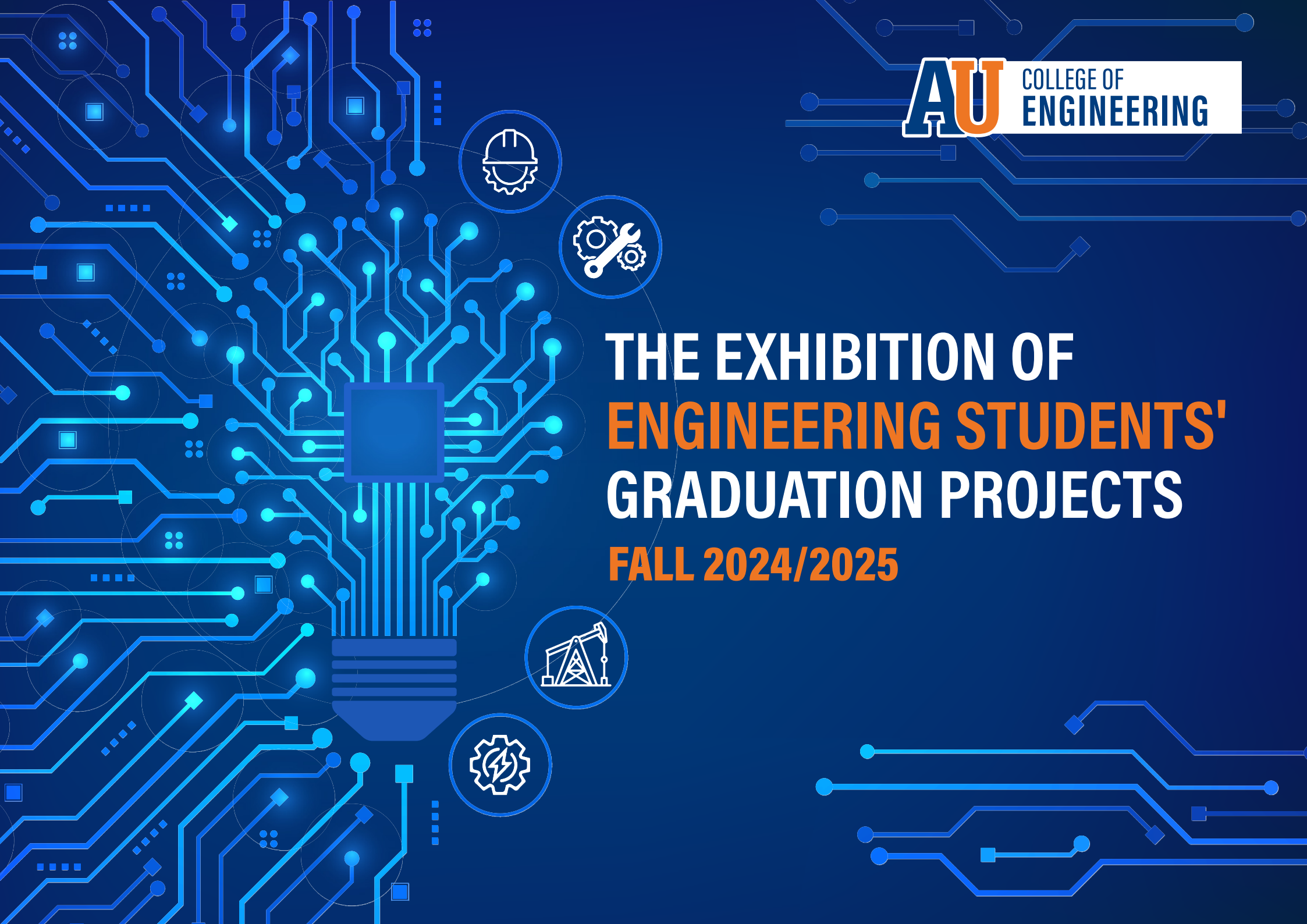
AU
COLLEGE OF
ENGINEERING
THE EXHIBITION OF
ENGINEERING STUDENTS'
GRADUATION PROJECTS
FALL 2024/2025

DR. MOHAMMED ABDUL-NIBY

DEAN - COLLEGE OF ENGINEERING

Dear distinguished guests, proud families, esteemed faculty members, and talented students,

It is my distinct honor to welcome you to the Fall 2024 Student' Engineering Graduation Project Exhibition. This event celebrates not only the hard work and innovation demonstrated by our students but also reflects the vision, determination, and creativity that will shape the future of engineering.

Our students have boarded on a challenging academic journey, concluding with presenting their projects today. These projects showcase their ability to apply cutting-edge technology and scientific principles to real-world problems, demonstrating not just technical expertise but also critical thinking and innovative capacity.

