



THE EXHIBITION OF ENGINEERING STUDENTS' GRADUATION PROJECTS SPRING 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 Spring 2025 Student' Engineering Graduation Project Exhibition. This event is a testament to the dedication, creativity, and perseverance of our students, who have worked tirelessly to transform their ideas into impactful engineering solutions.

Throughout their studies, our students have faced challenges, explored new technologies, and applied science to solve real-world problems. Today's exhibition highlights their technical skills, critical thinking, creativity, and teamwork that are essential for a successful engineering career.

This semester, our students have tackled emerging challenges, with a special emphasis on Artificial Intelligence, sustainability, and smart technologies. AI continues to revolutionize industries, and our students have leveraged their capabilities to develop intelligent and efficient systems. Meanwhile, sustainability remains at the core of engineering innovation, reflecting our commitment to creating solutions that balance technological advancement with environmental responsibility.

Beyond academics, these projects represent the bridge between university education and professional careers. Many of our students' innovations have the potential to evolve into research projects, or industry collaborations. To our industry partners and guests, we invite you to engage with our students, explore their ideas, and discover opportunities for collaboration, mentorship, and innovation.

To our students, this exhibition is just the beginning of your journey. As you take your next steps into the professional world, I encourage you to embrace lifelong learning, adaptability, and the drive to make a difference. Your work here today reflects your potential, and I have no doubt that you will continue to make a lasting impact in your careers and beyond.

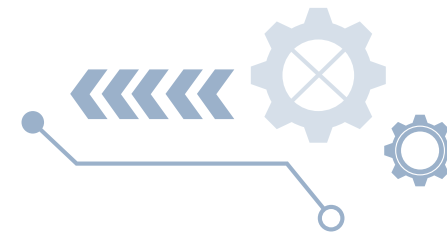
On behalf of the faculty and staff at the College of Engineering, I extend my heartfelt congratulations to all our students, mentors, and organizers. We are immensely proud of your achievements and look forward to seeing your contributions in the future of engineering.

Sincerely,





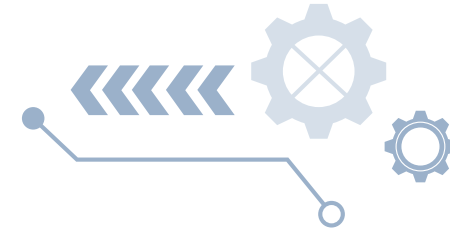
CIVIL ENGINEERING PROJECTS



C1 - EXAMINING PUBLIC PERCEPTIONS AND THE POTENTIAL IMPACT OF THE METRO SYSTEM IN KUWAIT: TOWARDS SUSTAINABLE URBAN DEVELOPMENT	3
C2 - ANALYSING DRIVER BEHAVIOR AND RISK FACTORS CONTRIBUTING TO MOTORCYCLE CRASHES IN KUWAIT: INSIGHTS AND IMPLICATIONS FOR ROAD SAFETY	4
C3 - CLIMATE TELECONNECTIONS CONTROLLING EXTREME PRECIPITATION CHARACTERISTICS ACROSS THE ARABIAN PENINSULA	5
C4 - THE ROLE OF CLIMATE TELECONNECTIONS IN DESERTIFICATION ACROSS THE ARABIAN PENINSULA	6
C5 - BUILDWATCH: DRONE-BASED RECOGNITION AND MONITORING OF EQUIPMENT AND SITE ACTIVITIES USING DEEP LEARNING	7
C6 - REAL-TIME DETECTION OF CONSTRUCTION AND DEMOLITION WASTE USING ADVANCED DEEP LEARNING MODELS	8
C7 - WATERPROOFING OF CONCRETE STRUCTURES	9
C8 - APPLICATION OF FRP FOR RETROFITTING OF CONCRETE STRUCTURES	10
C9 - INVESTIGATING EXOSUIT EFFICACY: A CONTROLLED STUDY OF PHYSIOLOGICAL IMPACTS IN WORK-RELATED MSD PREVENTION	11
C10 - ERGONOMICS IN CONSTRUCTION: MITIGATING WORK-RELATED MSD USING EXOSUITS	12
C11 - EVALUATING THE DURABILITY OF CFRP-REINFORCED CONCRETE UNDER EXTREME ENVIRONMENTAL CONDITIONS	13
C12 - INVESTIGATING THE THERMAL PERFORMANCE OF BUILDING MATERIALS FOR IMPROVED COMFORT AND ENERGY EFFICIENCY	14
C13 - INTEGRATION OF PARAFFIN WAX INTO GYPSUM FOR IMPROVED THERMAL PERFORMANCE	15
C14 - AN ON-GRID SOLAR EV CHARGING STATION	16
C15 - AN OFF-GRID SOLAR EV CHARGING STATION AND QUICKSAND SIDE BARRIER	17
C16 - SELF HEALING CONCRETE TECHNOLOGY	18



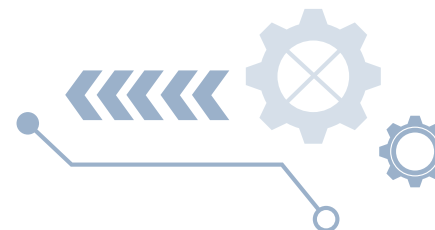
MECHANICAL ENGINEERING PROJECTS



M1 - AUGMENTATION SYSTEM FOR VERTICAL AXIS WIND TURBINE	21
M2 - EXPERIMENTAL EXAMINATION OF CONCRETE MADE OF KUWAITI OIL - CONTAMINATED SAND	22
M3 - INCREASING PV PANEL EFFICIENCY USING PCM: EXPERIMENTAL ANALYSIS AND TRNSYS VALIDATION	23
M4 - DESIGN AND FABRICATION OF A PORTABLE MECHANICAL HORSE FOR CHILDREN WITH DISABILITY	24
M5 - DESIGN AND DEVELOPMENT OF FLOWER TURBINE	25
M6 - DESIGN OF ROBOTIC ARM MIMICKING HUMAN ARM MOTION	26
M7 - DESIGN AND DEVELOPMENT OF HYDROKINETIC IN-STREAM TURBINE	27
M8 - WALL CLIMBING ROBOT	28
M9 - DESIGN AND IMPLEMENTATION OF WATER TREATMENT SYSTEM FOR WATER TANKERS	29
M10 - DESIGN AND FABRICATION OF SHELL AND HELICAL TUBE HEAT EXCHANGER	30
M11 - DESIGN AND FABRICATION OF A HIGH-DENSITY LIQUID HYDRO-TURBINE SIMULATOR	31
M12 - ATMOSPHERIC WATER GENERATOR USING SOLAR ENERGY	32



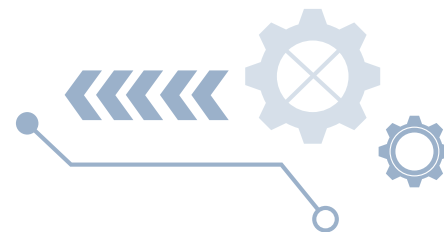
ELECTRICAL & ELECTRONICS ENGINEERING PROJECTS



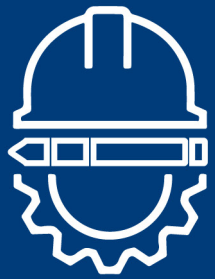
E1 - AI-DRIVEN RC BOAT FOR WATER QUALITY MONITORING AND SURFACE CLEANING	35
E2 - SMART SUSTAINABLE GREENHOUSE FOR KUWAIT USING INTERNET OF THINGS (IOT)	36
E3 - SMART MONITORING AND WATER QUALITY MANAGEMENT IN AQUACULTURE USING INTERNET OF THINGS (IOT)	37
E4 - DESIGN AND IMPLEMENTATION OF A SMART GLOVE FOR SIGN LANGUAGE TRANSLATION INTO SPEECH AND TEXT	38
E5 - SMART DEVICE FOR ALZHEIMER'S PATIENTS SUPPORT AND DAILY TASK MANAGEMENT	39
E6 - FLOOD DETECTION AND EMERGENCY ALERT SYSTEM	40
E7 - INNOVATIVE SAND-BASED RENEWABLE ENERGY STORAGE AND CONVERSION FOR THE ARABIAN GULF	41
E8 - SMART FIRE EXTINGUISHING SYSTEM	42
E9 - SMART SYSTEM FOR MOSQUES	43
E10 - CLASSROOM ENGAGEMENT ANALYSIS USING VISION AND AI	44
E11 - ORIGAMI-INSPIRED WIND TURBINE FABRICATION AND IOT-BASED DC POWER MONITORING	45
E12 - DESIGN AND IMPLEMENTATION OF SMART SOLAR STREET LIGHT SYSTEM	46



PETROLEUM ENGINEERING PROJECTS



P1 - ENHANCING THE PERFORMANCE OF DRILLING FLUIDS WITH HYBRID NANOPARTICLES AND POLYMERS FOR IMPROVED VISCOSITY CONTROL AND FILTRATION EFFICIENCY	49
P2 - TURNING CO₂ FROM ENEMY TO ALLY: SIMULATION AND OPTIMIZATION OF CO₂-TO-METHANOL CONVERSION FOR A SUSTAINABLE FUTURE	50
P3 - REVIEW OF SYNTHESIZED NANOPARTICLES FOR DIVERSE APPLICATIONS IN WATER TREATMENT	51
P4 - SUSTAINABLE OIL SPILL REMEDIATION USING A COLUMN-BASED SYSTEM WITH TIRE POWDER AS AN ADSORBENT	52
P5 - A NOVEL PREDICTIVE MODEL OF FIBER DRAG COEFFICIENT AND SETTLING VELOCITY FOR HIGH-DENSITY SPHERICAL PARTICLES IN HIGH CONCENTRATED FIBROUS FLUIDS	53
P6 - DESIGNING A SUSTAINABLE RESIDENTIAL AREA WITH BUILTIN RENEWABLE ENERGY, WASTE RECYCLING AND SANITARY WASTE MANAGEMENT	54
P7 - FEASIBILITY STUDY OF SHIFTING VEHICLE IN KUWAIT TO GREEN HYDROGEN IN COMPARISON TO FOSSIL FUEL AND ELECTRIC VEHICLES	55
P8 - CORRELATING GRANULAR FLOW BEHAVIOR WITH RHEOLOGICAL PROPERTIES OF SAND PARTICLES	56



