Design Project Proposal Form

Project # P7

Project Title: Fault Diagnosis Simulation in Solar PV array

Professor(s) Name(s): Dr. Wonsuk Ko and Dr. Irfan

Number of Students: Two

Students Qualifications

Students should have good background in PV modeling and MATLB.

Statement of Problem

Due to the advantages of this source of energy, and the increase of the electricity demand, Photovoltaic (PV) system capacity has been increased. But there are faults in the PV field such as short circuiting of a module, a disconnection with open circuiting of a module, short circuiting of a bypass diode, an increased contact serial resistance. For these reasons, fault detection and localization methods in PV systems are needed to increase reliability, efficiency and safety in PV systems. Numerous diagnosis techniques are proposed in the literature. In this project, we are going to simulate a simple detecting and localizing of fault occurring in photovoltaic arrays. The designed technique is based on the analysis of the anomalies in the I-V characteristic.

Brief Description of the Project

This project investigates a fault diagnosis technique for a photovoltaic string, based on the I-V characteristic analysis. Simulated data (I-V characteristics) will be used to validate the fault diagnosis technique. In this project, various fault cases will be considered and classified.
The objective of proposed project is to study modelling PV array and understand fault signal analysis.

Objectives

(1) Understanding PV Principle
(2) Modelling of PV array
(3) Understanding fault detection and diagnosis
(4) Simulating suggested PV model and fault case.
(5) Demonstrating result.

Technical Approach and Expected Deliverables

- Literature search of the fault analysis in Solar PV array under project
- Modeling PV array using Software.
- Carry out Simulation using MATLAB or similar tool
- Report with simulated results and discussion

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Graduation Design Project Proposal Form

Project # P8

Project Title: *Enhancement of Transformer Oil Dielectric Performance Based on Nano-Fluids*

Professor(s) Name(s): Dr. Usama Khaled

Number of Students: Two

Students Qualifications

Ability of experimental work implementation in the high voltage lab- Background about EE445 or EE446 courses – High grade and qualified students.

Statement of Problem

Nanotechnology deals with characteristics in nanometer size and/or microscopic regions on materials and functional devices.
In the recent past, nano-particle doped composite insulation came into use with a view to further enhance the electrical and dielectric properties.
This project will report dielectric investigations into nano-composites based on a class of metal oxides, (such as Al_2O_3 and SiO_2, ….). In particular, consideration would be given to the electrical pre-breakdown and breakdown under different voltage profiles as a function of the volumetric composition of the nano-particles in liquid insulations.

Brief Description of the Project

1 Measurement of conductivity
- Pure liquids
- Nano- fluids: influence of the type of nano- particles

2 Pre-breakdown phenomena in (a) pure oils and (b) nano-fluids

3 Streamer inception: inception threshold voltage, in a point-plane electrodes configuration:
- Influence of radius of curvature of the sharp electrode (point) - Influence of electrodes gap - Influence of the type of voltage - Influence of the concentration of nano- particles - Influence of hydrostatic pressure,…

4 Aging of Transformer oil
- Influence of thermal aging before and after adding nano-particles on dielectric properties of transformer oil.

5 Breakdown phenomena in (a) pure oils and (b) nano-fluids
- Influence of the type of voltage
- Statistical analysis of experimental results

Objectives

- The design will consider improvement the dielectric properties performance of high voltage liquid insulators by adding few amounts of specific nano filler into liquid insulation.
- Designing samples for increasing the breakdown voltages values as well as reducing partial discharge occurrence of nano-fluid liquids under all voltage profiles.
- Getting an optimum volume concentration of nano particles in the used nano-fluid insulation.
- The design will help to select suitable nano particles considered for the study that gives the best performance for dielectric properties improvement of high voltage insulation liquids.

Technical Approach and Expected Deliverables

The design will be satisfied by theoretical, analytical and simulation approaches.

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Graduation Design Project Proposal Form

Project # P9

Project Title: ***Defect Identification in Distribution Switchgear using TEV Sensors***

Professor(s) Name(s): 1. Dr. Yasin Khan
2. Dr. A. A. Al-Arainy

Number of Students: Two

Students Qualifications

The students should have basic knowledge of electrical power and having good academic background in Matlab/C++ languages and related technologies.

