

LIST OF CHANGES

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TABLE OF CONTENTS

1.	INTRODUCTION	5
2.	FINAL YEAR GRADUATION PROJECTS: FACTS AND FIGURES	6
2.1	Final year graduation projects per university	6
2.2	Final year graduation projects per IREEDER topic	6
2.3	Final year graduation projects by period of completion.....	7
2.4	Final year graduation projects by department	7
2.5	Use of IREEDER equipment in the graduation projects	9
2.6	Students involved in the final year graduation projects: gender	9
2.7	Complete list of graduation projects.....	9
3.	CONCLUSION	41

LIST OF FIGURES

Figure 1– Final year graduation projects by hosting university.....	6
Figure 2– Final year graduation projects by IREEDER topic	7
Figure 3 – Final year graduation projects by academic period	7
Figure 4 – Final year graduation projects by involved department	8
Figure 5 – Use of IREEDER equipment for final year graduation projects	9
Figure 6 – Gender distribution of students participating in the final year graduation students.....	9

LIST OF TABLES

Table 1 - Complete list of final year graduation projects	40
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1. INTRODUCTION

This document reports on the final year graduation projects conducted in the scope of the Erasmus+ Capacity Building Project 609971-EPP-1-2019-1-JO-EPPKA2-CBHE-JP “Introducing Recent Electrical Engineering Developments into Undergraduate Curriculum” (IREEDER).

In detail, the purpose of this document is to report on the execution of the task 5.4 - “Final Year Graduation projects”, in which high calibre students from each Jordanian Partner undertook a final year graduation project in one of the IREEDER topics.

This document is developed in the scope of the WP 5 - Exploitation of results and sustainability plan (Dissemination & Exploitation) of the Project in compliance with the Project description and all applicable rules & guidelines.

2. FINAL YEAR GRADUATION PROJECTS: FACTS AND FIGURES

2.1 Final year graduation projects per university

A total of 62 final year graduation projects conducted in the scope of the IREEDER project have been reported by Jordanian partners, distributed as follows:

- 21 projects at Philadelphia University (33.9%),
- 15 projects at Isra University (24.2%),
- 11 projects at Mutah University (17.7%),
- 10 projects at Al-Hussein Bin Talal University (16.1%), and
- 5 projects at Tafila Technical University (8.1%).

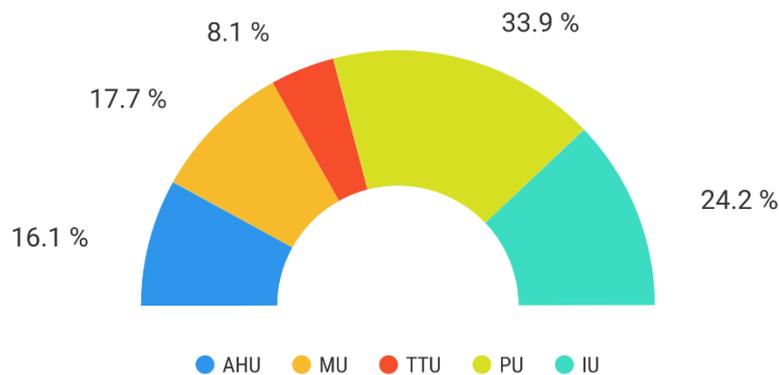


Figure 1– Final year graduation projects by hosting university

2.2 Final year graduation projects per IREEDER topic

From the 62 reported projects 28 were conducted in the topic of Renewable Energy (RE), 26 were related to the topic of Internet of Things (IoT), while the remaining 8 were in the field of Cybersecurity.

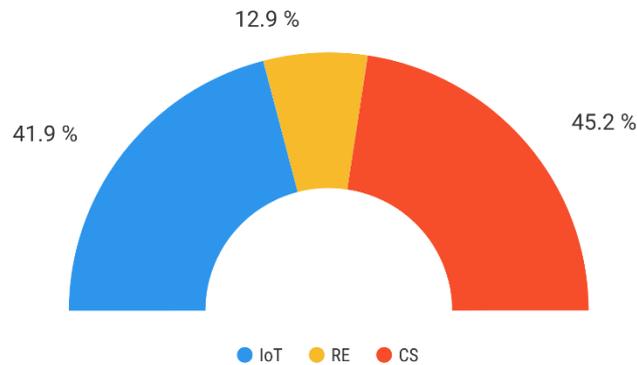


Figure 2– Final year graduation projects by IREEDER topic

2.3 Final year graduation projects by period of completion

There is an even distribution of final year graduation projects by time of completion: 30 projects were completed in the first semester of academic year 2021/2022, while 32 were finalized during the second semester of the same academic year.

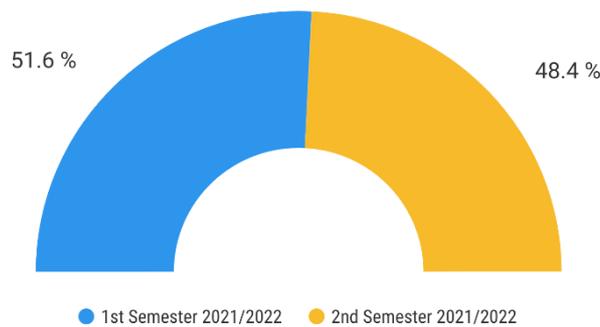


Figure 3 – Final year graduation projects by academic period

2.4 Final year graduation projects by department

The different final year graduation projects were completed in different departments at the participating Jordanian institutions, covering a big range of Engineering areas, from Electrical Engineering to Cyber Security, Mechatronics, Data Science and Artificial Intelligence and Computer Science and Software Engineering, among others. The highest number of projects (26) was conducted in several Electrical Engineering departments, followed by Renewable Energy Engineering departments (7), and Electrical Engineering & Communications and Electronics departments (6). The total number of projects per department is presented in Figure 4.