CIVIL ENGINEERING PROJECTS







C1 – EXAMINING PUBLIC PERCEPTIONS AND THE POTENTIAL IMPACT OF THE METRO SYSTEM IN KUWAIT: TOWARDS SUSTAINABLE URBAN DEVELOPMENT

STUDENTS:

- Mefreh Sattam Mefreh Alharbi
- Khaled Obaid Salman Almutairi
- Abdullah Saud Eshewi Aldhafeeri
- Ahmad Meshal Bandar Almutairi
- Rashed Ali Rashad Rashed

ACADEMIC SUPERVISOR:

Dr. Ahmad Aiash



PROJECT DESCRIPTION:

The project involves conducting a comprehensive survey to gather data on public perceptions, commuting habits, and preferences regarding the proposed Kuwait Metro system. The collected data is analyzed using advanced statistical methods, including Multinomial Logit (MNL) models and decision tree techniques such as Chi-squared Automatic Interaction Detection (CHAID). The MNL model will help identify factors influencing individuals' choices among multiple transportation options, while the CHAID analysis will segment the population based on significant predictors of metro usage. This approach aims to provide a nuanced understanding of potential metro demand and inform strategies to enhance its adoption while attempting to capture the potential environmental and traffic impact the proposed metro can create.



C2 - ANALYSING DRIVER BEHAVIOR AND RISK FACTORS CONTRIBUTING TO MOTORCYCLE CRASHES IN KUWAIT: INSIGHTS AND IMPLICATIONS FOR ROAD SAFETY

STUDENTS:

- Hani Hussain Ali Alshahab
- Bader Sami Abdullah Mandan
- Khaled Anwar Ali Almulla
- Yousef Yaqoub Ali Abdullah

ACADEMIC SUPERVISOR:

Dr. Ahmad Aiash



PROJECT DESCRIPTION:

This project investigates the factors contributing to motorcycle crashes, utilizing survey data and advanced analytical techniques to enhance road safety. The study employs the Multinomial Logit (MNL) model to assess the probability of different crash severity outcomes based on behavioral, environmental, and infrastructural factors. Additionally, machine learning techniques, such as decision trees could be used to predict accident risk and identify high-risk zones. The analysis aims to uncover key risk factors like reckless riding behavior, poor road conditions, and inadequate safety measures while providing data-driven recommendations for policy improvements, infrastructure enhancements, and targeted safety interventions, such as stricter helmet laws, dedicated motorcycle lanes and unfolding risky driving behavior of the motorcyclists. The findings will aid transportation planners, policymakers, and safety authorities in developing effective strategies to reduce motorcycle-related fatalities and injuries.



C3 - CLIMATE TELECONNECTIONS CONTROLLING EXTREME PRECIPITATION CHARACTERISTICS ACROSS THE ARABIAN PENINSULA

STUDENTS:

- Yousef Alsheshtari
- Yousef Alduaij
- Raghda Yasin
- Essa Alessa

ACADEMIC SUPERVISOR:

Dr. Masoud Irannezhad



PROJECT DESCRIPTION:

The Arabian Peninsula (AP) is home to millions of people who have experienced increasing hydroclimatic extreme events, particularly floods, in recent years. Understanding the oceanic-atmospheric drivers of regional extreme precipitation variability is crucial not only for effective flood risk assessment but also for sustainable development across the AP. This study investigates the spatial and temporal variability and trends in extreme precipitation characteristics (including intensity, frequency, and duration) using gauge-based gridded daily precipitation time series. The analysis also examines the associations between historical extreme precipitation patterns and key climate teleconnections, such as the El Niño-Southern Oscillation (ENSO). These findings provide valuable insights into the regional hydrological cycle, offering essential guidance for flood risk mapping and sustainable water resource management in arid and semi-arid regions like the Arabian Peninsula.



C4 - THE ROLE OF CLIMATE TELECONNECTIONS IN DESERTIFICATION ACROSS THE ARABIAN PENINSULA

STUDENTS:

- Fahad Alenezi
- Saoud Alazmi
- Khalifah Alghareeb
- Ouqla Suliman

ACADEMIC SUPERVISOR:

Dr. Masoud Irannezhad



PROJECT DESCRIPTION:

Water availability is essential for achieving the United Nations' 2030 Sustainable Development Goals (SDGs), especially in arid and semi-arid regions like the Arabian Peninsula (AP). Millions of people in the AP rely on limited freshwater to sustain critical sectors such as agriculture. Therefore, assessing water resources is crucial for ensuring local, regional, and global sustainability. The Aridity Index (AI), which measures dryness and wetness based on the ratio of precipitation to potential evapotranspiration, serves as a key indicator of water availability. Generally, AI variability is influenced by large-scale climate teleconnections, such as the El Niño-Southern Oscillation (ENSO). Hence, this study investigates the effects of these climate teleconnections on historical AI variability across the AP using gridded precipitation and temperature time series. The Mann-Kendall non-parametric test and Spearman's rank correlation were applied to detect AI trends and their links to climate teleconnections, respectively. These findings offer valuable insights for improving water resource management, enhancing water security, and supporting the successful implementation of the UN's 2030 Sustainable Development Agenda in arid regions.



C5 - BUILDWATCH: DRONE-BASED RECOGNITION AND MONITORING OF EQUIPMENT AND SITE ACTIVITIES USING DEEP LEARNING

STUDENTS:

- Yousef Albkoor
- Salman Fadhil
- Awrad Abdullah
- Shaikha Alateeqi
- Abdulaziz Aldammak

ACADEMIC SUPERVISOR:

Dr. Ahmed Assad



PROJECT DESCRIPTION:

Construction projects, particularly large-scale ones, significantly depend on the effective management and utilization of heavy equipment. Nevertheless, the classification of heavy equipment has traditionally been a manual process which is labor-intensive, time-consuming and may pose some safety risks. To overcome these challenges, an efficient yet precise methodology needs to be developed to automatically identify and classify heavy equipment in construction projects. Most of the research in this domain has concentrated on the classification of a limited set of equipment classes with little focus on heavy construction equipment. Hence, this study utilizes a robust algorithm, you only look once (YOLO), to classify heavy construction machinery into 15 different types. A comprehensive dataset of equipment images was utilized to train, validate and test the develop classifier. The model achieved an overall accuracy of 94%. It was able to accurately classify most of the heavy equipment and construction activities with an Area Under the Curve (AUC) ranging between 0.97 and 1.0. This study highlights the potential of advanced deep learning models for real-time classification of heavy construction equipment. By offering a practical and automated solution, these models can significantly enhance efficiency, safety, and maintenance protocols on construction sites.



C6 - REAL-TIME DETECTION OF CONSTRUCTION AND DEMOLITION WASTE USING ADVANCED DEEP LEARNING MODELS

STUDENTS:

- Abdullah AlShaalan
- Mohammad Buabbas
- Sulaiman AlWaqyyan

ACADEMIC SUPERVISOR:

Dr. Ahmed Assad



PROJECT DESCRIPTION:

Many countries are progressively integrating effective management of Construction and Demolition Waste (CDW) into their Circular Economy initiatives. (CDW) comprises an extensive array of materials, including concrete, brick, wood, glass, metal, plastic, and others. The vast majority of CDW is often disposed of in landfills, with limited focus on recycling efforts. Effective waste management can reduce landfill utilization and its related environmental and health consequences. It may also result in less consumption of scarce raw materials. Traditional recycling techniques need the laborious segregation of CDW to isolate its various components for enhanced recyclability. Yet, manual sorting presents disadvantages, such as worker safety and health hazards, elevated labor expenses, labor shortages, time inefficiency, and spatial demands. The automated sorting of CDW using robots offers an efficient waste management solution. The efficacy of a sorting robot depends on its ability to identify and classify construction and demolition waste (CDW). This work proposes a real-time CDW sorting method utilizing the You Only Look Once (YOLO), single-item detection technique to address these challenges. This study seeks to enhance CDW sorting by minimizing the required time and resources. It paves the way for accurate waste sorting, facilitating efficient CDW recycling and resource recovery.



C7 - WATERPROOFING OF CONCRETE STRUCTURES

STUDENTS:

- Amal Khalaf Alenezi
- Samah Khaled
- Fanan Almutairy
- Abdullah Hussain Alajmi

ACADEMIC SUPERVISOR:

Dr. Reza Soleimanpour



PROJECT DESCRIPTION:

The student will evaluate different waterproofing techniques for concrete structures and compare their efficiency under various conditions. This study will investigate methods such as integral waterproofing admixtures, surface coatings, and membrane systems, assessing their performance in resisting water penetration, durability, and long-term effectiveness. By conducting experimental tests and analyzing case studies, the research will determine which techniques provide the most reliable protection against moisture intrusion in different environmental and loading conditions. The findings will help identify the most suitable waterproofing solutions for enhancing the durability and service life of concrete structures.