While many remarkable projects are on display, this year's primary focus is on Artificial Intelligence and sustainability. AI is reshaping industries and societies, and our students have utilized its power to create intelligent systems with practical applications. Additionally, sustainability remains a crucial theme, reflecting our commitment to designing solutions for pressing environmental challenges.

As you, our talented students, move forward in your careers, I encourage you to embrace curiosity, creativity, and the pursuit of excellence. Your work has already begun to influence industries and communities, and I am confident that your future contributions will leave a positive mark on society.

On behalf of the faculty and staff at the College of Engineering, I extend my heartfelt congratulations to everyone involved. We are proud of the innovative accomplishments and look forward to their broader impact.

Sincerely yours,

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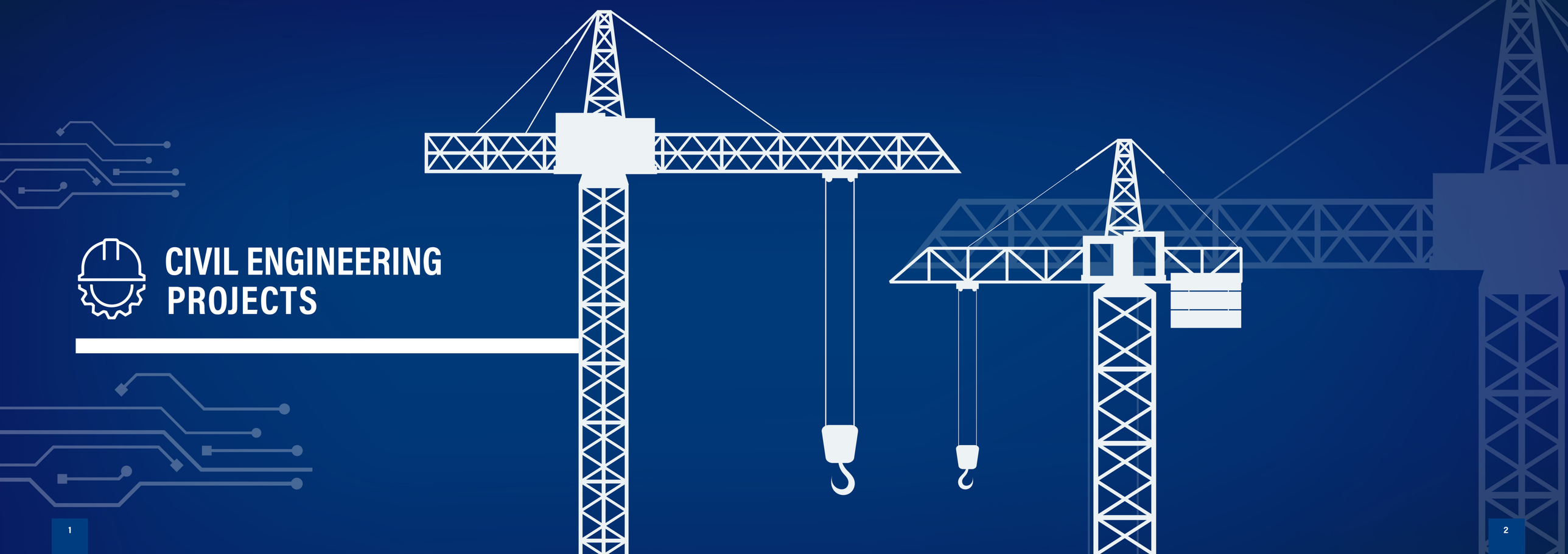


C1

UPCYCLING OF WASTE TO CREATE REFUGEE SHELTERS

STUDENTS:

- Amir Mohammad Reza

ACADEMIC SUPERVISOR:

Faisal Alotaibi

PROJECT DESCRIPTION

The global refugee crisis demands innovative solutions for providing shelter to displaced populations. This research aims to explore the feasibility and impact of upcycling waste into sustainable and culturally meaningful refugee shelters. By repurposing discarded materials, we can address both environmental sustainability and the urgent need for housing. The proposed study will investigate design methodologies, material selection, and community engagement strategies to create functional and dignified shelters. The outcomes will contribute to humanitarian efforts and inspire future shelter designs worldwide.

C2

ELEVATING CONSTRUCTION RESILIENCE: DIGITAL TWINS AND MACHINE LEARNING INNOVATIONS FOR FOUNDATION SETTLEMENT ASSESSMENT

STUDENTS:

- Modhi Albuti
- Murdhi Alothaina
- Esraa Altawari
- Othman Alhamdan
- Lamees Alkharafi

ACADEMIC SUPERVISOR:

Dr. Rodaina Aboul Hosn

PROJECT DESCRIPTION

This topic investigates the integration of Digital Twin technology and machine learning algorithms in the field of construction, specifically focusing on foundation settlement assessments. The project involves the construction of a lab-scale bridge, equipped with advanced sensor arrays for real-time data collection. A Digital Twin is developed to replicate the physical bridge, incorporating machine learning to enhance predictive capabilities for foundation settlement under varying conditions. The study aims to provide a scalable and user-friendly tool for construction professionals, contributing to sustainable practices in geotechnical engineering.