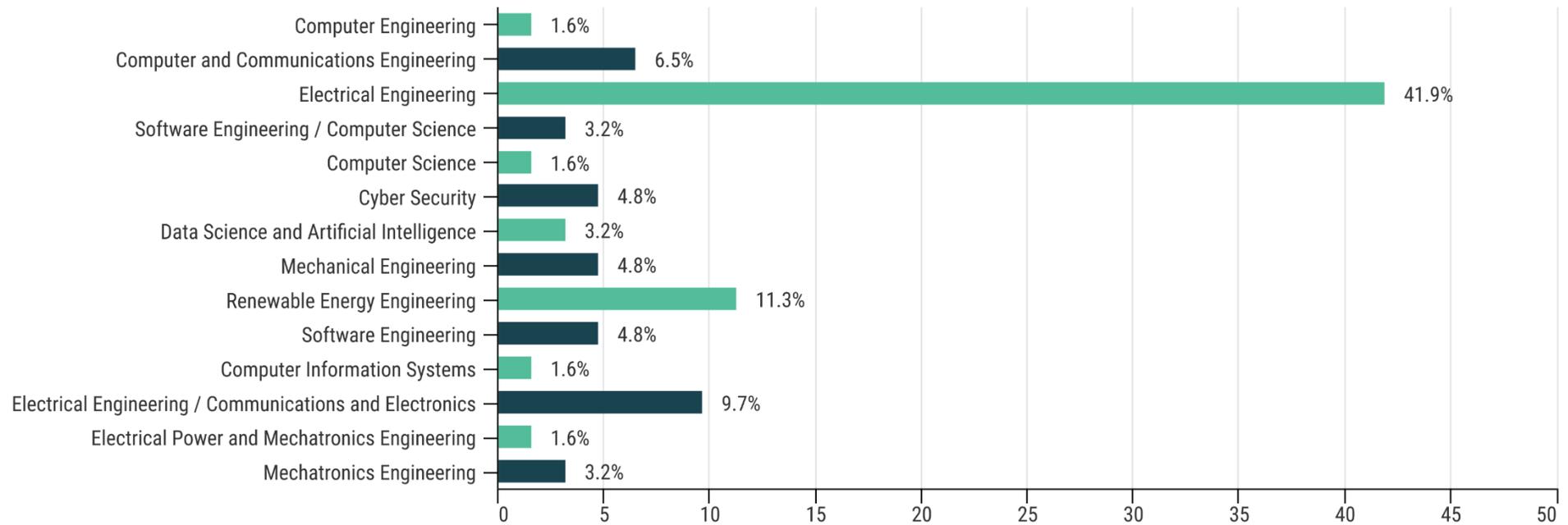


Figure 4 – Final year graduation projects by involved department

2.5 Use of IREEDER equipment in the graduation projects

Several items of equipment were purchased in the scope of the IREEDER project, to facilitate the establishment of the three laboratories on Cybersecurity, Internet of Things and Renewable Energy. For several of the final year graduation projects, IREEDER equipment was used to support the research activities.

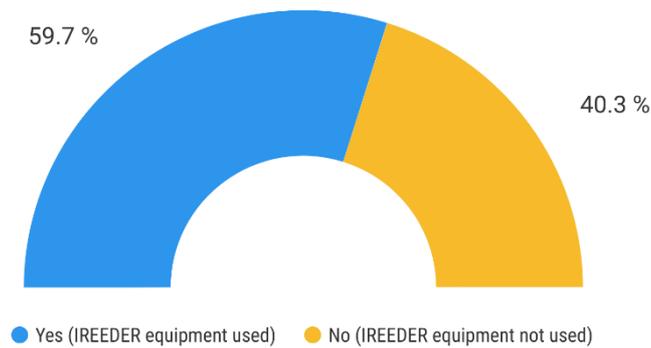


Figure 5 – Use of IREEDER equipment for final year graduation projects

2.6 Students involved in the final year graduation projects: gender

In what concerns the gender distribution among the participating students, the total number of female students involved was 31, in a universe of 203 participants.

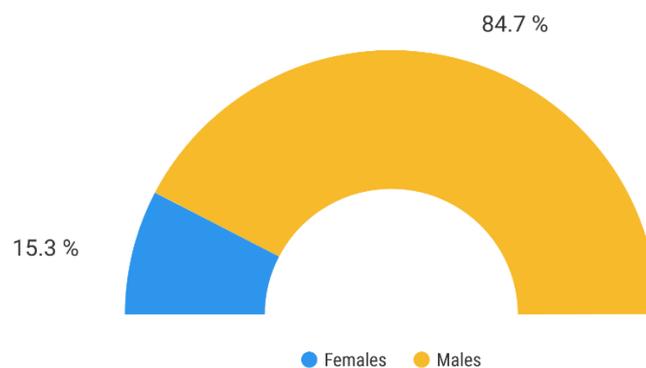


Figure 6 – Gender distribution of students participating in the final year graduation students

2.7 Complete list of graduation projects

The complete set of final year graduation projects is detailed in Table 1.

Ref.	Title	Abstract	Supervisor	Students	University Department
1	Developing and Implementing the Smart Campus	<p>In this project, the students will design and implement smart campus environment that collects data from different sensors and other Internet of Thing (IoT) technologies and big data to analyze data and convert it into decision-making about the following features:</p> <ul style="list-style-type: none"> • Optimization of energy consumption. • Optimization of water consumption: smart irrigation. • Smart Calling (Repair order) • Intelligent lighting • Automatic Failure Detection 	Dr. Qadri Al-Hamarshah	2-3	PU Software Engineering
2	Electrical Energy Storage System	<p>The Electrical Energy Storage System (EESS) is an established approach to enhance reliability and improve the functionality of power grids. The students shall introduce the types of (EESS), their usage, advantage, and disadvantage. And to design a pack-up (EESS) for a commercial complex with a maximum power of 800 kVA. This commercial complex is fed from two systems the first is the national grid while the second is from renewable energy resources.</p>	Dr. Ayman Agha	2-3	PU
3	Study of different techniques for cleaning PV solar panels systems	<p>The students shall introduce the different techniques for PV panels cleaning systems and provide a study of the advantages and disadvantage of each technique. At the end of the project ,the students shall select the suitable technique for a 1Mw PV system.</p> <p>Supervisor: Eng. Abdullah Al-Omouh (PU) Group: 2-3 Students</p>	Eng. Abdullah Al-Omouh	2-3	PU

4	Indoor Blind Assistance System	<p>In our lives, there are many people who are suffering from different handicap such blindness. These people are often dependent mainly on their family, trained dogs, sticks or similar devices. In this project, a wireless electronic system will be designed and implemented to help blind people to live their life easier, independent and as the normal people inside their home.</p> <p>Supervisor: Nada Khatib (PU) Group: 2-3 Students</p>	Nada Khatib	2-3	PU
5	Design and Implementation of Wind Farm	<p>Jordan imports nearly ninety-seven in a hundred of its primary energy, of which thirty in a hundred is used to produce electrical energy. Renewable energy sources are becoming more and more attractive especially with the great doubt of oil prices. Our Project 3 is a simulation of the project through the Homer program. The R. Monif site was selected in Jordan because of its wind speed to cover a load of (800 MW) with the help of (62) Turbine, generating (1,500 KW) of power, designed by General Electric company. The purpose of this project is to design and implementation wind farm if it is possible to get more renewable energy and to find another source of electricity to reduce electricity production costs.</p>	Dr. Mohammad Abu naser	<p>Sayed Hasan Noor Uddin</p> <p>Abdul Fattah Saeed Saad</p> <p>Hammam Mohsen Besaiso</p>	<p>PU</p> <p>Electrical Engineering</p>
6	Small village working on solar energy	<p>The project is an integrated solar system to fed small village consisting of almost 10 homes. This research will include the studies required for the implementation of the project such as elements of the</p>	Prof. Wagah Farman Mohammed	<p>Majed Zouhaur Oqilan</p> <p>Mourad Mohammed Khair</p>	<p>PU</p> <p>Electrical Engineering</p>