C8 - APPLICATION OF FRP FOR RETROFITTING OF CONCRETE STRUCTURES

STUDENTS:

- Fatima Abbas Ali
- Hadiya Almail
- Fatima Akbar
- Mohammed Alkhamees
- Abdulaziz Alholy

ACADEMIC SUPERVISOR:

Dr. Reza Soleimanpour



PROJECT DESCRIPTION:

The student will investigate different types of FRP, such as Carbon Fiber Reinforced Polymer (CFRP) and Glass Fiber Reinforced Polymer (GFRP), for retrofitting concrete structures. The study will involve performing standard tests to evaluate the efficiency of these materials in enhancing structural performance, determining the optimum number of FRP layers required for effective strengthening. Additionally, the research will analyze the failure mechanisms associated with FRP retrofitting under various loading conditions to understand the bond behavior, and overall effectiveness of FRP in extending the service life of concrete structures.



C9 - INVESTIGATING EXOSUIT EFFICACY: A CONTROLLED STUDY OF PHYSIOLOGICAL IMPACTS IN WORK-RELATED MSD PREVENTION

STUDENTS:

- Fatmah Mohammad Almulla
- Ola Emad Hassan
- Mohammed M Almsailem

ACADEMIC SUPERVISOR:

Eng. Mohamad Iyad Al-Khiami



PROJECT DESCRIPTION:

This study evaluates whether exosuits can reduce work-related musculoskeletal strain by monitoring muscle activity (EMG), physiological responses (smartwatches), and overall productivity. By comparing performance with and without the exosuit, the project aims to identify clear benefits or limitations, offering evidence-based recommendations for safer, more efficient workplace solutions.



C10 – ERGONOMICS IN CONSTRUCTION: MITIGATING WORK-RELATED MSD USING EXOSUITS

STUDENTS:

- Krist Abikian
- Farah Alsuwailem
- Ali Yousef Mohammad Abdulaziz

ACADEMIC SUPERVISOR:

Eng. Mohamad Iyad Al-Khiami



PROJECT DESCRIPTION:

This study focuses on how exosuits can mitigate work-related musculoskeletal disorders in construction environments. One site data is gathered—using worker surveys and direct observation—to gauge exosuit effectiveness and user acceptance. Findings will guide best practices for safer, more sustainable construction work.



C11 – EVALUATING THE DURABILITY OF CFRP-REINFORCED CONCRETE UNDER EXTREME ENVIRONMENTAL CONDITIONS

STUDENTS:

- Meshal Nayef Alrashidi
- Abdulrahman Mohammad Alwehaidah
- Abdulrahman Saud Alazemi
- Abdalaziz Fahad Almutairi
- Bader Saud Aljadei

ACADEMIC SUPERVISOR:

Eng. Faisal Alotaibi



PROJECT DESCRIPTION:

Carbon fiber reinforced polymer (CFRP) sheets are highly efficient for strengthening concrete structures, offering a durable and lightweight alternative to traditional jacketing methods. Their application can significantly enhance the lifespan and usability of infrastructure. However, a major drawback of CFRP is its vulnerability to environmental factors, particularly ultraviolet (UV) radiation and extreme heat. Given Kuwait's harsh climate, it is crucial to study the long-term effects of these conditions on CFRP materials to ensure their reliability in structural applications. This project aims to evaluate the durability of CFRP-reinforced concrete by exposing over sixty samples to Kuwait's natural environment and assessing the resulting loss of strength over time.

The study will involve outdoor exposure of CFRP-reinforced concrete samples to simulate real-life environmental conditions. Periodic mechanical testing will be conducted to measure changes in strength and identify degradation patterns caused by prolonged UV exposure and high temperatures. The collected data will be analyzed to develop predictive models that can estimate the long-term performance of CFRP materials in Kuwait's climate. By understanding the behavior of CFRP under these extreme conditions, the project will provide valuable insights for engineers and construction professionals, helping to optimize CFRP applications and enhance the durability of reinforced concrete structures in hot and arid environments.



C12 – INVESTIGATING THE THERMAL PERFORMANCE OF BUILDING MATERIALS FOR IMPROVED COMFORT AND ENERGY EFFICIENCY

STUDENTS:

- Shahad Hajy
- Hanay AlShammari
- Doha AlMutairi
- Aisha AlKandari

ACADEMIC SUPERVISOR:

Dr. Sana Al-Azzeh



PROJECT DESCRIPTION:

This project explores the thermal properties of eco-friendly building materials by integrating recycled elements such as rubber, plastic waste, and construction debris. The study aims to develop a sustainable mix design, evaluate its insulation performance, and compare it with conventional materials. By utilizing waste materials, the research contributes to energy-efficient construction and environmental sustainability.



C13 - INTEGRATION OF PARAFFIN WAX INTO GYPSUM FOR IMPROVED THERMAL PERFORMANCE

STUDENTS:

- Hassan Kadhem Alqallaf
- Hassan Mohammad Altelfah
- Layan Marwan Al-Haddad
- Mahdi Saleh
- Rawan Baqer

ACADEMIC SUPERVISOR:

Dr. Sana Al-Azzeh



PROJECT DESCRIPTION:

The project focuses on improving the thermal performance of gypsum boards by the introduction of phase-changing materials (PCMs) such as paraffin. The mechanism of this additive is its ability to absorb and store thermal energy when temperatures are high until they drop, at which point the PCM would release the stored energy, maintaining a moderate and acceptable indoor temperature. If this material is properly used, it can improve the stability of indoor temperature by reducing rapid fluctuations, therefore lowering the cost of mechanical cooling (Shilei et al., 2018). Research has shown Paraffin's excellent capacity for latent heat storage and this makes it an ideal candidate for enhancing the thermal inertia of buildings in hot climates such as Kuwait.



C14 – AN ON-GRID SOLAR EV CHARGING STATION

STUDENTS:

- Asmaa AlRashidi
- Sarah AlMutairi
- Mohammed Saad AlAzimi
- Mohammad Adel Bonashi

ACADEMIC SUPERVISOR:

Dr. Mohamed M. Salem



PROJECT DESCRIPTION:

The increasing demand for electric vehicles (EVs) in Kuwait, while positive for environmental sustainability, presents challenges related to energy access and infrastructure, particularly in remote desert regions. The lack of reliable charging stations outside the national power grid significantly hinders the widespread adoption of EVs in these areas. This project aims to tackle this issue by focusing on urban areas connected to the grid, developing sustainable charging infrastructure that can support the growing EV fleet.

The "On-Grid Solar EV Charging Station" project proposes a solution by developing a solar-powered charging station prototype designed to feed into the national power grid. This approach aims to offer a reliable and environmentally friendly charging solution within urban areas, contributing to both EV adoption and renewable energy integration. The project intends to create a scalable model for sustainable energy infrastructure that can be replicated across other urban regions in Kuwait and similar environments. The proposed design involves modifying existing road barricades, incorporating solar charging capabilities, and illustrates a practical approach to integrating sustainable energy solutions within existing urban infrastructure.



C15 – AN OFF-GRID SOLAR EV CHARGING STATION AND QUICKSAND SIDE BARRIER

STUDENTS:

- Basam Alqahtani
- Mubarak Abdullah
- Fahad Aldaihani
- Abdulwahab Jamal
- Dana Zeedan

ACADEMIC SUPERVISOR:

Dr. Mohamed M. Salem



PROJECT DESCRIPTION:

Kuwait's transition to electric vehicles (EVs) faces substantial obstacles in its expansive desert regions due to limited energy access and the challenging environmental conditions. The increasing demand for EVs is hampered by the lack of reliable off-grid charging infrastructure, especially in areas beyond the national power grid. Furthermore, the dynamic nature of the desert landscape, with shifting sands and dunes, poses a constant threat to the accessibility and long-term viability of any infrastructure deployed in these remote locations. This creates a significant barrier to EV adoption and hinders broader development efforts in these areas. The absence of readily available power and the persistent threat of sand encroachment necessitate innovative solutions to support sustainable transportation and infrastructure development.

To address these challenges, a project has been proposed focusing on the development of an off-grid solar EV charging station prototype coupled with a quicksand side barrier. The project aims to provide a sustainable charging solution independent of the national grid, enabling EV usage in remote areas. Simultaneously, the project seeks to mitigate the disruptive impact of sand migration on roads and infrastructure through the implementation of a protective barrier. This dual approach addresses both the power accessibility issue and the environmental challenges posed by the desert. The proposed design involves an independent structure located alongside roadways, offering a potentially scalable model for sustainable energy and infrastructure development applicable to other remote areas within Kuwait and comparable desert environments.



C16 – SELF HEALING CONCRETE TECHNOLOGY

STUDENTS:

- May Ali
- Sarah Habib
- Dhahawi Aladwani
- Balqees Mothaffar

ACADEMIC SUPERVISOR:

Dr. Rana Lakys



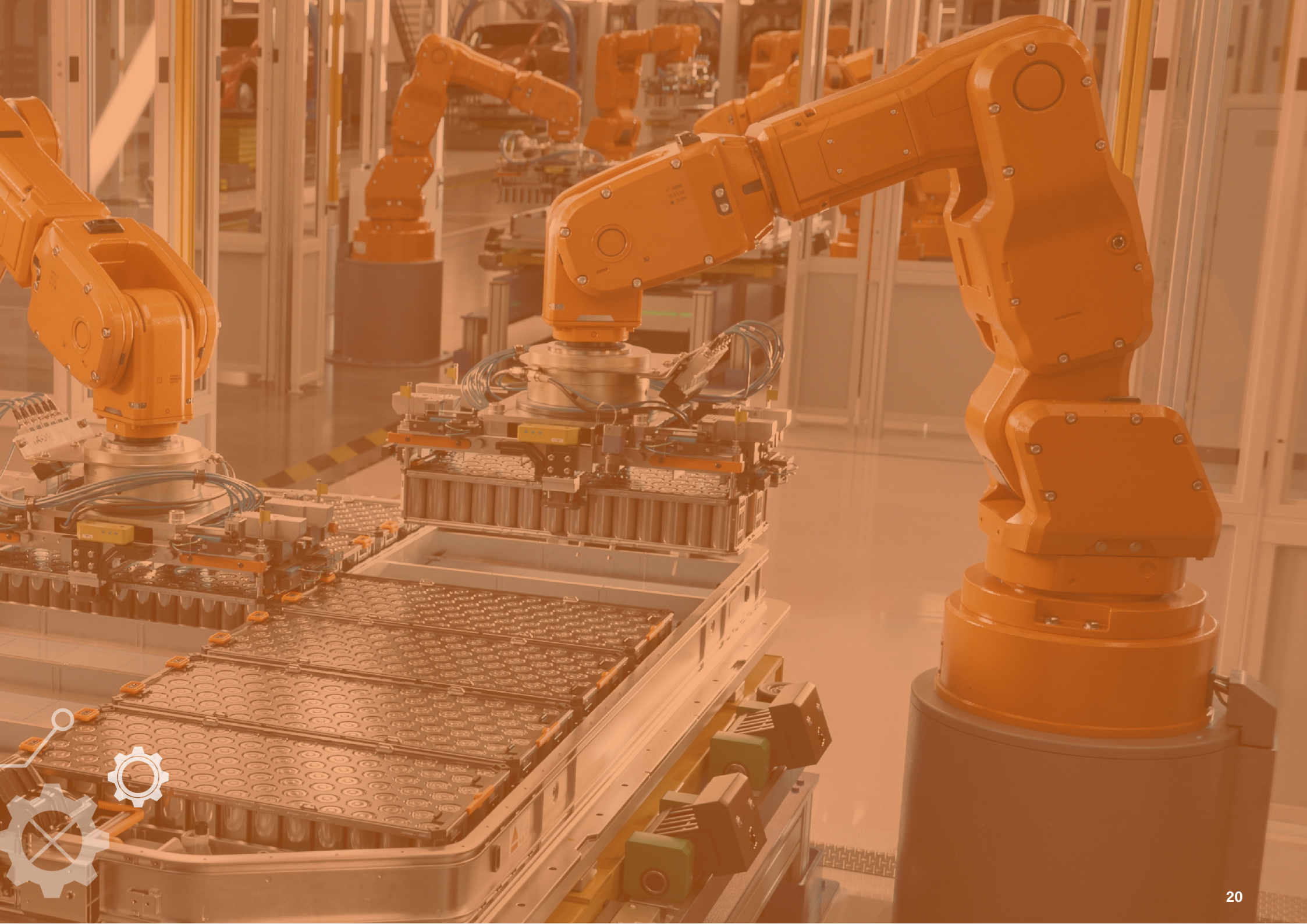
PROJECT DESCRIPTION:

This study investigates the potential of self-healing concrete (SHC) to address durability challenges in modern construction. The research focuses on enhancing concrete's ability to autonomously repair cracks using a combination of chemical compounds: silica fume, crystalline admixtures, and natural zeolite. These additives are designed to react with environmental triggers, particularly moisture, to seal cracks and improve overall durability. The project employs a comprehensive methodology, including both autogenous and autonomous self-healing mechanisms. The experimental plan involves preparing concrete samples with various admixture combinations, subjecting them to controlled cracking, and evaluating their healing performance under different curing conditions. Tests are conducted to assess mechanical properties, permeability, and the extent of crack closure. This research aims to optimize SHC mixtures for improved resilience, reduced maintenance costs, and enhanced sustainability in construction. The findings are expected to contribute to the development of more durable and environmentally friendly concrete structures, potentially revolutionizing the approach to concrete durability in civil engineering applications.



MECHANICAL ENGINEERING PROJECTS







M1 - Augmentation System For Vertical Axis Wind Turbine

STUDENTS:

- Abdulaziz Abbas Ejbarah
- Abdullah Shaker Mahdi
- Abrar Makki Hasan
- Emad Jassem Aljadi
- Roudan Abdullateef Dashti

ACADEMIC SUPERVISOR:

Dr. Hayder Salem



PROJECT DESCRIPTION:

This project aims to design, develop, and implement an augmentation mechanism for vertical axis wind turbines (VAWTs) using paired airfoiled casings. The proposed system enhances power output by more than doubling the free stream velocity, significantly improving energy generation efficiency. To achieve this, detailed Computational Fluid Dynamics (CFD) analysis, full-scale model construction, and performance testing are conducted to optimize and maximize power output.



M2 - Experimental Examination Of Concrete Made Of Kuwaiti Oil -Contaminated Sand

STUDENTS:

- Al-Waleed Khaled Alhajri
- Bandar Ali Alhajri
- Waleed Ghazi Almutairi
- Faisal Salem Almutairi
- Mohammed Moubarek Alajmi

ACADEMIC SUPERVISOR:

Dr. Zainab Al Hajaj



PROJECT DESCRIPTION:

This project explores the use of oil-contaminated sand as a partial replacement for natural sand in concrete. Given Kuwait's petroleum industry, large quantities of oil-contaminated sand accumulate, leading to high disposal costs and environmental concerns. Instead of treating it as waste, we aim to incorporate it into concrete while maintaining strength and durability. In this study, a portion of the natural sand in the concrete mix will be substituted with oil-contaminated sand at varying percentages. The resulting concrete will undergo mechanical and physical testing to assess its strength, durability, and overall performance. By evaluating different mix proportions, we aim to determine the optimal balance between sustainability and structural integrity. This approach provides a practical solution to reduce waste, lower treatment costs, and promote environmentally friendly construction while ensuring the material's feasibility for real-world applications.



M3 - INCREASING PV PANEL EFFICIENCY USING PCM: EXPERIMENTAL ANALYSIS AND TRNSYS VALIDATION

STUDENTS:

- Abdullah Almee
- Abdulwahab Albannai
- Awad Mubarak Alrashedi
- Mohammad Alshammari
- Shehab Hasan Alshammari

ACADEMIC SUPERVISOR:

Dr. Wisam Al Saadi



PROJECT DESCRIPTION:

This project investigates techniques for regulating photovoltaic (PV) cell temperature to improve conversion efficiency and power output using phase change material (PCM). The study focuses on the experimental setup and simulation of heat extraction from PV panels using TRNSYS software. A combined PV-PCM system will be designed, and data on cell temperature, voltage, and power output—both with and without PCM—will be collected and analyzed. Additionally, simulations of both PV configurations will be conducted in TRNSYS, and the results will be compared against experimental data to validate the findings.



M4 - DESIGN AND FABRICATION OF A PORTABLE MECHANICAL HORSE FOR CHILDREN WITH DISABILITY

STUDENTS:

- Dalal Ali Alenezi
- Mohammed Sultan Alzufairi
- Dhuha Haitham Alshaiji
- Qamrah Salem Alrashidi
- Bedour Khaled Almansoori
- Anfal Nouri Alenezi

ACADEMIC SUPERVISOR:

Dr. Nader Ghareeb



PROJECT DESCRIPTION:

The main goal of this project is to design and build a portable mechanical model of a horse that could be ridden by children with disabilities. This could give them a good feeling of comfort while participating in equine therapy at home.

The mechanism of the proposed design simulates real horse riding. Thus, the crest and the loin have relative motion with the rest of the horse body. This is achieved by implementing specific mechanisms that combine low-speed DC motors together with batteries, springs, bearings, etc. All components of the proposed design are identified, and the necessary calculations are made.

The frame is basically constructed of wood while its inner supports are made out of steel. In addition, a finite element analysis and simulation of the structural members of the horse is performed using SolidWorks to validate the manual calculations.



M5 - DESIGN AND DEVELOPMENT OF FLOWER TURBINE

STUDENTS:

- Mohammad Owaidhah Owaidhah
- Abdulaziz Abdullah Alajmi
- Hadi Fhaid Alajmi
- Ali Mohammad Maarafi
- Naser Baddah Alajmi

ACADEMIC SUPERVISOR:

Dr. Adel Younis



PROJECT DESCRIPTION:

Smaller vertical axis wind turbines, like Flower Turbines, offer an effective small-scale wind energy option that may be installed on both residential and commercial buildings. These smaller turbines can generate electricity at significantly lower wind speeds; they range in size from 2 meters to 5.5 meters high. The goal of this project is to create a small-sized, highly productive floral turbine. To evaluate the effectiveness and performance of the suggested model, simulation analysis and experimental work will be conducted. Important design factors will be examined to understand how they affect the extracted power.



M6 - DESIGN OF ROBOTIC ARM MIMICKING HUMAN ARM MOTION

STUDENTS:

- Maurice Mechail Maurice Nasta
- Lolwa El Helou
- Abdulqader Salah Bader Albosarh
- Seyed Hossein Seyed Mohammad Ameli
- Mubarak Hamad Abdullah Aldeehan

ACADEMIC SUPERVISOR:

Dr. Raouf Mbarki



PROJECT DESCRIPTION:

The project consists of a robotic arm designed with a structure similar to that of a human arm, featuring multiple links and joints. Each joint is driven by a DC motor, allowing only a single degree of freedom in movement. The motors are controlled by an Arduino microcontroller, along with essential components such as a rotary magnetic encoder for joint angle measurement and a high-current H-bridge for motor control.

The robotic arm operates by mimicking the movements of the operator's arm. An Inertial Measurement Unit (IMU) captures the operator's arm motion and transmits the data to the microcontroller, which interprets it as the target rotation for the DC motors. To ensure stability, speed, and precision, a PID controller is designed and implemented on the microcontroller, effectively regulating the robotic arm's movement.