Statement of Problem

High-voltage switchgear is an important electric equipment of power generation, transmission, distribution and conversion. The safe operation of switchgear directly influences the reliability of power supply. However, grave consequences may occur due to creepage, flashover and breakdown induced by the degraded equipment insulativity. Statistical data shows that among switchgear faults, those caused by insulation and current-carrying defects take around 40%. Therefore, the online detection technique for switchgears and to conduct preventative online detection are of great significance for timely monitoring of potential defects and fault reduction.

Brief Description of the Project

High-voltage switchgear is an important electric equipment of power generation, transmission, distribution and conversion. The safe operation of switchgear directly influences the reliability of power supply. Therefore, the online detection technique for switchgears and to conduct preventative online detection are of great significance for timely monitoring of potential defects and fault reduction. Commonly used online switchgear fault detection techniques include electrical and non-electrical measurement methods. Electrical measurement methods can be further divided into pulse current method, ultrahigh frequency (UHF) method, and transient earth voltage (TEV) method. Non-electrical measurement methods mainly include ultrasonic and infrared detection. The TEV method has been popularized in regular switchgear fault detection by virtue of its advantages such as uninterrupted power supply, high sensitivity, strong anti-interference performance, and non-instructive mode. However, the research on the detection mechanism of TEV method remains at the initial stage. Typical models of partial discharge defects will be designed according to major types of switchgear faults. Tests will be performed on the models to study TEV time-domain waveform and partial discharge spectra. Simulation and experimental study will be performed to determine the effect of detection position.

Objectives

The project have the following objectives:
(1) Design of experimental setup and acquisition of components required.
(2) Experimental investigation, analysis of results and recommendations.

Technical Approach and Expected Deliverables

The students should understand the main types of switchgears and types of faults in the MV/HV transmission system, factors affecting the efficiency of switchgear performance, measuring the PD characteristics using TEV sensors in the laboratory, data acquisition and itsanalysis.

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Graduation Design Project Proposal Form

Project # P10

Project Title: Design Improvement of Free Electrical Energy Generator

Professor(s) Name(s): Dr. Abdulhameed Alohaly, Dr. Yasin Khan

Number of Students: Two

Students Qualifications: The students should have basic knowledge of electrical power and having good academic background in Matlab / C++ languages and related technologies.

Statement of Problem

Unfortunately, even with all of our modern technological advancements, there's still a huge number of people living in extreme poverty. Most of the poverty can be directly linked to a lack of cheap and abundant energy. According to the IEA, "Modern energy services are crucial to human well-being and to a country's economic development; and yet globally 1.2 billion people are without access to electricity. Even in many places with access to power, it's not cheap enough or abundant enough to lift the population above the poverty line. Access to energy is the defining limit on the ability of population to pull itself out of poverty by increasing its productive capacity.

All real wealth comes from the ground. Wealth starts as raw materials that are transformed by human intervention into usable goods that improve the quality of the human condition. Extracting and transforming resources from the planet takes a tremendous amount of energy. The cheaper and more abundant the electrical energy resources at our disposal, the cheaper and easier it is to extract and transform resources; which ultimately means cheaper and more abundant goods and services for all of humanity.

Brief Description of the Project

A motor of 0.75kW capacity will be used to drive a series of belts and pulleys forming a gear-train that produces over twice the rotational speed at the shaft of an 1.5 kW electrical generator. The intriguing thing about this system is that greater electrical power can be drawn from the output generator than appears to be drawn from the input drive to the motor. That energy increases as the diameter of the flywheel increases. The energy also increases as the weight of the flywheel increases. In the proposed system we intend to design and practically implement a feedback control system to prevent the drop in speed and frequency of the motor driven generator..

Objectives

The project have the following objectives:

(1) Comprehensive literature review
(2) Design a feedback control system to prevent the drop in speed and frequency of the motor driven generator
(3) Practical implementation of objective (2) above

Technical Approach and Expected Deliverables

The students should understand the main components of the self energy generation and its application, factors affecting the efficiency of self energy generations, causes and effects, measuring the output characteristics of system in the laboratory, data acquisition and analysis.

Expected dileverables is design and development of an efficient self energy generation system.