	solar system that will be installed for the implementation of this project and related accounts. Brief information on these elements will also be briefly discussed.		Rami Abdallah Younis Enezat Mohammad Ghalib Zayed		
7	Wind Energy: Design Consideration & Improvement of Al-Fujeij Wind Plant	This project deals with design of Al-Fujeij wind plant. At first, Studies over this region found about ten years ago, including the Scientific Station at Fujeij that have a one turbine only. It was a grant from the European Union. It is existing already and it has one turbine with 1.65MW. Other attempt is a planning for wind plant with capacity of 90 MW and it was awarded to KEPCO, Korea Electric Power Company in December 2012. The project didn't move forward because of Bird Migration (environmental issue). The Turbine supplier is "VESTAS V112 X 3 MW". It is one of the largest companies in Jordan. Now with regard to this project, the main aim to it is to develop the design of this plant which includes: raising the capacity from 90 MW to 99 MW and use a smaller number of turbines from another type (VESTAS 3.3 MW).	Prof. Mohammed Tawfeeq	Yazeed Fareed Nasser Ahmad Ziyad Jawabra Mohammed Rebhi Saeed	PU Electrical Engineering
8	Development of an IoT smart bag	Students mainly suffer from many difficulties that might affect the education process , heavy bags due to traditional books can be replaced by the new electronic books version , the evolve of electronics and internet in the past decade has been gradually increasing due to the scientific revolution , smart bags are a good example of interaction between internet , wearable electronics . In this project a previously implemented project of a smart bag is developed into an evolved	Anis Mousa Al-Nazer	Abdulrahman AL-Jawan Anas Yousef AL-Kalash	PU Electrical Engineering

	<p>version ,the new bag has three main new features . First feature is weight indicator that displays the total bag weight on LCD screen, due to covid-19 pandemic a new social distance alert is added, also, an object detection feature that displays on the user screen whether the bag is filled with an object or not is added, in addition, solar panel cells are added as a contributing power source to the bag the main goal of the project is to serve the educational field i.e.(students)</p>			
9	<p>Automatic weather station using IoT</p> <p>This project was developed to help user access data about weather anywhere in real-time. There is a difference between real-time weather station and weather forecast. Weather station is a facility that can use for measuring atmospheric conditions like temperature, humidity and air pressure to provide information for weather forecasts and to study the weather and climate. Due to the fact that without weather station, user can't be alerted of the strong winds, heat waves or any other weather-related emergency. This means that we need weather station to make forecasts and collects data related to the weather. To overcome the problems faced, there are techniques that can be implemented to assist this project. This project will use Internet of Things with sensors to build weather station. The weather station can help provide data for forecasts. Once a weather station is connected, user can view the history of information as well. The project stands on IoT to design and implementation weather station, reading the weather parameters such as, wind speed,</p>	<p>Eng. Sultan Al-Rashdan</p>	<p>Ali Bahjat Ali AL-hajji</p>	<p>PU</p> <p>Electrical Engineering</p>

	temperature, barometric pressure, and any parameter related to weather using sensors placed in right place ,send it to cloud storing the data and send it to smart phone, which at the end the user read useful data about the weather.				
10	Implementation of Smart Security Door System with Face Tracking Camera using IoT	Providing humans with safety and a more secure environment for their belongings and values is an important need.. In this project, a smart lock door with different types of methods for entry, like fingerprint and authentication PIN code, with an unnoticeable face tracking camera capturing a photo in case of error data entry is to be controlled via the user's smartphone using Blynk with the implementation of IoT. This system is made with two microcontrollers, the first one is for controlling the fingerprint sensor, keypad, and solenoid lock which is ESP32 and ESP32-CAM that captures a photo and be sent to the owner's smartphone and be viewed on Telegram application. Many conclusions are extracted from system results, as well as suggested ideas for future work.	Anis Mousa Al-Nazer	David Ashton Herbet Hamza Nasri Al-Temawi Mohamed Waleed Mohamed Abu Baker	PU Electrical Engineering
11	Energy Monitoring and Controlling Device using IoT	In recent years, the demand for smart energy meters has increased due to the spread of the smart electric grid around the world. However, there are some issues with smart electric meters in terms of predicting monthly consumption and safety. In this project, the main purpose is to develop a data transmission system. To control and monitor the consumptions for each device and to achieve financial saving. The other advantage of using this new system is safety, the system will sense movement around the energy source	Anis Mousa Al-Nazer	Mohammed Mustafa Aldrewi Omar Zammari Ali Al-Tawalbeh	PU Electrical Engineering

		and decide about it, to avoid the mistakes generated due to human error. This system will provide the ability to create a virtual electricity bill showing the monthly consumption of any device.			
12	Real-Time student attendance system using face recognition	Attendance registers are very useful in keeping records of presence and Absence of students daily, and the average attendance of students and teachers. The attendance registration also helps in maintaining records of names and data about each student in a particular class. It also contains details of students such as time of attending the class, College number, etc. The attendance and absence registration usually takes quite a long time. As for the total time of the lecture\class, especially with classes that have a high number of students.		Wessam, S. Lahloub Mohamed S. Al-Awadat Omar M. Al-Awawdeh	TTU
13	Automated Solar Grass Cutter	In today's world, automation is a very important part of invention. Presently, manually handled devices are commonly used for cutting the grass over the lawn. Because of this, there is pollution and loss of energy. The old grass cutters need to be replaced by automated one where system will work for guidance and obstacle detection using battery as a power source. Solar panel will help to conserve the energy and preserve environment. this project on automated solar cutting grass, it uses the renewable source of energy for its operation like solar energy. The main objective of the project is to overcome the pollution problem. In order to help farmers, a smart control system should be designed to control different issues without the need of human intervention. The electrical source is form the	Eng. Ahlam Damati	Omar Mohammad Omar Jabr Ahmad Bilal Ibraheem Al-Taweel Osama Basil Abdullah Amara	PU Renewable Energy Engineering

	<p>solar panel which is converting the light to an electrical power by connecting series which gives 12 v that needed for DC motor the rear wheels in robot to moving forward. To achieve the desired pattern of cutting the grass, we will use the motor and wheels movement to generate a pattern cutting on the grass. There are mainly two different types of design system can create on the grass, forward and cutting. Wheels movement is controlled with Arduino programming code to move in a special position and direction to generate this patterns. To generate a circle pattern, we only programmed left rear motor to rotate 3 in full speed for the fixed time to circle movement, while right motor will move freely so that the grass cutter will move in a right circle position and the cutter will cut the grass in the desired shape. This project describes the different features and technologies present in the robotic solar lawn cutter and the different technologies capable of mowing the lawn in the lawn using infrared sensors for obstacle detection.</p>			
<p>14 Dual axis sin tracking system</p>	<p>The main objective of this project is to design an efficient solar generation system that follows the sunlight to provide the maximum power from the solar energy compared to the conventional static one. The system should be simple, cost effective, reliable, and efficient. A comparison between the two solar panels (regarding power, efficiency, cost...) should be provided. This project can be executed by building a prototype and/or by using simulators</p>			