M7 - DESIGN AND DEVELOPMENT OF HYDROKINETIC IN-STREAM TURBINE

STUDENTS:

- Hamad Yousef Alsaeedi
- Soud Ayed Alazmi
- Khalefah Saad Aljuwaisri
- Abdullah Yahya Alkhalaf
- Fahad Falah Aldousari

ACADEMIC SUPERVISOR:

Dr. Adel Younis



PROJECT DESCRIPTION:

The Smart Hydro Power turbine was developed to produce a maximum amount of electrical power with the kinetic energy of flowing waters. Because it is powered by kinetic energy instead of potential energy, it is known as a so-called "zero-head" or "in-stream" turbine. As such, no dams and/or head differentials are necessary for the operation of this device; the course of a river remains in its natural state and no high investments in infrastructure are required. Because the amount of kinetic energy (velocity) varies from river to river, a greater amount of energy is generated with a higher velocity of water flow. This project proposes and examines an in-stream turbine to identify and optimize key design parameters that contribute in reducing cost and increasing power generation.



M8 - WALL CLIMBING ROBOT

STUDENTS:

- Khaled Ahmad Mohammad Albaker
- Abdulaziz Mohammad Awwad Alshammari
- Khaled Abdullah Eid Saleh
- Fahad Fawzi Fahad Alsanea
- Dalal Mustafa Ali Alshatti

ACADEMIC SUPERVISOR:

Dr. Mohamed Elbadawy



PROJECT DESCRIPTION:

In several daily applications, we need to reach spots in buildings that are difficult to approach for humans. This difficulty could be for a significantly high or deep destination that could be too dangerous or narrow for a human to reach. Such restrictions need a remotely operated robot that can climb different surfaces, especially smooth ones, and is also sufficiently compact to pass through gaps of limited clearance.

The abovementioned robot is proposed to be battery-powered and utilizes a set of suction fans to stick to flat surfaces, controlled by a microcontroller. This project involves a blend of mechanical design, electronic circuitry design, and dynamic systems analysis and control.



M9 - DESIGN AND IMPLEMENTATION OF WATER TREATMENT SYSTEM FOR WATER TANKERS

STUDENTS:

- Mohammad Saad Ali Alazemi
- Abdullah Nawaf Abdi Alenezi
- Rashed Saad Salman Alhajeri
- Salim Esam Ali Alasfour
- Mohammad Hamad Mohammad Alajmi
- Khaled Mesfer Faisal Alhajeri

ACADEMIC SUPERVISOR:

Dr. Abeer Abdullah Al Anazi



PROJECT DESCRIPTION:

In today's global economy, industrial companies are constantly challenged to improve productivity and efficiency, reduce costs, comply with ever more stringent environmental standards and ensure an uninterrupted water supply.

Innovative and cost-effective solutions are required to manage the entire industrial water cycle, including treatments for processing water. Water treatment systems for water tankers are required to maintain water quality benefiting from automated systems in ensuring reliability and efficiency while overcoming the challenges of continuous operation.

This project is aimed to design and implement a water treatment system for water tankers. The system will be fixed at a site and will ensure that the water quality transferred from tankers to on-site water tanks meets stringent standards. Specifically, the system will prevent particles of 5 microns and above from passing into the tanks. The system will feature a switch-over option, continuous pressure monitoring, an automated switch-over facility, and incorporate safety features to prevent contamination during filter changes.



M10 - DESIGN AND FABRICATION OF SHELL AND HELICAL TUBE HEAT EXCHANGER

STUDENTS:

- Meshal Alotaibi
- Abdullah Al-Deehani
- Salem Alduwaisan
- Abdulaziz Alajmi
- Hussain Madi
- Fahad Alrshaed

ACADEMIC SUPERVISOR:

Dr. Ehab Bani Hani



PROJECT DESCRIPTION:

Heat exchangers are vital pieces of engineering equipment that move heat from one fluid to another. Heat exchangers find numerous and varied uses in a variety of industries, including petrochemical, mechanical, biomedical, nuclear reactors, air conditioning and refrigeration systems, heat recovery systems, and power plants. Hydraulic coil heat exchangers are gaining popularity these days because of their capacity to deliver a high heat transfer coefficient in a small surface area. The primary goals of this work are to develop and evaluate the thermal performance of shell and helical coil heat exchangers with counterflow designs. The temperature, efficacy, hot and cold-water flow rates, and overall heat transfer coefficient are some of the elements considered when conducting thermal analysis.



M11 - DESIGN AND FABRICATION OF A HIGH-DENSITY LIQUID HYDRO-TURBINE SIMULATOR

STUDENTS:

- Brak Khaled Alhaddad
- Abdulaziz Hasan Alkandari
- Nader Ali Almutairi
- Amir Reza Rezaei
- Hussain Ali Alqalaf

ACADEMIC SUPERVISOR:

Prof. Ahmad Sedaghat



PROJECT DESCRIPTION:

Water batteries are used to store surplus electrical energy from steam power plants during hours of minimal demand. In peak hours, the stored water is discharged through hydro turbines to provide auxiliary electricity generation. This requires natural elevations between two reservoirs, such as mountains and hills. In flat countries, the application of water batteries is not feasible using water reservoirs due to a lack of natural elevations. Devising high-density hydro turbines that operate not with water but with a high-density liquid that flows easily could be a solution. In this project, the feasibility of high-density fluids will be investigated in a hydro turbine within a hydro-battery simulator, using heavy liquids with higher fluidity (lower viscosity) to operate the hydro turbine. The simulator consists of a tank, a hydro turbine, and a generator in an open loop. 3D printing will be used to examine different hydro turbines, and Arduino-based devices and sensors will be utilized to measure time series data for flow rate and output power for both water and heavy liquids.



M12 - ATMOSPHERIC WATER GENERATOR USING SOLAR ENERGY

STUDENTS:

- Abdullah Motlaq Alhassini
- Ali Mohammad Alawad
- Jaber Fahad Alghassab
- Majed Mustafa Abed Aljawad
- Osamah Edrees Aldaihani
- Yousef Jamaan Alazemi

ACADEMIC SUPERVISOR:

Dr. Wisam Al Saadi



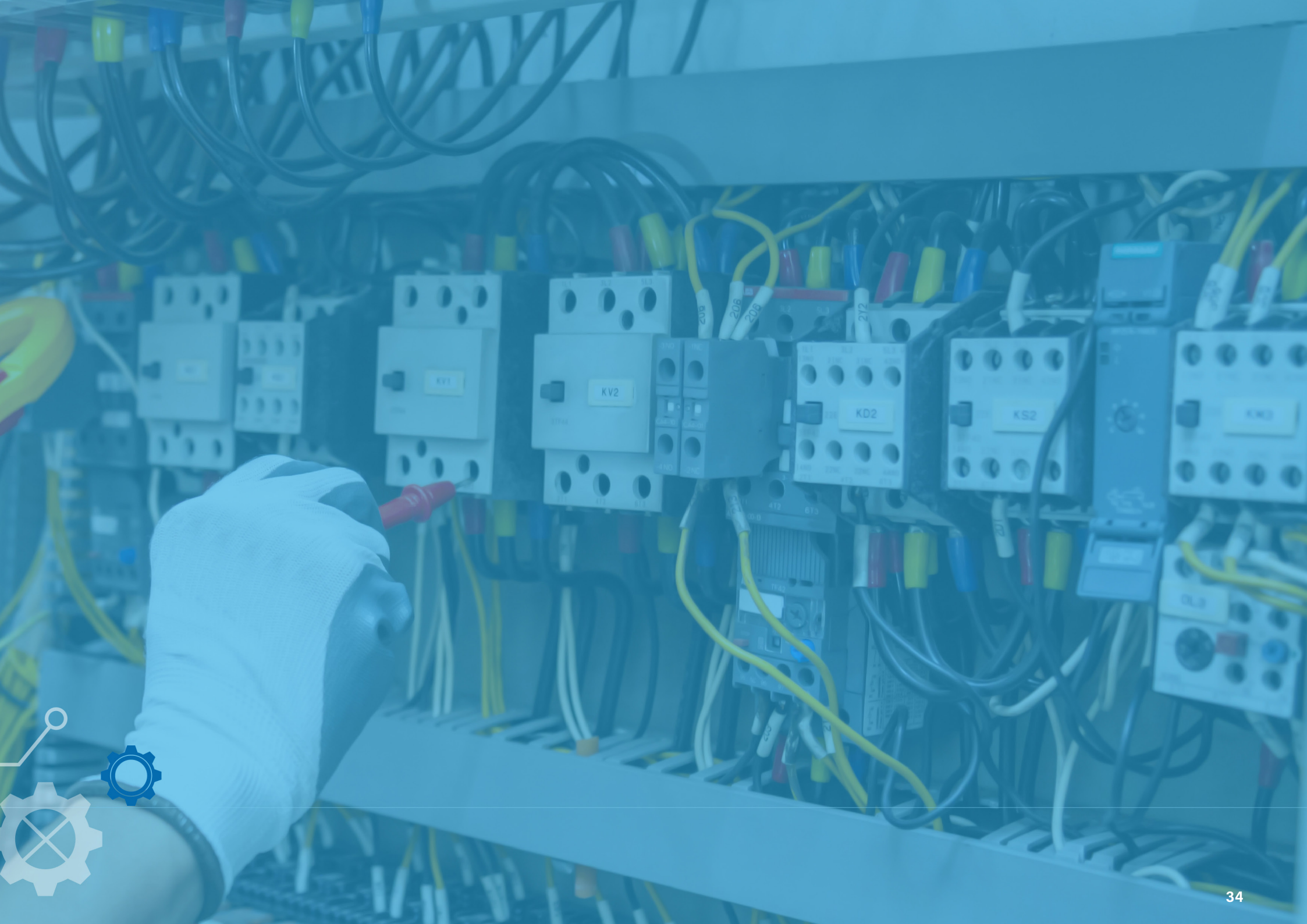
PROJECT DESCRIPTION:

Many people worldwide lack access to clean water, and droughts have severely impacted various regions, threatening food security and overall stability. The UN estimates a 40% shortfall in the global water supply, underscoring the urgent need for sustainable solutions. This project addresses the issue by developing a cost-effective, solar-powered atmospheric water generator. The system will leverage high-humidity environments to extract moisture from the air, providing fresh water for households and farms.