C3

NAVIGATING THE FUTURE: A COMPREHENSIVE SURVEY ON DIGITAL TRANSFORMATION, AI INTEGRATION, AND SUSTAINABILITY IN KUWAIT'S CONSTRUCTION INDUSTR

STUDENTS:

- Dalal Fahad Alajmi
- Hamad Ali AlRashidi
- Mohammad Fadhel Alfadhel
- Hajar Khaled Alsabah
- Walah Abdulaziz Almutairi

ACADEMIC SUPERVISOR:

Dr. Rodaina Aboul Hosn

PROJECT DESCRIPTION

This study consists of a survey focusing on the integration of artificial intelligence (AI) and sustainability practices within Kuwait's construction industry. Leveraging a comprehensive questionnaire, the survey aims to investigate the current status of digitalization, AI adoption, and sustainable initiatives. By exploring the impact of these advancements on construction processes, the survey seeks to uncover challenges, assess preparedness for future investments, and illuminate sustainability efforts in Kuwait's construction firms. Consequently, this will contribute to a better understanding of industry dynamics, providing valuable guidance for stakeholders committed to fostering technologically advanced and environmentally sustainable practices in construction.

C4

SMART SOLUTION TECHNOLOGY FOR ENHANCED MANHOLE DETECTION IN RAINY CONDITIONS

STUDENTS:

- Othman Almesbah
- Sayed Hussain
- Khaled Alrabeea
- Yousef Talal
- Abdulrazak Taleb

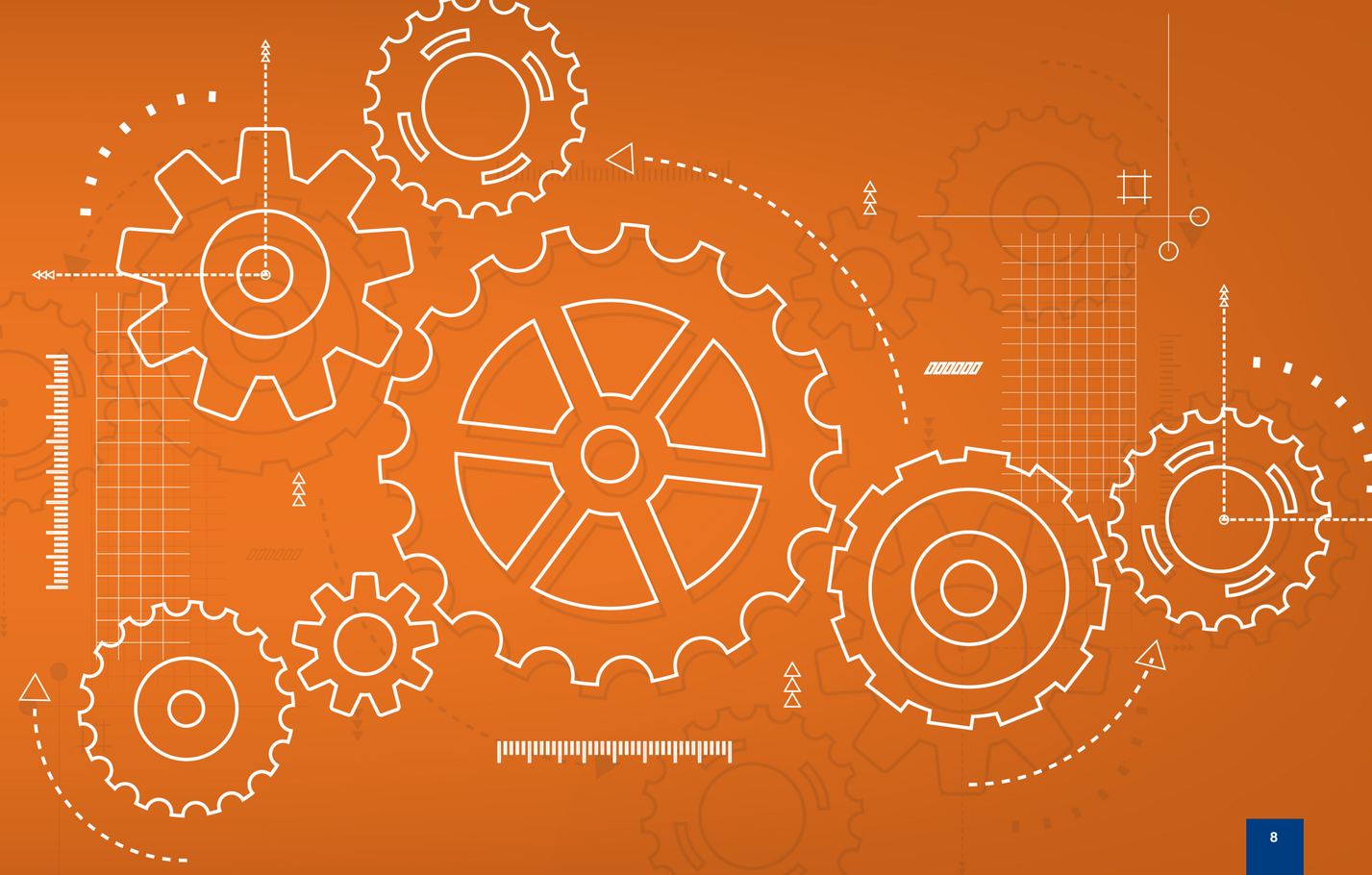
ACADEMIC SUPERVISOR:

Dr. Meshari Almutairi

PROJECT DESCRIPTION

This work acknowledges the innovative advancements in manhole detection technology, particularly under challenging weather conditions such as rain. The integration of acoustic sensors, infrared imaging, GPS mapping, and ground-penetrating radar demonstrates a significant leap in locating manholes with precision and reliability. By leveraging artificial intelligence for visual recognition and employing regular maintenance strategies, we enhance safety and operational efficiency in urban infrastructure management. This multifaceted approach not only addresses the limitations posed by water accumulation but also sets a new standard for environmental adaptability in civil engineering practices.

MECHANICAL ENGINEERING PROJECTS



M1

ELECTRIC VEHICLE BATTERY COOLING SYSTEM USING NANOFLUIDS

STUDENTS:

- Hamad Almerjan
- Logain Ali
- Thamer Alaftan

ACADEMIC SUPERVISOR:

Dr. Wisam Al Saadi

PROJECT DESCRIPTION

The battery pack is a critical component of electric vehicles, playing a vital role in their overall performance and efficiency. However, one of the significant challenges faced in battery technology is the issue of heating, which can lead to severe complications such as reduced lifespan, safety hazards, and diminished performance. To address this challenge, an effective cooling system is essential to maintain optimal operating temperatures for lithium-ion cells. This project aims to design an advanced battery cooling system utilizing nanofluids, which have superior thermal properties to conventional coolants. By employing Simscape and MATLAB simulations, the thermal performance of the cooling system will be evaluated, and the impact of incorporating nanofluids will be assessed. It is anticipated that the addition of nanofluids will significantly reduce the maximum temperature of the battery pack and enhance its efficiency, safety, and longevity.

M2

ECO-POWER DESIGN OF GREEN GYM EQUIPMENT

STUDENTS:

- Mustafa Obaissi
- Musaed Yousef Alhumoud
- Mansour Bader Husain
- Ahmed Ali Mualla
- Khaleel Naqi

ACADEMIC SUPERVISOR:

Dr. Ehab Bani Hani

PROJECT DESCRIPTION

Producing power and creating a positive environmental impact are crucial for sustainable societies. Gyms consume a lot of energy for operating fitness and training devices, lighting, and other functions. The efforts consumed through training can be used to help save power. By designing environmentally friendly training gym equipment, energy can be produced and used to run the device itself or in any other way inside the gym which will help in saving energy and protect the environment. Thus, the project aims to design and build an eco-friendly gym that can be installed inside the AU campus where students can practice and produce energy and integrate another renewable energy source such as solar panels to have more power generation that could be used for many applications.

M3

PCM COMPOSITE WALLS' THERMAL PERFORMANCE EVALUATION IN BUILDINGS

STUDENTS:

- Saad Alrashidi
- Maryam Altamaar
- Abdulaziz Rumaih
- Reem Alzaher
- Abdullah Almulla

ACADEMIC SUPERVISOR:

Prof. Ahmad Sedaghat

PROJECT DESCRIPTION

This project aims to investigate the impact of phase change materials (PCM) in composite walls on the thermal characteristics of buildings. The study involves manufacturing two identically sized rooms with a half-sized model of the portable cabin built at the Australian University of Kuwait. The interior space of the rooms measures 1000mm by 1000mm with a height of 1400mm. The door and window should be scaled and fabricated with glass or similar materials. One room will have walls made entirely of sandwich panels, while the second room will use both sandwich panels and PCM. Both rooms must have identical wall and roof thicknesses. Additionally, identical PV panels will be installed on top of each room and used to cool down the rooms using a cooling system. The main challenge is to select a frame structure for both rooms using lightweight materials and ensure that the weight of each room remains below 50 kg. Temperature sensors will be strategically installed inside and outside the rooms, with data collected at 10-minute intervals over a few weeks. The results will then be analyzed and reported.