15	Solar vehicle using Arduino	The main goal of this project is to build a small model of a solar vehicle, so in the future it can be a reference in bigger project for helping the environment from oil waste and saving the public health .also using the robotics technology in human service like fire fighting and in military field.	Dr. Ayman Al Lawama	Mumen aqeel Omar fakhre Shahd tariq Nancy othman Bayan aldaboubie	IU Electrical Engineering
16	Thermal Energy Management System	The idea of the project is to control the central heating system located inside the university using IoT systems	Dr. Ziad Altarawneh	Ala salah abd al mudi moawiah adnan alkhamaiseh Mohammad-zain alabdeen Montaser Abu Abdalaah Osama Awwad Alnaimat Shadi Akram Dmour	IU Electrical Engineering
17	Low-Cost Anti-Theft Home Security System	Low cost and efficient smart home security and safety electronics solutions have become the primary requirement for people in smart homes. This project is a simulation simple model of an anti-theft security system for homes using an Arduino controller, PIR sensor for motion detection, and buzzer and LCD to warn of the presence of theft. The module was simulated and working as it should, but in the end, there were some errors in its work.	Dr. Saqer S. Al Ja' Afreh	Ahmad Al-Debsi Ali Al-slaiti Ammar Dmour Abd-AL Fattah khresat Khaled Ghazal	IU Electrical Engineering

18	IoT Patient Health Monitor during Covid-19 Quarantine with Heart Rate Sensor, a respirator and GPS Detector	an IoT based Health Monitoring System which records the patient heart beat rate and body temperature and also send GPS signal to locate whenever those readings go beyond critical values. Pulse rate and body temperature readings are recorded over Thing Speaks sheets so that patient health can be monitored from anywhere in the world over internet.	Dr. Saif Alnawayseh	Mahmoud Alkaabneh Ahlam Alsoudi Mohammed Idies Montaser Alabbadi Haroon Mustafa	MU Electrical Engineering
19	Stand-alone Hybrid solar system Using (PV modules & Generators)	The main objective of this project is to design a stand-alone hybrid renewable energy system based on PV and diesel generators for Al Hussein Bin Talal University / Ma'an (Large scale system). PV deployment aims to reduce diesel fuel usage, diesel generator operating hours, and overall power bills. Pre-design preparation and system design simulation will result in the best possible system design. It is also comparing the economic feasibility of a PV-diesel hybrid system to a diesel grid unreliable system during a 25-year lifetime.	Dr. Ahmad Salah	Mohammad Tarkhan Yazan Al-Ramamneh Mohammad Musleh Mohammad Yassien	AHU Electrical Engineering
20	Design of a portable solar PV System	One of the modified designs on photovoltaic systems is the off-grid portable PV generator system which is capable of producing an electric power output up to 2kWh/day and with the inclusion of a storage batteries system as a backup. The PV arrays mounted on the main body can be closed and opened hydraulically in order to save space and make it easy for the system to be transported and be set and operated in a very short time.	Prof. Munzer S. Y. Ebaid	Baha Aldeen Hussam Sawalmeh	PU Mechanical Engineering

21	Dual Axis Sun Tracker	Solar energy is one of the most efficient renewable energy sources that might help to alleviate the current energy problem. This project uses Arduino to build a dual axis solar tracking system. The maximum light source from the sun is detected using four light dependent resistors(LDR). The solar panel is moved by two servo motors in conjunction to the maximum light source location sensed by the LDRs. The code is written by using C programming language and has targeted to the Arduino UNO controller. Further more, the project was put to the test using LED light to show that it is capable of catching the greatest amount of sun light for star harvesting applications.	Eng. Ahlam Aldamati	Dilal Mohammad Samir Ahmad	PU Electronic and Communications Engineering
22	Modeling and Simulation of Photovoltaic Modules Cleaning Robot	In this project, a photovoltaics modules cleaning robot was designed, modelled and simulated for functioning and proposed to be implemented as a prototype for future work. The proposed robot is to be self-driven and connected to the internet. this project was achieved using Arduino MKR1000 with Wi-Fi connectivity based on Atmel ATSAMW25 SoC specifically designed for IoT projects and devices. A compact optical dust sensor used to detect dust particles on PV modules. It consumes low current to detect dust and uses photometry method to detect dust level. Appropriate motors were also selected to drive the robot wheels for vertical as well as horizontal movement. Another motor was used for the cleaning brush.	Prof. Ibrahim Rahoma	Abdulrahman Al-Ozzo Hamzh Mestarihi Tareq Azaizh Islam Nussairat	PU Electronic and Communications Engineering

23	Solar Powered Auto Irrigation System	This project proposes a model of variable rate automatic micro controller based solar powered irrigation system Solar power is used as the only source of power to power the overall system Sensors are placed on different parts of the field and these sensors continuously sense the soil humidity level and give message to the controller informing when water is needed.	Dr. Hasan Maridi Prof. Ibrahim Rahoma	Mohammad Albaba Wadie Alshaghadari	PU Electronic and Communications Engineering
24	Hybrid Power Irrigation System for Rural Areas	This project is about developing a hybrid power irrigation system of renewable power in rural farms far from the electricity network by installing a solar panel and a wind turbine to generate electricity. It is desired to make the electronic irrigation process with the least human intervention possible, besides installing moisture sensors, water level sensors, and operating the pumps automatically when needed. In this way, the irrigation process will become better, easier and reliable.	Eng. AhlamA. Damati	Amer Krizim MotasemAL-Qawasmeh OsaidFarah	PU Electronic and Communications Engineering
25	Design and Implementation of IoT based smart bag	In this project, a prototype is proposed for a wearable electronic bag. The bag is fitted with a screen and acts like a computer; it can also display phone data and keep up with the fashion. The bag will be unique as it will be fitted with a screen and a computer that can be connected to the internet. It can also be connected to a mobile phone where the user can control many aspects of the bag, such as: locking/unlocking, internal lighting, checking the bag contents, and many other useful features. The bag also has a GPS module that allows the user to locate the bag on a map in case of loss or theft.	Dr Omar Daoud	Mohammed Ahmad Samir Refai	PU Electrical Engineering