ELECTRICAL AND ELECTRONICS ENGINEERING PROJECTS







E1 - AI-DRIVEN RC BOAT FOR WATER QUALITY MONITORING AND SURFACE CLEANING

STUDENTS:

- Salem Sweid
- Taleb Al-Rifaae
- Mohanad Durgham
- Faisal Al-Suwailem
- Ali Al-Sahaf

ACADEMIC SUPERVISOR:

Dr. Mohammad Farhat



PROJECT DESCRIPTION:

Monitoring water quality in large water bodies like lakes and reservoirs is challenging, as traditional methods are slow, costly, and cover limited areas. This project introduces an AI-powered remote-controlled (RC) boat that combines real-time water quality monitoring with surface cleaning, offering an efficient and innovative solution.

The boat is equipped with sensors to measure pH, turbidity, and dissolved oxygen, providing vital data about water conditions. AI algorithms enhance data accuracy, identify pollution patterns, and predict future changes, enabling smarter environmental management.

It can navigate autonomously using GPS or be controlled manually via RC, allowing flexibility based on the environment. To tackle surface pollution, the boat includes a mechanical skimmer that collects floating debris such as plastics and organic waste.

Collected data is sent to the cloud for remote access and backed up on a microSD card for offline use. This system is cost-effective, scalable, and eco-friendly, supporting researchers, environmental agencies, and policymakers with real-time insights and helping maintain cleaner, healthier water bodies.



E2 – SMART SUSTAINABLE GREENHOUSE FOR KUWAIT USING INTERNET OF THINGS (IOT)

STUDENTS:

- Mariam Abdulrahman Ahmad Alahmad
- Ali Shafiq
- Faisel Fawzy Khalid Aleesa

ACADEMIC SUPERVISOR:

Eng. Hania El-Kanj



PROJECT DESCRIPTION:

Food security is an important topic in Kuwait, where it has put forward a strategic plan until 2035 that aims to develop the national agricultural system to achieve sustainable agricultural development. Kuwait is a dry desert environment with extremely hot and dry long summers. Approximately 90 percent of Kuwait's land is considered not agriculturally viable. Accordingly, greenhouse environments are considered a typical solution to address these agricultural problems. However, the main challenges in the greenhouse industry in Kuwait and the GCC are the high energy consumption for the cooling and water supply. The Smart Sustainable Greenhouse utilizing the Internet of Things (IoT) is an innovative agricultural solution designed to address the growing challenges of energy consumption by utilising solar panels and integrating Internet of Things (IoT) technology. This system automates the monitoring and control of key environmental factors such as temperature, humidity, soil moisture, light, and CO₂ levels within the greenhouse. Real-time data collected by IoT sensors will be used to optimize crop growth conditions and automate resource usage, ensuring energy and water efficiency.

This project aims to create a scalable and sustainable solution for modern agriculture, offering enhanced productivity, reduced reliance on the grid, and better adaptation to climate variability. The system can be used in botanical gardens and houses, and can be scalable for commercial crop production.



E3 - SMART MONITORING AND WATER QUALITY MANAGEMENT IN USING INTERNET OF THINGS (IOT) AQUACULTURE

STUDENTS:

- Zainab Khaled Mohammad Mohammad
- Hawraa Qasem Abdullah Alhaddad
- Nadra Talal Melfi Alharbi
- Saraa Homoud Hamad Alajmi

ACADEMIC SUPERVISOR:

Eng. Hania El-Kanj



PROJECT DESCRIPTION:

The increasing global demand for seafood and emphasis on sustainable aquaculture practices to meet the United Nations Sustainability Development Goal (UNSDG) number 14 related to life below water has urged the need to develop innovative solutions in the field of aquaculture. The main challenge in aquaculture is the continuous maintenance of good water quality, as unstable water quality is the major cause of fish death. Fish populations are particularly vulnerable to environmental change and contamination. Smart aquaculture provides a solution for maintaining the survival of fish outside their natural environments. The proposed prototype mimics the environment for fish and utilizes Internet of Things (IoT) technology. The system incorporates the integration of sensors and actuators to enable real-time data collection. The data, which is related to water quality, will be collected through the IoT system and processed by the microcontroller, which will continuously analyse this data and suggest optimized decisions that will maintain a stable and healthy ecosystem for fish.

This novel approach aims to dynamically improve water quality management to maintain marine life in aquaculture. The benefits of the system include reduction in: (1) fish fatalities, (2) dependence on natural fish environments, and (3) costs. The system can be used in the fish breeding industry as well as an environment for aquatic reserves that protect marine animals and their habitats.



E4 - DESIGN AND IMPLEMENTATION OF A SMART GLOVE FOR SIGN LANGUAGE TRANSLATION INTO SPEECH AND TEXT

STUDENTS:

- Abdullah Faisal Abdullah Sadeqi
- Mohammad Jaafar Abdullah Ashkanani
- Hamad Salem Hamad Alotaibi
- Abdulrazzaq Matar Ghazi Alharbi
- Abdulaziz Mohammad Ahmad Alkandari

ACADEMIC SUPERVISOR:

Dr. Amin Al Ka'bi



PROJECT DESCRIPTION:

This project aims at developing a smart glove which will be capable of translating sign language into voice and text with the use of a Smartphone. The overall goal is to improve the interpersonal communication and social relations of the deaf people in their local community. An accelerometric sensor is employed in the glove to determine the tilt of the palm, while five bend sensors inclusive of the thumb and four fingers are used. Such sensors successfully determine the extent of flexing of the fingers, thumb, and the palm. The bend angle data that is collected is analyzed by an Arduino Nano microcontroller which in turn translates the received sensor data into the corresponding sign language symbols. When recognized, the microcontroller sends the information through Bluetooth to Android application in which the symbol is displayed on the screen and simultaneously converted to voice. The integration of innovative sensors, data flow and wireless technologies in this smart glove provides a useful apparatus for enhancing sign language as a means of communication for deaf people, and the additional scope for home automation applications on fingertips and more.



E5 - SMART DEVICE FOR ALZHEIMER'S PATIENTS SUPPORT AND DAILY TASK MANAGEMENT

STUDENTS:

- Majed Nabeel Majed Almajed
- Sulaiman Bader Ahmad Almedhhy
- Hamad Salem Hamad Alotaibi
- Ahmad Yousef Abdulaziz Alasousi
- Khaled Ghali Hamdan Alshammari

ACADEMIC SUPERVISOR:

Dr. Michel Nahas



PROJECT DESCRIPTION:

Alzheimer's patients often face challenges in recognizing individuals and managing their daily routines, leading to confusion, frustration, and decreased quality of life. This project proposes a smart wearable device designed to assist Alzheimer's patients in improving social interactions and staying on top of essential daily tasks. The smart device incorporates a camera, speaker, and mobile application to provide practical functionality. The camera captures images of individuals in the patient's view, which are processed through the mobile application and labeled with names. When a familiar person is detected, the device announces their name through the speaker, offering real-time assistance to support social interactions.

The mobile application also includes customizable reminders for critical daily activities such as taking medications, attending appointments, or completing routine tasks. These reminders are delivered through the smart device, helping patients maintain a structured daily schedule and reducing caregiver intervention. By combining new technology and user-friendly design, this solution offers a supportive tool to improve the autonomy and quality of life for Alzheimer's patients while minimizing dependence on caregivers.



E6 - FLOOD DETECTION AND EMERGENCY ALERT SYSTEM

STUDENTS:

- Ali Hussain Ali Alsaid
- Hasan Bader Ahmad Yaqoot
- Hasan Yaser Abdullah Alkhamees
- Hussain Wael Mohammad Alhashash

ACADEMIC SUPERVISOR:

Dr. Michel Nahas



PROJECT DESCRIPTION:

Flooding during seasonal rains poses significant risks to infrastructure and residential areas in Kuwait and other countries. This project aims to develop a low-cost flood detection system that uses sensors to monitor water levels and send real-time alerts via wireless communication. Integrated GPS ensures precise localization of flood events, enabling faster and more efficient emergency responses. The system will detect rising water levels and send real-time alerts to authorities and residents through wireless communication. By providing timely alerts, this system aims to reduce property damage, prevent loss of life, and assist in efficient emergency response.

The system is scalable, meaning it can be expanded to cover multiple areas or urban regions, making it suitable for both residential and industrial zones. Moreover, it provides a low-cost, easy-to-implement solution that could be deployed in flood-prone areas across Kuwait, improving community safety and disaster preparedness.



E7 - INNOVATIVE SAND-BASED RENEWABLE ENERGY STORAGE AND CONVERSION FOR THE ARABIAN GULF

STUDENTS:

- Fajer Lafi Suker Mutlaq
- Dana Mahdi Saleh Khuraibet
- Anwar Rashed Mutair Albathali

ACADEMIC SUPERVISOR:

Dr. Hamzeh Aljarajreh



PROJECT DESCRIPTION:

This project explores the potential of harnessing renewable energy from the vast desert landscapes of the Arabian Gulf by using sand as a medium for thermal energy storage and conversion. Inspired by advanced sand battery technologies developed by Polar Night Energy and Newton Energy Solutions, the system aims to capture surplus renewable energy, store it as high-temperature thermal energy in sand, and later convert this stored energy into electricity or utilize it for heating applications. The process begins with heating the sand to high temperatures, achieved through various renewable energy sources. Concentrated solar power (CSP) systems use sun reflectors to focus sunlight, while photovoltaic solar panels and wind turbines indirectly heat the sand via a heat transfer system. The thermal energy is stored in insulated sand reservoirs, taking advantage of sand's high specific heat capacity, stability at extreme temperatures, and abundant availability in desert regions.