M4

DESIGN AND FABRICATION OF A BATTERY-OPERATED MULTIFUNCTIONAL KART

STUDENTS:

- Abbas Mohammad Alqattan
- Ahmed Bader Hasan
- Abdullah Othman Saleh
- Aryam Abdullateef Alsaidy
- Haya Walid Al Qasim

ACADEMIC SUPERVISOR:

Dr. Nader Ghareeb

INDUSTRIAL SUPERVISOR:

Dr. Ghassan Alothman

PROJECT DESCRIPTION

This project introduces a novel approach to sustainable transportation of compost bins inside a park by using a multifunctional Kart. This Kart, designed for versatility and eco-friendliness, integrates basically a brushless DC motor, charge controller, battery, and frame. It is engineered to navigate unpaved terrain and facilitate the transportation of compost bins within green spaces. The objectives encompass the design and fabrication of a lightweight, stable steel frame for the Kart, along with the development of a lifting mechanism for transporting compost bins. The selection of the appropriate motor, controller, and battery will be based on thorough calculations to achieve efficient operation at relatively high speeds. The project also includes designing and modeling of the multifunctional Kart lifting mechanism, as well as the risk assessment, BOQ and calculations.

M5

DESIGN AND DEVELOPMENT OF IN-RIVER WATER TURBINE

STUDENTS:

- Muaaz Abdullah Mohammad Alqahatani
- Hashem Abdulhadi Abdulhameed Alsaleh
- Mustafa Adel Mohammed Ghuloum
- Zaid M. K. Elfara
- Abdulrahman Abdullah Najem Alfaleh

ACADEMIC SUPERVISOR:

Dr. Adel Younis

PROJECT DESCRIPTION

This project will produce a cutting-edge in-river water turbine that is perfect for powering off-grid assets like cottages, holiday houses, RVs, campers, and even remote monitoring systems and villages. The river turbine uses the natural flow of a river to create energy once it is submerged underwater. It only needs to be submerged in the river, and secured to the sides of riverbeds. The river current causes the turbine to spin, which activates an electrical generator that is completely waterproof. An integrated smart converter then transforms the generated energy into electricity. More turbines could be constructed and coupled to a single battery bank if more power is required. The low-maintenance turbine is made to function in flows with low velocity and shallow depths. The proposed river turbine is beneficial for the ecosystem and does not harm the river's surroundings.

M6

DRILL-PIPE AND DRILL-STRING'S FATIGUE FAILURE INVESTIGATION

STUDENTS:

- Abdullah Mohammad Manea Alajmi
- Nayef Jamaan Falah Alazemi
- Husain Abdullah Husain Aldousari
- Naser Mnahi Fahad Alazmi

INDUSTRIAL SUPERVISOR:

Dr. Adel younis

PROJECT DESCRIPTION

Drill strings are used in the oil industry to excavate and extract oil and gases from the ground. The drill string experiences a variety of loads throughout this operation, including axial, lateral, and torsional loads. The drill string is currently utilized in the oil and gas business, and it is replaced when it breaks, which can impede operations, result in work downtime, and be expensive to replace. To replace a drill string before it breaks and incurs additional costs and delays, an experimental investigation needs to be carried out so that the fatigue failure of a drill string can be forecasted or predicted. The drill string will be put through an experimental setup where it is going to be subjected to axial, lateral, and torsional loads to gather data that can help in predicting drill string fatigue failure. This can significantly minimize downtime and reduce costs associated with drilling operations.

M7

DESIGN AND IMPLEMENTATION OF A FIRE EXTINGUISHING ROBOT

STUDENTS:

- Humoud Faleh Alhajeri
- Abdullah Jamaan Busamri
- Hamad Zeyad Alhaqan
- Omar Motlaq Alkahtany

ACADEMIC SUPERVISOR:

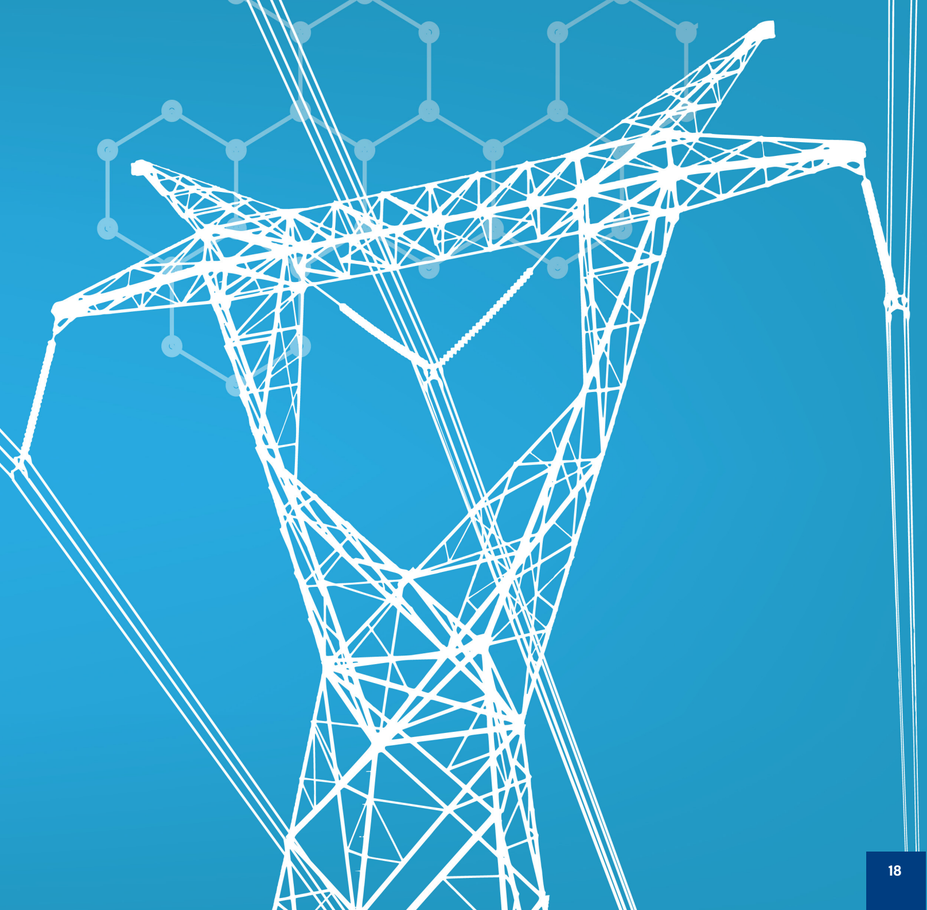
Dr. Afif Gouissem

PROJECT DESCRIPTION

The objective of the project is to design and build a fire extinguishing robot. The robot will work by pre-fixing a standard type of fire extinguisher on its base and by being driven remotely. The design will be powered by a battery and should allow the user to remove the extinguisher safety pin when the robot reaches its destination and to aim the foam/powder toward the wanted directions. All equipment should be able to handle high temperatures, and not to be damaged in a fire. The project involves the following steps:

- Motor power/torque/battery calculations for moving the robot.
- Load, stability, and stress calculations
- Material selection
- 3D design using SolidWorks.
- Building the robot using chosen materials and commonly used techniques (bolting / welding / ...)
- Performing Arduino coding for the remote controllers.
- Testing the prototype in a simulated harsh environment

ELECTRICAL AND ELECTRONICS ENGINEERING PROJECTS



E1

COMPACT AND RELIABLE SPIDER ROBOT FOR SEARCH AND RESCUE MISSIONS

STUDENTS:

- Rawan Tareq Najaf Hasan
- Nourah Saad Adel Alsaidy
- Jenan Abdulhameed Esmael Moqaddam
- Hissah Saad Mohammad Alsaeidan
- Hamad Khaled Ebrahim Alhajree

ACADEMIC SUPERVISOR:

Dr. Hamzeh Aljarajreh

PROJECT DESCRIPTION

This project focuses on creating a small and reliable robot that can be used for various purposes, especially in areas where traditional wheeled robots can't go. The robot is designed to move through difficult, uneven, and tight spaces, making it perfect in natural disasters, such as earthquakes or building collapses, where access is difficult. Because of its compact size, the robot can enter areas that are too small or too dangerous for humans, like collapsed buildings or narrow tunnels filled with debris. This makes it an ideal tool for search and rescue missions, where finding and helping trapped people quickly is critical. The robot is also versatile, meaning it can be used in a wide range of other dangerous environments. For example, it could operate in nuclear facilities where radiation levels are too high for humans, or even assist in space missions where the environment is too harsh for traditional equipment.

The robot is equipped with advanced sensors that help it see and understand its surroundings, allowing it to navigate and perform tasks on its own without needing constant control from a human operator. This makes the robot not only well-founded but also highly efficient in conducting its missions. Overall, this project aims to provide a practical and effective tool for real-world challenges where getting around is hard and reliability is essential.

E2

POSTUREIQ:AI-BASED BODY POSTURE OPTIMIZATION SYSTEM

STUDENTS:

- Abdullah Faraj Obaid Alajmi
- Ahmad Mohammad Hajeyah Hasan
- Hamad Saleh Sulaiman Alkharji
- Hamoud Anwer Saud Almofarah
- Othman Jamil Mohammad Muzher

ACADEMIC SUPERVISOR:

Mr. Khaled Abujbara

PROJECT DESCRIPTION

The AI-Powered Posture Optimization System is designed to monitor, predict, and enhance body posture and balance in real-time. Tailored for athletes, rehabilitation patients, and the elderly, it uses wearable sensors, embedded controllers, and AI-driven analytics to offer personalized feedback and preventive care.