26	Smart Security Door System with Face Tracking Camera using IoT	Providing humans safety and a more secure area for their values and properties is an important goal to achieve. In this project, a smart lock door with two types of methods for entry, which are fingerprint and authentication PIN code, also, an unnoticeable face tracking camera that captures a photo in case of error data entry is to be controlled via smartphone with the implementation of IoT. The simulation is made via Proteus software which shows two microcontrollers, the first one is for controlling the fingerprint sensor, keypad, and solenoid lock which is ESP32, while the second one is the ESP32-CAM which captures a photo of unknown person who enters wrong data and be send to the owner's smartphone using the web server and the Blynk application. for future work.	Dr. Anis Mousa Al-Nazer	David Ashton Herbet Hamza Nasri Al-Temawi Mohamed Waleed Abu Baker	PU Electrical Engineering
27	Smart Wearable Health Monitoring Device	The wearable smart health monitor should be used to assist the elderly in addition to assisting the care giver and providing them with information of where and when the wearer has fainted or fallen. These information can be transmitted over the internet to a relative and a doctor who is responsible for the case. The proposed device monitors O2 level, Temperature and heart rate. It sends an alarm to health care giver if upnormal value s were detected. Moreover, the device can detect if the user falls down, and then send an alarm message and GPS location to relative sand caregivers.	Dr. Mohammed Abu Mallouh	Abdulrahman Mughrabi Omar Farraj Fadi Qafesha	PU Mechatronics Engineering
28	Design of solar photovoltaic electric	In this project, a grid-connected solar powered electric vehicle (EV) charging station and off grid solar	Dr. Amer Abulaish	Saja Almaraieh	AHU

	vehicles charging station - case study Alhussineh , Ma'an	powered electric vehicle charging station are designed and constructed. The solar powered EV charging station consists of many component we will discuss it in details . The proposed charging station is powered by renewable energy source such as photovoltaic (PV) , this work includes results obtained from the pv syst software when we make simulation.		Majd Alzyood Mahmoud Abdel-ghani Elsed Ahmad Raja Alnasarat	Mechanical Engineering
29	Solar Tracking Drive System	The main aim of this project is to implement a solar tracking system that ensures the sun rays fall perpendicularly on the solar PV panel and thus harness the maximum amount of solar energy possible. In doing so, increases the efficiency of solar cells. The project seeks to solve the problem of accurate, efficient and economical micro-controller based solar tracking system that can be implemented within the available time and using available resources so as to track the motion of the sun. Motor control using pulse width modulated (PWM) signals is generated by the MSP430G2553 micro-controller is effected to move the solar panel, directing it towards the sun.	Dr. Mohammad Ibrahim Al-Sharari	Mohammed Khaled Al Maraieh AbdulRahman Soud Krishan Hamza Nedal Abu Hayaneh Ehab Mufeed Krishan	AHU Electrical Engineering-
30	Design of Smart speed bump	Smart Speed Bumps would be a game-changing improvement in pedestrian safety, particularly in school zones and on roadways with a high volume of pedestrian and vehicular traffic. Selective deterrence guarantees that law-abiding drivers are not penalized, preventing them from becoming enraged. The preemption technology reduces worries about delays in emergency response times caused by bumps. The bump would cause fewer vehicles to brake and accelerate, lowering pollution produced by any other	Dr. Aser M. Matarneh	lamya'a Jameel Al-Qaralleh Tasnem Majed Al-Dmour Rawan Basheer Al-Iqnibe Saja Mohammed Al-Nawaiseh	MU Electrical Engineering

	traffic-calming device. As a result, as compared to traditional bumps, the system's installation would face little or minimal public opposition. The Internet of Things technology will help in monitoring and collecting street data remotely and identifying possible faults that may occur during the operation of the system.				
31	Smart Solar Panel System Design	Design Smart Solar Panel System Design using the developed IoT and RE courses	Dr. Omar Al-Ayashrah	<p>Suhaib Banat</p> <p>Mohammad Abudeleh</p> <p>Mutaz Mazaida</p> <p>Hussein Ershied</p> <p>Hasan Hadya</p>	<p>MU</p> <p>Electrical Engineering</p>
32	Radio Frequency Energy Harvesting	The idea of the project was based on the developed IoT and RE courses	Dr. Ayman Al-Lawama	<p>Fadi Ismail</p> <p>Nada Mbideen</p> <p>Lina Al-Qbelat</p> <p>Rand Al-jarajreh</p> <p>Mohammed Al-Qarra</p> <p>Hamzah Mohammed</p>	<p>MU</p> <p>Electrical Engineering</p>
33	Design of Smart Farm	The idea of the project was based on the developed IoT course	Dr. Ayman Al-Lawama	<p>Mohmmad Qnuipie</p> <p>Ammar Al-sarayreh</p>	<p>MU</p> <p>Engineering</p>

			Zain Al-baddawi Rowaa Al-manaiseh Banan Al-Tarawneh Heba Suliman		
34	Avoiding Obstacles Solar Car	This project was based on the developed IoT and RE courses	Eng. Anwar AL-Tarawneh	Ahmad Sameeh AL-Dmour Laith Eid AL-Amro Zaid Salameh Al-Amro Sofyan Salameh AL-Ma'aqbeh	MU Electrical Engineering
35	Design and implementation of solar tracking system	This project was based on the concept explained in developed courses of IREEDER project	Eng. Anwar Al-Tarawneh	Mahmoud Alshobaki Abd al Nasser abd al ghani jaber Yazan Aloran Ahmad almajali Tareq Alwalidi	MU Electrical Engineering
36	Lost and Found	The purpose of the document is to explain how the application works and to specify the tools and the programming language that we are going to use to build our program and more details about it.	Dr.Zeyad Al-Odat	Yahya Al-Adahm Ahmad Afshah Ahmad Shalabi	TTU

37	Smart Home (IOT)	Internet of Things (IoT) is the network of interconnected devices, digital machines, vehicles, home appliances and other objects embedded with sensors, software, switches and connectivity which enable these things to connect to a network and collect and exchange data. The system creates the scope of connecting the non-internet-enabled physical devices and machines to be connected over the internet and remotely monitored and controlled. This project intends to propose architecture for home automation using near field and mobile communication along with a mobile application. The basic architecture or framework consists of connecting devices which will use Arduino , sensors and solar cells to build the system. Along with smart control of the appliances, we will be focusing on energy consumption management system through which consumers can reduce excess energy consumption by remotely controlling the devices and more security home.	Dr. Mohammad Al-Rashdan	Osama Ahmad Omar Tarkhan Hamza Al-bataiha	AHU Electrical Engineering
38	Smart Kitchen using Internet of Things	In this project we will present an integrated system for a smart Kitchen, based on the Internet of things using ESP32 and sensors for comfort and safety. We believe that the need of our project stems from the fact that in our modern world, most people prefer to use their smart devices for their everyday activities, hence the idea for this project to improve the safety of one's kitchen, we will also enable the monitoring and control of some devices via smart phone In the coming pages of our project, we will provide a full explanation of how to modify your kitchen in such way with the use	Dr.Mohammad Al-Rashdan	Mohammad AL-SHAMRI Laith AL-Da'aseen Awad Ahmad	AHU Electrical Engineering