Energy conversion is achieved through two primary methods. The first utilizes the Seebeck effect, where a temperature gradient between two dissimilar materials generates a voltage, allowing the direct conversion of thermal energy into electricity. The second method involves using the stored thermal energy to generate hot steam or air, which can be employed in industrial processes such as manufacturing, district heating, and power generation. By capitalizing on the region's abundant desert resources and renewable energy potential, this project seeks to provide a scalable, sustainable, and cost-effective solution for renewable energy storage and utilization, promoting energy resilience and sustainability in the Arabian Gulf.



E8 - SMART FIRE EXTINGUISHING SYSTEM

STUDENTS:

- Sarah Majed Yousef Eisa
- Abdullah Fuad Khaleel Alshatti
- Ahmad Bader Ahmad Aldyouli
- Bader Snaitan Ayedh Alrashidi
- Hassan Ali Hamad Alshammari

ACADEMIC SUPERVISOR:

Eng. Sami Assad



PROJECT DESCRIPTION:

Fire incidents in factories pose significant threats to safety, infrastructure, and productivity. Traditional fire suppression systems often lack the precision to respond efficiently to localized fire outbreaks. This project proposes a smart fire extinguishing system capable of detecting and extinguishing fires at their source with high accuracy.

The system involves a hose installed on a rail mechanism mounted on the factory ceiling, similar to the rail design used in 3D printers. This setup allows the hose to traverse the factory floor, covering the entire area. Integrated automated fire detection will identify the exact location of a fire, enabling the hose to move swiftly to the fire's origin and spray water or other extinguishing agents to suppress it effectively.

The system is designed to enhance safety and minimize damage by providing targeted fire suppression while integrating seamlessly with existing safety protocols.



E9 – SMART SYSTEM FOR MOSQUES

STUDENTS:

- Muneerah Anwer Ahmad Alawadhi
- Fatemah Ali Husain Qasem
- Ayah Ahmad Omar Alenezi
- Anwar Motlaq Hejab Almutairi
- Shahad Mohammad Fadhel Alshammari

ACADEMIC SUPERVISOR:

Eng. Sami Assad



PROJECT DESCRIPTION:

Mosques play a vital role in the lives of Muslims as spaces for prayer, community gatherings, and educational activities. However, many mosques face challenges in managing their operations efficiently, ensuring the comfort of worshippers, and promoting energy conservation. This project aims to design and implement a smart system for mosques that integrates modern technologies to address these challenges.

The smart system will incorporate features such as automated lighting and air conditioning control based on prayer times and the number of attendees, real-time monitoring of energy consumption, and emergency alert systems. Additionally, the system will provide digital displays for prayer times, announcements, and guidance for worshippers. It will also integrate mobile application connectivity to inform users of mosque schedules, special events, and donation opportunities.

The system will be designed using microcontrollers, sensors, IoT modules, and wireless communication technologies. By automating essential functions and improving the management of mosque resources, this project will enhance the experience of worshippers while promoting sustainability and efficiency.



E10 - CLASSROOM ENGAGEMENT ANALYSIS USING VISION AND AI

STUDENTS:

- Reem Majed Malek Almalek
- Maryam Abdullah Abdulrahman Taleb
- Ghadeer Yousef Hussain Aljeridan
- Fatimah Ali I Alhubabi

ACADEMIC SUPERVISOR:

Dr. Arash Mehdizadeh



PROJECT DESCRIPTION:

Student engagement is a critical factor in ensuring effective teaching and learning within a classroom. Engaged students are more likely to absorb and retain information, participate actively, and achieve better outcomes. Conversely, disengaged students may struggle to follow the content, leading to gaps in understanding. By analyzing classroom engagement, educators can adapt their teaching methods to improve content delivery and provide a more effective learning environment.

To this end, this project proposes an innovative vision and AI-based system designed to detect and analyze classroom sentiment during lectures, providing real-time feedback to educators. The system would utilize advanced machine learning algorithms and vision to capture, identify and classify student sentiments, such as interested (engaged), not interested, confused, and tired. Insights gathered from these analyses will help educators evaluate the effectiveness of their content, the timing of the class, and the delivery method. A consensus based on the class's overall sentiment will be reported to the lecturer either in real-time or after class, enabling more informed teaching decisions and improved learning experiences.



E11 - ORIGAMI-INSPIRED WIND TURBINE FABRICATION AND IOT-BASED DC POWER MONITORING

STUDENTS:

- Yousef Sadeq Ahmad Alqattan
- Jarrah Meshal Hamad Dhaif
- Ayah Mohammad Saleh Alsaraf
- Abdullah Mohammad Ghareeb Zankawi
- Ali Fawzi Ali Albanaa

ACADEMIC SUPERVISOR:

Dr. Arash Mehdizadeh



PROJECT DESCRIPTION:

Wind energy plays a pivotal role in achieving global sustainability goals. However, the accessibility and affordability of traditional wind energy systems remain a challenge for widespread adoption, especially in small-scale, decentralized settings. Low-cost, small-scale wind turbines have emerged as a promising solution to address this gap. These turbines provide an affordable and scalable way to harness wind energy for localized applications, such as powering homes, small businesses, or remote areas. Despite their potential, there is a need to innovate and improve the design and efficiency of these turbines while maintaining cost-effectiveness.

This project aims to fabricate a novel, origami-inspired wind turbine using 3D printing techniques. By comparing the origami-inspired turbine to a traditional one, this project seeks to provide insights into the advantages of advanced design methodologies in small-scale wind energy systems. To this end and to perform the comparative analysis, this project includes the implementation of an IoT-based DC power monitoring system utilizing sensors and microcontrollers to collect real-time data on power generation efficiency and stability aiming to identify operational issues and enhance energy production.



E12 - DESIGN AND IMPLEMENTATION OF SMART SOLAR STREET LIGHT SYSTEM

STUDENTS:

- Ali Fouad Alsaleh Alhariri
- Abdul Kareem Osama Abdul Kareem Hanan
- Mahmoud Ahmad Mahmoud Almaraj
- Shoaib Mohammed Abdullgafar Atsh
- Mohammed Nabeel Mohammed Boabbas

ACADEMIC SUPERVISOR:

Dr. Majdi Alomari



PROJECT DESCRIPTION:

The smart solar streetlight system offers an innovative solution for urban lighting, focusing on sustainability and energy efficiency. This system uses solar energy to power streetlights, significantly reducing electricity consumption while ensuring safety and visibility in public areas. Solar panels charge batteries throughout the day, providing a reliable energy source for nighttime operation. At sunset, motion sensors activate the lights only when movement is detected, illuminating the area as needed and conserving energy when no activity occurs. This smart lighting approach minimizes energy waste, extends the life of lighting components, and reduces maintenance costs. In addition to its energy-saving features, the system also contributes to public safety by maintaining well-lit environments.

Integrating renewable energy technology with intelligent sensors, the system demonstrates a forward-thinking approach to urban infrastructure, fostering the development of smarter, more sustainable cities. The Smart Solar Street Light System also includes environmental monitoring capabilities, such as air quality, noise, and weather sensors, which can be shared with local authorities to inform public health and urban planning efforts. Furthermore, the system can be integrated with emergency response functions, allowing the lights to flash or change color in response to incidents, helping to guide first responders and alert the public.



PETROLEUM ENGINEERING PROJECTS







P1 - ENHANCING THE PERFORMANCE OF DRILLING FLUIDS WITH HYBRID NANOPARTICLES AND POLYMERS FOR IMPROVED VISCOSITY CONTROL AND FILTRATION EFFICIENCY

STUDENTS:

- Maryam Hameed Alkhaldi
- Taiba Saqer Alharban
- Samiah Mohammad Alhajri
- Fatemah Jassim Almansour

ACADEMIC SUPERVISOR:

Dr. Biltayib Misbah



PROJECT DESCRIPTION:

Testing drilling fluids is critical for ensuring their performance in extreme conditions, as they play a vital role in the success of drilling operations by maintaining wellbore stability, controlling pressure, and minimizing risks. Properly optimized drilling fluids contribute to the efficiency, safety, and cost-effectiveness of the entire drilling process.

This project investigates the enhancement of drilling fluid properties by incorporating hybrid nanoparticles and polymers (CMC, Flaw Zan, xanthan gum) under high-temperature conditions (up to 130°C). The study evaluates how these materials affect viscosity control, thermal stability, and filtration efficiency. Rheological tests will be conducted at various temperatures and high shear rates to determine the optimal formulations for improving fluid stability, reducing filtration losses, and maintaining viscosity. The impact of hybrid nanoparticles on polymer additive performance will also be assessed, particularly in challenging subsurface conditions. The results will contribute to the development of more effective and durable drilling fluids.



P2 - TURNING CO₂ FROM ENEMY TO ALLY: SIMULATION AND OPTIMIZATION OF CO₂-TO-METHANOL CONVERSION FOR A SUSTAINABLE FUTURE

STUDENTS:

- Mohammed Dawoud Alajmi
- Abdullah Hussain Alnassar
- Mohammad Mubarak Alazemi
- Bandar Abdulaziz Alsuwait
- Torki Abdullah Alemtairi

ACADEMIC SUPERVISOR:

Dr. Jean El Achkar



PROJECT DESCRIPTION:

As the world faces the urgent challenge of climate change, innovative solutions for carbon utilization have become essential. Methanol presents a promising alternative fuel that can be sustainably produced by converting captured CO₂, reducing greenhouse gas emissions while supporting cleaner energy systems. Methanol can serve as a substitute for gasoline or diesel, or be used in fuel cells for electricity generation, making it a key player in the transition to sustainable energy. This project focuses on simulating and optimizing the CO₂-to-methanol conversion process using MATLAB. Through mathematical modeling, we will analyze key parameters such as feed composition to enhance efficiency and maximize methanol yield. A particular focus will be placed on the Liquid-Out Gas-In Concept (LOGIC) reactor, an advanced system designed for near-complete CO₂ conversion through natural convection-driven internal gas recycling. By leveraging computational tools to refine process conditions, this research aims to contribute to advancing carbon capture and utilization (CCU) technologies. The outcomes of this study could help optimize large-scale methanol production, offering a viable pathway toward a carbon-neutral and sustainable future.