Athletes can optimize performance and reduce injury risk, while rehabilitation patients benefit from faster recovery with continuous monitoring. For the elderly, the system helps prevent falls and promotes independence.

This innovative solution transforms health management by reducing healthcare burdens through proactive posture correction and injury prevention. It combines cutting-edge AI, seamless mobile integration, and real-time analytics to deliver a smarter, healthier future.

E3

ADAPTIVE AI-BASED HOME ENERGY CONTROL SYSTEM

STUDENTS:

- Abdullatif Saud Abdulaziz Almatoq
- Abdullah Mohammad Abdullah Alajmi
- Abdullah Nafea Saleh Alnafea
- Mohammed Ahmad Mohammed Abudakar

ACADEMIC SUPERVISOR:

Mr. Mohamed Zaki

PROJECT DESCRIPTION

This project involves the creation of an AI-driven system designed to monitor and optimize energy consumption in homes. By utilizing real-time data from current and voltage sensors, the system analyzes energy usage patterns through advanced machine learning algorithms, allowing it to predict and adapt to user behavior. The AI module automatically controls appliances, reducing energy waste and minimizing costs by deactivating devices during peak times or when they are not needed.

A user-friendly mobile app interface offers real-time feedback, detailed reports, and personalized energy-saving recommendations, while also enabling manual control of appliances remotely. This project emphasizes the potential of AI to enhance energy efficiency, reduce unnecessary consumption, and contribute to sustainability.

E4

EMG-DRIVEN 3D PRINTED PROSTHETIC ARM: A BREAKTHROUGH IN MOBILITY

STUDENTS:

- Hashem Subhi Khalaf Alenzi
- Atalla Bader Atalla Alenezi
- Mona Talal Abdulmajeed Altatan
- Zakria Abbas Ali Alblooshy

ACADEMIC SUPERVISOR:

Dr. Hamzeh Aljarajreh

PROJECT DESCRIPTION

This project presents a 3D-printed myoelectric prosthetic arm, controlled by muscle signals from the user. The arm works by detecting the user's muscle movements, allowing people who have lost an arm, part of it, or were born without one to control the prosthetic arm. Although these advanced prosthetic arms can be expensive and are not always available to people in poorer countries, new 3D printing technology and advanced controller are making it easier and affordable. The 3D printing industry has grown quickly, allowing people to make custom products, including prosthetic limbs for war victims. While simpler mechanical versions of these arms exist, 3D printing has great potential to improve lives, and the technology is expected to get even better over time.

In this design, the prosthetic arm connects to the user's forearm. Three EMG sensors detect muscle signals, which control the hand's movements. The hand has five motors, one for each finger and the palm, all controlled by an Arduino Uno microcontroller. Since commercial prosthetic arms can cost between $5,000 and $10,000, this project aims to create a more affordable option that allows users to perform basic tasks like gripping and releasing objects. The arm must also be comfortable and fit well with the user's forearm.

E5

AI-PERSONALIZED SMART BODY AND HEALTH CONTROL SYSTEM

STUDENTS:

- Abdulaziz Madallah Ismaeil Alanezi
- Khaled Ali Mohammad Alshammari
- Arwa Mohammad Saeed Jumah
- Shaima Jaber Jassem Shumais

ACADEMIC SUPERVISOR:

Mr. Mohamed Zaki

PROJECT DESCRIPTION

This project focuses on developing an AI-powered mobile application that transforms personal health management by integrating embedded systems with smart devices like a smart scale, blood pressure monitor, and blood sugar sensor. The system tracks essential health metrics such as weight, body fat percentage, muscle mass, hydration, blood pressure, and blood sugar levels.

Using AI and machine learning, the app continuously analyzes these data points to provide personalized health insights and actionable lifestyle recommendations, including optimizing nutrition and exercise plans. It evolves with the user's health data to offer increasingly specific feedback over time. The app also includes a nutritional database, allowing users to scan food items via QR codes to receive detailed nutritional information, helping prevent conditions like obesity, diabetes, and heart disease.

By combining AI technology, health tracking, and user-friendly design, this project aims to revolutionize health management, promoting sustainable lifestyle changes and better overall health.

PETROLEUM ENGINEERING PROJECTS

P1

ENERGY EFFICIENCY CONCEPT FOR KUWAIT UPSTREAM SECTOR

STUDENTS:

- Ahmad Dashti
- Mohammad AlAli
- Mubarak AlAbdullah
- Fahad Sabhan

ACADEMIC SUPERVISOR:

Dr. Suad Al Radhwan

PROJECT DESCRIPTION

The oil upstream sector in Kuwait has a significant power demand. The challenges are in the consumption of fluid processing equipment (compressors, pumps, boilers) where optimization of the unnecessary energy consumption in this equipment is required to avoid energy waste. In a large number of wells, this energy inefficiency adds up, resulting in substantial energy waste.