	of already provided hardware and how to program them.				
39	The Intelligent Survival System (The i-Survival)	This project aims at designing an Intelligent Survival System (ISS). The proposed system consists of two components: intelligent assembly (i-assembly) and mobile application (isurvival). The task of the i-assembly is to collect information about the status (number and locations) of people collected at the assembly point. Then, send this information to the local authorities of civil defense for the rescuing process. On the other hand, the task of the i-survival as a mobile application (Apps) is to make an earlier warning to its user about any approaching disaster, to make sure that people can reach the closest and the safest assembly point and allow them to request assistance within a proper time frame.	Dr. Abdullah Ismail AL Hasanat	Ghaida Hsana Harran Qusai Qhasan Alshayeb	AHU Computer Engineering
40	Creating practical applications for sustainable green energy Development of an auxiliary solar cell system for vehicles	This study's objective is to identify the factors that motivate individuals to participate in RE activities so that appropriate action may be taken. A literature review, a section on the research method and design, a section on the expected outcomes and their discussion, a section on the determinants and problems that the project ran into, and a section that provides a summary of the findings make up the seven sections that make up the report: an introduction, a section on the expected outcomes and their discussion, a section on the determinants and problems that the project ran into, and a section that provides a summary of the findings.	Dr.Mohammad Alimon	Ala`a Shaher Jamil Al- Ajlouni Bashar Suleiman Abdallah Bani Essa Mohammad Mahmoud All Salah	AHU Mechanical Engineering

41	Stand-Alone Solar System for a Cow Farm - Study and Simulation	The objective of this project is to design, build, and simulate an off-grid PV solar system that can provide 100% of the electricity demand needed by a cow farm in Jordan that requires 23.65 kWh/day, for daily purposes. The calculations are done based on the institute's geographical location, corresponding weather data, and daily demand information. For the simulation, PVsyst software is used. The real-based final design of the farm uses SketchUp software. The results are then analyzed and discussed to find the best and longest-lasting solution.	Dr. Wael Abu-Shehab	Sara Aldabaibeh	AHU Electrical Engineering
42	Design and Investigation Study of a Novel Polygonal Trough Collector for Solar Concentrating Photovoltaic Applications	In this project, we create a concentrating system for solar radiation on the cells, which will boost efficiency, while also increasing the temperature of the cells, which will have a negative impact on the quantity of electric current produced. Previously, we would remove it utilizing a water cooling system.	Eng. Ghayda Almatarneh	Samir Z.Soqea Abdullah M.Alrosan Mohannad M.Abutayeh Mahmood F. Algharabli	AHU Mechanical Engineering
43	Design an Automatic Sun Tracking Solar Panel with Arduino	The aim of this project was to design a dual axis tracking system which can sense the incident solar light on the panel and move it in the direction of maximum solar light incident. Further the advantages studied. From this study the main conclusions are: i. Proposed system is low cost and compact as compared to the other tracking systems in use for same application. ii. It is very easy to program and modify because it is Arduino based and no external programmer is required. iii. The designed system is easy to use and provides better efficiency of the panel.	Eng. Saddam AlNabhan	Rashid Fahid Almarayeh Mohammad Abdullah Alsalameen Hamza Ali Mahmoud Alayayde	AHU Electrical Engineering

	iv. In the developed system real time data is retrieved on the android device.			
44	Sizing of On-Grid Photovoltaic System for Al-Manhal School	Discusses proper sizing of PV systems	Dr. Al-Motasem I. Aldaoudeyeh	Huthaifa N. Sabra Hamzah H. Oqilan Ahmad M. Al-Najdawi Hamed S. Zabout Al-Mothana S. Al-Masri TTU
45	Mobile Driver Assistant: XBump	In this project, a mobile application called Mobile Driving Assistant is proposed to track some important data about vehicle and road while driving. This application is designed to work on mobile phones and tablets with Android operating system. The application analyzes the data from mobile sensors, GPS and motion sensor, to detect bumps and assist drivers on road. This project was developed at the IREEDER Cybersecurity lab at TTU.	Dr. Murad Alaqtash	Qais Al-Khateeb TTU Computer and Communications Engineering
46	AAA Car: Arduino robot car with Autonomous/Android drive control	In this project, a robot car is developed with main goal to navigate an obscured path and detect the source of gas leak with minimal directions through Android phone. Alternatively, autonomous drive control enable the car to detect and avoid path obstacles. The proposed robot is portable and efficient for various usage in industry, firefighting departments, and at homes. Moreover, the proposed robot can be customized for different missions by installing the	Dr. Murad Alaqtash	Ahmed Alkhateeb Anas Hammad Hadeel Yaqoub TTU Computer and Communications Engineering

	related sensor, i.e. explosive detection, chemical weapons detection, radiation sensors, etc. This project was developed in the IREEDER lab at TTU.				
47	Assessment of Wind Energy for South and North of Jordan	The relation of this project to the IREEDER project (especially the Renewable Energy part of it) comes from the fact that the importance of the study lies in increasing the demand for energy to achieve development goals while limiting the use of traditional energy, as well as highlighting the role and importance of renewable energy in achieving sustainable development without harming the environment, as well as the importance of stimulating investments in the field of renewable energy, in addition to the importance of the topic due to the ongoing environmental changes and developments. And an attempt to draw the attention of investors in depleted energy and notify them of the potential danger regarding the depletion of fossil fuels, and to contribute to enriching scientific research in this field. Moreover, this project aims to draw a wind map to the South and North of Jordan city including (Aqaba – Karak-Tafila- Maan- Irbed- Ras Muneef- Mafraq- Deir Alla) in order to determine the best place for installing a solar or wind system. Finally, the project helps the energy in Jordan by pointing the suitable energy system for each city.	Dr. Mohanad Gharibah	Marwan Zyad Alrefai Tariq Ziyad Altahlah Malek Alzghol Mohammad Almasri	IU
48	Water production via air reality facts of global water crisis &	The relation of this project to the IREEDER project (especially to the Renewable Energy part of it) come from the fact that the purpose of this project is to re-examine the preparation of an Ethiopian study of water	Dr Zakarya Alomari	Marwan Ahmad Samih Thani	IU

	creative technologies for clean water	<p>seer and evaluate its performance in a variety of weather conditions, such as varying air speeds and humidity levels. The following objectives are necessary to achieve the project's goal:</p> <ul style="list-style-type: none"> • In order to evaluate and investigate the current conditions of the atmosphere in terms of its air pressure, humidity, and climate. • Components like the manually operated pump, the internal fan, gears, and the chamber need to be designed and prepared. In order to prepare the water seer tool for the Lay Gayint worda. • The outputs are tested and evaluated based on factors including moisture, humidity, wind speed, and environmental temperature. • SolidWorks and ANSYS are the programmes that are used to analyse the results and create both 2D and 3D components. 			
49	Savonius wind turbine installation on the Highway	<p>The relation of this project to the IREEDER project (especially the Renewable Energy part of it) comes from the fact that the importance of a clean power supply is increasing. So too is the role of wind energy in the overall energy mix. this requires not only investments in new onshore and offshore wind farms. Wind is caused by the uneven heating of the atmosphere by the sun, variations in the earth's surface, and rotation of the earth. Mountains, bodies of water, and vegetation all influence wind flow patterns. Wind turbines convert the energy in wind to electricity by rotating propeller-like blades around a rotor. The rotor turns the drive shaft, which turns an electric generator. Three key factors affect the amount of energy a turbine</p>	<p>Dr. Mohanad Al-Ghriyah</p> <p>Dr. Ismail Hdaib</p>	<p>Sultan Mohammad Barakah</p> <p>Yaser Hasan Al-Bustanji</p> <p>Hothaifa Abd-Alhaleem Shehab</p>	IU