P3 - REVIEW OF SYNTHESIZED NANOPARTICLES FOR DIVERSE APPLICATIONS IN WATER TREATMENT

STUDENTS:

- Abdallah Ali Almutairi
- Alwaleed Jaber Meshkhas
- Abdullah Ahmad Abbas
- Abdulhady Gamal Aldoosery
- Ali Mubarak Alhajri

ACADEMIC SUPERVISOR:

Dr. Mohamed Omar



PROJECT DESCRIPTION:

Water pollution from organic/inorganic compounds threatens sustainability, necessitating advanced treatment methods. Semiconductor-based photocatalysis using titanium dioxide (TiO_2) is promising for pollutant degradation due to its stability and low cost. However, its high bandgap energy (3.2 eV in anatase form) and rapid electron-hole recombination limit its efficiency. To address this, modifying TiO_2 with reduced graphene oxide (rGO) enhances electron transfer, reduces recombination, and improves photocatalytic performance (e.g., degrading methylene blue). This study reviews semiconductor photocatalysis, evaluates synthesis methods for TiO_2 @rGO nanocomposites, and aims to develop a simpler, cost-effective, and eco-friendly synthesis process. Key objectives include optimizing morphology, purity, and surface area to maximize photocatalytic efficiency for water purification applications.



P4 - SUSTAINABLE OIL SPILL REMEDIATION USING A COLUMN-BASED SYSTEM WITH TIRE POWDER AS AN ADSORBENT

STUDENTS:

- Khansa Ishaq Ishaq
- Wafaa Naser Alkhazam
- Retaj Fahad Homaidi
- Anfal Mustafa Al-Mutawa
- Shahad Rashid Albathali

ACADEMIC SUPERVISOR:

Dr. Rana N. Malhas



PROJECT DESCRIPTION:

Oil spills pose significant environmental risks, affecting marine life, water quality, and coastal ecosystems. Traditional cleanup methods, such as mechanical recovery, chemical dispersants, and bioremediation, face challenges related to efficiency, environmental impact, and cost. Therefore, innovative and sustainable solutions are needed.

Tire combustion releases hazardous pollutants, making it crucial to avoid burning tires. Instead, safe disposal and recycling are essential. One promising approach is using tire powder (ground scrap tires) as an adsorbent material for oil spill remediation. Tire powder has a high surface area and porosity, making it effective for absorbing oil from water.

This project investigates the use of tire powder in a column-based prototype for oil spill cleanup. It focuses on the design, construction, and testing of the prototype to assess the efficiency of tire powder in adsorbing oil, as well as its regeneration and reusability. By utilizing tire powder, the project aims to provide an innovative, cost-effective, and environmentally friendly solution for oil spill mitigation, while also addressing waste reduction and promoting recycling. This approach could enhance oil spill response efforts and contribute to sustainable waste management.



P5 - A NOVEL PREDICTIVE MODEL OF FIBER DRAG COEFFICIENT AND SETTLING VELOCITY FOR HIGH-DENSITY SPHERICAL PARTICLES IN HIGH CONCENTRATED FIBROUS FLUIDS

STUDENTS:

- Ahmad Fayez Ahmad Alkhamees
- Abdullah Saqer Al-Khaledi
- Abdulmohsen Fadhel Alali
- Khalid Bader Hussain Alsanea
- Mohammad Fadhel Abbas Abdullah

ACADEMIC SUPERVISOR:

Dr. Rida Elgaddafi



PROJECT DESCRIPTION:

Fluid-particle transport systems are widely used across industries, particularly in petroleum operations such as hydraulic fracturing and drilling. In hydraulic fracturing, solid proppants are transported through fluids to open fractures, while in drilling, cuttings are circulated to the surface. A key challenge in fracturing is proppant settling, which is strongly influenced by the rheological properties (viscosity and elasticity) of the fluid. To enhance suspension capabilities, fiber additives are introduced—such as in FiberFRAC and channel fracturing techniques.

Accurate prediction of proppant settling velocity is essential for designing effective fiber-based fracturing fluids. However, existing models show high discrepancy, especially for heavy proppants in fiber-rich fluids, primarily due to inaccurate estimation of the fiber drag coefficient. This study addresses that gap through both experimental and theoretical investigations. Sedimentation tests using glycerin-based Newtonian fluids with varying fiber concentrations are conducted to measure particle settling velocities. Additionally, a new model for predicting the fiber drag coefficient is developed and validated against experimental data.

This study aims to enhance hydrocarbon recovery from tight reservoirs to address increasing energy demands. By improving the proppant transport efficiency of fracturing fluids, the research supports the creation of more effective and controlled fracture geometries, contributing to both operational efficiency and reservoir performance.



P6 - DESIGNING A SUSTAINABLE RESIDENTIAL AREA WITH BUILTIN RENEWABLE ENERGY, WASTE RECYCLING AND SANITARY WASTE MANAGEMENT

STUDENTS:

- Ahmad Lam
- Abdalwahab Alselemany
- Naser Albader
- Abdullah Alwazzan
- Abdulaziz Alahmad

ACADEMIC SUPERVISOR:

Dr. Suad Al Radhwan



PROJECT DESCRIPTION:

It is well known that human-caused climate change is already affecting many regions across the globe. This has led to widespread adverse impacts and related losses and damage to nature and people. Accordingly, it is required under the Paris agreement to limit the global temperatures to 1.5°C to mitigate the adverse impacts. Kuwait has also prepared its vision and committed to achieve carbon neutrality by 2050 for O&G sector and by 2060 for other Kuwait sectors.

As rapid urbanization and diversified lifestyle options have collectively led to an escalation in housing demand, it is known that the residential areas, as the largest portion of urban land use type, causes significant impact on the environment and thus play a critical role in the formation of sustainable cities. As we face increasing challenges related to climate change, designing sustainable residential areas has become a necessity to achieve Kuwait's vision on carbon neutrality. This project focuses on the conceptual design of a new residential area that harmonizes modern living with environmental responsibility. By incorporating renewable energy, sustainable waste practices, and advanced sanitary management, the proposed community aims to serve as a model for future urban developments.

This project challenges students to conceptualize and design a sustainable residential area that addresses modern living needs while minimizing environmental impact.



P7 - FEASIBILITY STUDY OF SHIFTING VEHICLE IN KUWAIT TO GREEN HYDROGEN IN COMPARISON TO FOSSIL FUEL AND ELECTRIC VEHICLES

STUDENTS:

- Yasmain Alowaisheer
- Sarah Almulla
- Mohamed Abdelmageid
- Fatemah Alkhadhari
- Nawal AlSamhan

ACADEMIC SUPERVISOR:

Dr. Suad Al Radhwan



PROJECT DESCRIPTION:

Throughout the last many decades, Kuwait's population has grown, and its oil exploration has produced massive economic changes. Without a mass transportation system available in Kuwait, it has led to high vehicle demand and causing greenhouse gas emission. As a result, air pollution has increased in urban areas due to the Transportation sector.

There have been numerous efforts globally to operate vehicles on renewable energy to ensure that the adverse effects of transportation are mitigated. The rapid transition toward sustainable transportation has highlighted the need for a comparative evaluation of emerging clean energy technologies. One of the technologies which is being pioneered is the production of Hydrogen in a green way.

This study focuses on conducting a feasibility study to utilize green hydrogen-based vehicles (HBVs) in comparison to fossil fuel and electric vehicles (EVs). The objective is to assess and analyze their feasibility, efficiency, environmental impact, cost-effectiveness, infrastructure requirements, and potential for large-scale adoption in Kuwait for decarbonized mobility.



P8 - CORRELATING GRANULAR FLOW BEHAVIOR WITH RHEOLOGICAL PROPERTIES OF SAND PARTICLES

STUDENTS:

- Mohamed Ahmed Abbas
- Dhari Abdulah Alenezi
- Mohammad Salman Alazemi
- Ali Bader Alshammari
- Ahmad Mohammad Alghaith

ACADEMIC SUPERVISOR:

Dr. Seyed Mehdi Seyed Alizadeh



PROJECT DESCRIPTION:

This research establishes correlations between marsh funnel flow times and fundamental rheological properties of sand materials with varying particle characteristics. By examining how funnel geometry affects these relationships, the project aims to develop a field-deployable methodology for assessing sand flow behavior.

In petroleum engineering applications- including sand production prediction, control completions, and erosion management- understanding sand particle flow is essential for system optimization. While laboratory rheometers provide precise measurements, calibrated marsh funnels could offer valuable field assessments. The study will conduct laboratory testing to analyze relationships between funnel measurements and rheological properties, considering how funnel dimensions, angles, and outlet characteristics influence results. The research will yield validated mathematical correlations linking funnel measurements to key rheological properties, analysis of scaling effects and methodology limitations, and recommendations for optimal funnel geometry and testing procedures. This work bridges the gap between laboratory measurements and practical field applications, providing petroleum engineers with reliable tools for on-site sand behavior assessment.



**CONGRATULATIONS TO
OUR FUTURE ENGINEERS!**

**WISH YOU ALL THE BEST
IN YOUR JOURNEY!**



Dr. Mohamad Hussein Farhat
Electrical and Electronics Engineering Department

EVENT COORDINATOR



Amani Abed Al Hai
Academic Administration

EVENT ASSISTANT

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

SPECIAL THANKS TO OUR SPONSORS



Australian Embassy



مؤسسة الكويت للتقدم العلمي
Kuwait Foundation for the Advancement of Sciences







www.au.edu.kw