The objective of this project is to check for both thermal and electrical losses at the facilities of KOC, particularly the losses at the GCs. The study is to find a complete solution to overcome these losses through electrification. Electrification involves using electricity for oilfield operations instead of burning fossil fuels such as gas or diesel.

One considerable waste found in the field is the operation of the generators. For the same operation, two generators are always required to be operated where diesel is used to run these generators 24/7, one generator is used during startup and another generator is running continuously for normal operation. This can be replaced by introducing energy from renewable sources such as applying solar energy in the oilfield.

The study will cover the operation of a GC in one selected area, i.e., North Kuwait or South Kuwait. The outcome of the study will be estimated and representative for all other GCs.

The goal is to reduce the carbon footprint of oil and gas activities, increase energy efficiency, and support sustainable development. In addition, it will assist KOC in registering this study under the Clean Development Mechanism (CDM).

P2

EXPERIMENTAL AND MODELLING STUDY OF A SPHERICAL PARTICLE IN FIBROUS FRACTURING FLUID

STUDENTS:

- Dary Reden AlDaihani
- Abdulaziz Hamad Almarri
- Youniss Ali Youniss Ahmad
- Yousif Salman AlAzemi

ACADEMIC SUPERVISOR:

Dr. Rida Elgaddafi

PROJECT DESCRIPTION

Fluid-particle transport systems are ubiquitous in various industries. In the petroleum industry, they are encountered in hydraulic fracturing where solid proppants are transported through fracturing fluids to induce fractures, and in drilling operations where solid cuttings are circulated back to the surface. Proppant settling is a critical issue in hydraulic fracturing and this is found to be a strong function of the rheological properties (viscosity and elasticity) of fracturing fluids. To improve the proppant suspension capacity of fracturing fluids, fiber materials are often added into fracturing fluids, such as in FiberFRAC and channel fracturing.

In this study, the settling velocity of a spherical particle in a fibrous fracture fluid is experimentally and theoretically investigated. In the experimental section, a sedimentation test is carried out to measure the settling velocity of various particles through a Newtonian fluid blended with different fiber concentrations. Mineral oil serves as a base test fluid. The test setup is built to conduct the experiments. In addition, this work presents the development of an improved model for predicting the rate of sedimentation as a function of fluid and proppant properties using a mechanistic model. The model predictions will be validated with measured data. The improved model performance will be compared to available existing models.

The main objective of this study is to increase the productivity of the hydrocarbon from tight reservoirs and satisfy the growth demand for energy. This can be achieved by improving the proppant transport efficiency of the fracturing fluid which in turn creates the designed fracturing dimensions.

P3

ENHANCING AGRICULTURAL SUSTAINABILITY IN KUWAIT BY CONVERTING WASTE INTO BIOENERGY WITHIN A CIRCULAR ECONOMY

STUDENTS:

- Sara Jasem Alenezi
- Mohsen Theeb Alajmi
- Ghazl Khaled Alkhayat
- Khalid Fahad Alqaoud

ACADEMIC SUPERVISOR:

Dr. Jean El Achkar

PROJECT DESCRIPTION

In collaboration with the Public Authority for Agriculture Affairs and Fish Resources (PAAF), this project aims to enhance agricultural sustainability in Kuwait by converting agricultural waste into bioenergy. Data and resources for the project will be provided by PAAF. By using the Automatic Methane Potential Test System (AMPTS), we will assess the biogas production potential of local waste streams. Adopting a circular economy approach, the project will transform agricultural waste into a valuable resource, reducing environmental impact and supporting sustainable waste management. This aligns with Kuwait Vision 2035, emphasizing sustainability, renewable energy development, and environmental stewardship. The results will contribute to Kuwait's sustainability goals by promoting the use of renewable bioenergy and reducing reliance on fossil fuels. Expected outcomes include demonstrating the feasibility of bioenergy production from agricultural waste, providing valuable data for future recommendations, and contributing to the overall development of a sustainable agricultural sector in Kuwait.

CONGRATULATIONS TO OUR FUTURE ENGINEERS!
WISH YOU ALL THE BEST IN YOUR JOURNEY.

EVENT COORDINATOR:

Dr. Mohamad Hussein Farhat – Electrical and Electronics Engineering Department

EVENT ASSISTANT:

Ms. Amani Abed Al Hai - Academic Administration

Our warm thanks and appreciation to everyone who
contributed to the success of this event.

SPECIAL THANKS TO OUR SPONSOR

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