		can harness from the wind: wind speed, air density, and swept area. Therefore, we are studying on how to produce electrical energy from the movement of cars and provide electricity by installing a Savonius Vertical wind turbine so that we see where the highest electricity production will be in the Highway.			
50	Smart Card	The relation of this project to the IREEDER project (especially the IoT part of it) comes from the fact that in this project, we provided a desktop application that serves university students and facilitates their interaction with university services and facilities. The platform is designed for two types of users, the first is the student and the person who wants to access and benefit from university services and facilities that need to prove his identity and know his information, and the second user, who is the employee responsible for the facility or service, who must verify the information of students wishing to benefit from the available services and facilities The system enables students to store their information on the university smart card that they will have in their possession. This card contains the student's university information such as his university number, fees, name and registration status.	Dr. Aayesh Alhroub	Yazan Khalil Ghannam Sakher Hayel Al-Fayez Nour khaleed alrasool Najd Mahoumoud Aljboor	IU Data Science and Artificial Intelligence
51	AGRIPONIA	The relation of this project to the IREEDER project (especially the IoT part of it) comes from the fact that Jordan is currently suffering from the scourge of climate change, the growing problem of desertification, and the decrease in the areas of fruit trees and forests due to the industrial and population incursion on agricultural areas. With the growing demand for food, water and energy and their	Dr. Aysh Alroub	Rand Albustanji Mo'tasem Alsawalha Raghad Alsulimat	IU Data Science / Artificial Intelligence

		<p>connection together in an integrated system, it was necessary to think, research and experiment to innovate and develop an integrated system for food production, taking into account the rationalization of energy and water consumption and the exploitation of modern technology for renewable energy and water production. Therefore, we thought of issuing an application to control the system by remote workers, that is, without the needing to be in agricultural lands all the time. This is done by adding sensors to know the weather conditions that the system is going through all the time, which transfers data automatically to the users' devices by connecting these sensors to a device esp32, which will connect to the Internet and transfer the data to the Android application and thus review information the system.</p>			
52	NFT-JO	<p>The relation of this project to the IREEDER project (especially the IoT part of it) comes from the fact that this study examines the risk and returns characteristics of Non Fungible Token (NFT)-based startups listed on a cryptocurrency exchange. What is NFT ? Cryptographic assets on a block chain with unique identification codes. and metadata that distinguish them from each other. Unlike cryptocurrencies, they Cannot be traded or exchanged at equivalency Our investigation was driven by the recent surge in NFT activity by creators, investors, and traders. We propose a new classification for existing NFTs ranging from NFT blockchains. This project was done using MySQL databases to save and store all the data and purchases, PHP programming language was used, and</p>	Dr. Huthaifa Abauhammad	<p>Eyad taha Omar Samarah Mohammad Sharif Khalel Shaban</p>	IU

		in building user destinations, CSS and JavaScript were used And bootstrap, and at the end of the project, all the functional requirements for this site were fulfilled, where the system administrator adds images and NFT media in the databases. Users create new accounts, log in, and buy all the media or the NFT, and when they are booked and purchased, no one can see them only Because it is owned by the person who purchased them and, in turn, can rename it or add the necessary description to it and sell it again.			
53	Beauty Clinic	The relation of this project to the IREEDER project (especially the IoT part of it) comes from the fact that on (Feb 17, 2022) I discussed the basic idea of the project and defined the basic system requirements, then I collected the required information that most of the patients and consultants in Dr Sami clinic experience and I wrote these notes to be taken into account in order to improve the functional system requirements. On (02-28-2022), I held another meeting to organize a work plan and on (10-03-2022), and after consulting many experts and programmers specialized in the field of websites, they suggested that user interfaces be made using CSS html, JavaScript, bootstrap, jQuery and PHP programming language , databases must be used in this project and they have praised the use of MySQL databases with the local server XAMPP. The system will contain a special screen for booking appointments. Through this screen, a meeting can be held between the patient and the doctor for consultation. On (20-04-2022), I got some instructions from a programmer who is skilled in	Dr. Huthaifa Abauhammad	Amal Al-Deffalh	IU Computer Information Systems

		creating databases and structuring data for use on the site.			
54	Education website	The relation of this project to the IREEDER project (especially the IoT part of it) comes from the fact that in presenting this project to fulfill the requirements for a Bachelor of Information Technology degree from Al-ISRA University, we agree that the University Library may make it freely available for inspection. We further agree that permission for copying this project in any manner, in whole or in part, for the scholarly purpose may be granted by my supervisor(s) or, in their absence, by the College of Information Technology. It is understood that any copying, publication, or use of this project or parts thereof for financial gain shall not be allowed without my written permission. Due recognition shall be given to Al-ISRA University for any educational use made of any material from my project. Requests for permission to copy or to make other use of materials in this project, in whole or in part, should be addressed to: College of Information Technology Al-Isra University Amman, Jordan.	Dr. Mohammad aljanini	Aws Ibrahim albadawi Bader Elden forsan almasri Ahmad ismail	IU Software Engineering
55	My School	The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that through our vision of the problems of distance education and the difficulty of communicating information to students from teachers, we are ready to solve these problems in the end. The main goal of this application is to build a platform that makes the learning process easier, simpler, and clearer	Dr. Ayesha Alroob	Husam Aldean mohammad alkhatalen Yazan Mohammed Khalaf Mahmoud Ahmed Alyan	IU Computer Science and Software Engineering

		for the student The application can improve the quality and reliability of education services, which will lead to better acceptance and use of these services by students. The education process is a fundamental issue, a problem with a great danger due to the pandemic, and solutions had to be found.		Haytham Waheed Alqunber Youssef Hassan Al-Wahsh	
56	Best Lawyers	The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that ever since mankind walked the earth they have always looked for a way to communicate and express themselves, to survive and to coexist. time went by and mankind found newer ways to contact others beyond the borders of destination; using the internet, but most of the content creators are armatures. This project aims to create a safe environment, where people with legal questions can ask without the fear of judgment or legal fees, in a community of people that want to help and support each other, helping the legal team to develop their skills. The project consists of several legal categories, the visitor can be a viewer by only viewing or searching the website content without registering, the visitor may also sign in and become a member giving them the right to comment, the lawyers can send a request for joining and wait for the approval to be a consultant member.	Dr. Aysh Alroob Dr. Venus Samawi	Aya Ziad Al-Kurdi Laila Nazieh Hassan Amal Abd Alkareem Al-Othman	IU Software Engineering and Computer Information Systems
57	Hon Clinic	The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that the idea of the project revolves around the e-mail service and the services provided through the provision of electronic services, its on-site,	Dr. Aysh Alroub	Abdullah Mahmoud Barghash Anas Masoud Jaara	IU Faculty of Information Technology

	<p>government services, and medical records for all patients, the possibility of paying bills directly or via Through the visa, the system enables supervisors to obtain reports about clinic expenses, add it, and it can add new clinics and manage drug stocks, treatment and prices. All of these services provided on the platform revolve around one main goal, which is to provide high-level medical care to patients.</p>		<p>Bahaa Zakarea Dar-khalil Oday Mohieldeen Al-Khalili</p>	
58	<p>(Zombie Killer) Mobile Game</p> <p>The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that the main objective of this project is to design and implement a game (called Zombie Killer) to develop players' skills in terms of concentration and speed of response, and to improve the player's ability to solve problems that arise during the playing stages. It also develops the spirit of cooperation and a sense of responsibility among the players and the love of helping others. The scenario of the game talks about people infected with a viral disease that turned them into zombies, and there is a group of doctors who managed to make the antidote, but they dispersed due to the zombie attack on them. Doctors are divided into three groups. The player's responsibility is to try to rescue the doctors and assemble them to make the antidote, as the components of the antidote are distributed among the groups. The game target people >=13 years old. Zombie Killer was created using Unity software in C. 3D renderings are used to design and draw scenes and characters. The player must win the three stages to succeed in rescuing the doctors and gathering them to make the antidote and save the</p>	<p>Dr.Venus W. Samawi</p>	<p>Yousef Adle Mohamad Al-Mohtaseb</p>	<p>IU Faculty of Information Technology</p>

	people. Artificial intelligence (AI) is used to control the zombie animation. The game is tested by several players who fill out a questionnaire to clarify their opinion of the game.				
59	Boot2Root and PrivEsc Arena – Virtual	The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that Cybersecurity competitions are exciting events surging in popularity in the cybersecurity community. One common event type is the "Capture the Flag" (also referred to as CTF) competition, available online and in-person in many areas. CTF are a unique and interesting part of the cybersecurity community. Cybersecurity captures the flags, involving professionals and beginners alike to learn and keep their skills sharp. Our project comes here to make a vulnerable machine that help is the students to improve their skills and become more familiar with security tools in legal ways. We will introduce two machines in CTF style that will be one of them a Privilege Escalation, and we will abuse the wrong permissions in the system to become a root (Administrator). The second one will be a Boot2Root machine. You need to identify the vulnerabilities in a server and misconfiguration or more; then, we need to exploit those vulnerabilities and escalate your privileges until you become the root.	Dr. Huthaifa Abauhammad	Ahmad Yasser Juran Hashem Mahmoud AbuShaikha	IU Cyber Security
60	Trojan Horse Malware (Lucifer)	The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that the project is about a Trojan horse, a type of malware that sneaks into the computer while	Dr. Huthaifa Abauhammad	Loai Alqatanani Lana Salma	IU Cyber Security

	<p>masquerading as a legitimate program. This project was established to help government agencies track wanted persons and help companies conduct a penetration test. This project will add a solution to one of the most challenging difficulties faced by government agencies, which is tracking criminals, as well as a large number of cyber attacks. We usually use social engineering to hide malicious code inside legitimate programs to gain access to the system. In addition, a Trojan, unlike a computer virus, cannot appear on its own, so it requires the user to download it to the server-side of the application for it to work. This means that the executable file (.exe) must be executed and the program installed in order for the Trojan to attack the device system. The Trojan also spreads through legitimate-looking emails and files attached to emails that are sent to spam to reach as many people's inboxes as possible. It is possible to turn the device into a zombie computer, giving us remote control of it without the user's knowledge.</p>				
61	Spam Mail Detection For WebSite	<p>The relation of this project to the IREEDER project (especially the Cyber Security part of it) comes from the fact that some people rely on email messages to communicate. It is the fastest way to send information from one place to another. Furthermore, some people started using emails for attack and fraud for many purposes. The email may be affected by spam attacks, which flood boxes with unwanted commercial messages or fill them with viruses and malware. This project aims to reduce, detect, and help to stop spam from increasing productivity, protect users from</p>	<p>Dr. Huthaifa Abauhammad</p>	<p>Mohammed Al-Omari Mohammed AL-Hindi Mohammed Al-Zaidi Lutfi Farraj</p>	<p>IU Cyber Security</p>

	<p>Cybercrime, and prevent messages full of viruses, malware, and network attacks such as phishing mail. In this project, a website has been created to allow users to communicate with each other through messages and to access their data with a Safe-Mail account using a Local Host Server via a created mongo database hosted on cloud storage. When conducting conversations in email, users can analyse the messages that have been received to see the percentage of spam and not-spam. Then a free Web service has been used which allows the user to classify the text messages easily. To analyse messages, a machine learning classifier has been used in this project. Automatic workbooks are classified automatically by grouping them into one or more groups of "categories". The most popular type of classifier is the Email Filter (the classifier is the rules that devices use to classify data) that scans email messages to classify them by category classification: Spam or Not Spam. To use classification and machine learning in the website, we used a free web service where we can easily create text messages and use them. It is a website that allows the user to contact him to analyse the text after sending an email and know the percentage of spam in the incoming message, and this helps reduce spam and to avoid the messages from viruses.</p>				
62	<p>Design of a small-scale power system integrated with PV source</p>	<p>PV systems have the unique potential to produce electricity for local consumption in regions where there are no power lines and expensive fuel is in short supply. They may provide electricity to locations that would otherwise be without it, as well as improve the</p>	<p>Dr. Amneh Mbaideen</p>	<p>Moath Hussin Al_Zyoud Hashem Ahmad Aldabbas</p>	<p>MU Electrical Engineering</p>

	<p>quality of life in those regions while being ecologically friendly. They may power water pumps in locations where this vital resource is scarce, medical health centers that previously lacked enough or consistent electricity, and villages that are largely shut off from the outside world and where activity ceases as the sun sets. The project used the developed IREEDER RE course.</p>		<p>Abdullah Falah Albayaydah</p> <p>Ansam Majed Al_Thunaibat</p> <p>Ruaa Mohammad Al_Tarawneh</p>	
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Table 1 - Complete list of final year graduation projects

3. CONCLUSION

Given the number of final year graduation projects achieved, the diversity of relevant topics and the quality of the work conducted, it appears safe to say that IREEDER not only achieved the goal it set itself, but that it surpassed the expectations.

Task 5.4 - “Final Year Graduation projects”, is therefore considered as complete, and provides the springboard and the motivation for further graduation projects, making use of IREEDER created facilities and of the new expertise and knowledge acquired, guaranteeing the project’s sustainability.