UTHM
Universiti Tun Hussein Onn Malaysia

FKEE

FEST

Faculty of Electrical and Electronic Engineering

15&16 JUNE 2026

INTEGRATED DESIGN PROJECT (IDP) SHOWCASE

Semester 2 Session 2025/2026

Program Book

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BACKGROUND OF INTEGRATED DESIGN PROJECT (IDP)

The Integrated Design Project (IDP) is an engineering course (code: BEE40803) where the students must provide a feasible solution for a given complex engineering problem (CEP) based on a specific theme, engage with a related industry or community, and produce a product that reflects a deep understanding of the CEP. The IDP activities, on the other hand, involve real-life problem-solving that must consider public health and safety, technology, the environment, the economy, and project management.

The students must understand a given problem within a specific theme, create an engineering sketch of the product, transform the sketch into an engineering model, and deliver the product as a prototype. They will perform engineering design and testing activities to produce a working product. These tasks require students to possess the skills of handling various engineering tools, including both software and hardware. The final working product will be evaluated at the end of the course in the IDP Showcase by a set of academic and industrial panels. The IDP Showcase, organized by the FKEE Capstone Committee, is held to recognize students' hard work and dedication and to celebrate knowledge and innovation. Furthermore, this showcase can serve as a platform to discover potential products to enter innovation competitions.

In conclusion, the CEP process in the IDP course trains students to integrate multidisciplinary knowledge in solving a given problem statement. Moreover, the new knowledge and skills acquired in the IDP course will prepare FKEE students to address current and future global challenges in their careers.

DEAN'S FOREWORD

Assalamualaikum w.b.t and Greetings,

First and foremost, I would like to congratulate all of you, the IDP students of FKEE, on your successful participation in the IDP Showcase for Semester 2, 2025/2026. This event is one of the strategies the faculty employs to spur research, nurture innovation and creativity, and instill awareness of good engineering practices among students.

As some of you might know, FKEE strives to be an Industrial-Driven Faculty in a few years' time. Now is an appropriate time for the faculty to start building ties and engaging with industry. Furthermore, IDP is one of the courses in the faculty that requires students to engage in active knowledge acquisition to produce multiple solutions to address the complexity of problems faced by industry.

This semester, the Capstone Committee of FKEE has decided to focus on the themes Smart Home/Cities, Smart Health, Smart Agriculture, and "Energy Efficiency. A total of 85 students have registered for this course. They are grouped into 20 groups. Each group is supervised by an academician. The students would tackle real-life, complex engineering problems and work in teams. Multiple stages of assessments would evaluate their performance, commitment, and achievement.

I would like to applaud the students who have worked hard to produce a working product for the showcase. I strongly hope that the knowledge and experiences you have gained will be beneficial in the future.

Finally, my deepest appreciation goes to the Capstone Committee of FKEE for the tremendous efforts in organizing this event. Well done!

Thank you.

Best Wishes,
Prof. Ts. Dr. Asmarashid bin Ponniran
Dean
Faculty of Electrical and Electronic Engineering
Universiti Tun Hussein Onn Malaysia

ORGANIZING COMMITTEE

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Assoc. Prof. Ts. Dr. Asmarashid bin Ponniran

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Dr. Wan Suhaimizan bin Wan Zaki (KJ Kejuruteraan Elektronik)
Dr. Mohamed Najib bin Ribuan (KJ Pengurusan Makmal dan Aset)

ACKNOWLEDGEMENT

The Capstone Project Committee of FKEE would like to extend its gratitude to the Dean and management of FKEE for their full support and financial assistance in organizing this event. On behalf of the committee, we would like to thank all generous sponsors, including The IET Malaysia Local Network, IEEE EDS, and IEEE EMBS, for providing the certificates/tokens for the winner.

Special thanks to the IDP supervisors and assistant engineers for sharing their knowledge and providing guidance to the students, which enabled them to complete their work.

Finally, our deepest appreciation to the wonderful students of FKEE for their hard work, time, and energy spent participating in the IDP Showcase of Semester 2 2025/2026. May all be rewarded accordingly.

Yours sincerely,

Capstone Project Committee of FKEE
Faculty of Electrical and Electronic Engineering
Universiti Tun Hussein Onn Malaysia

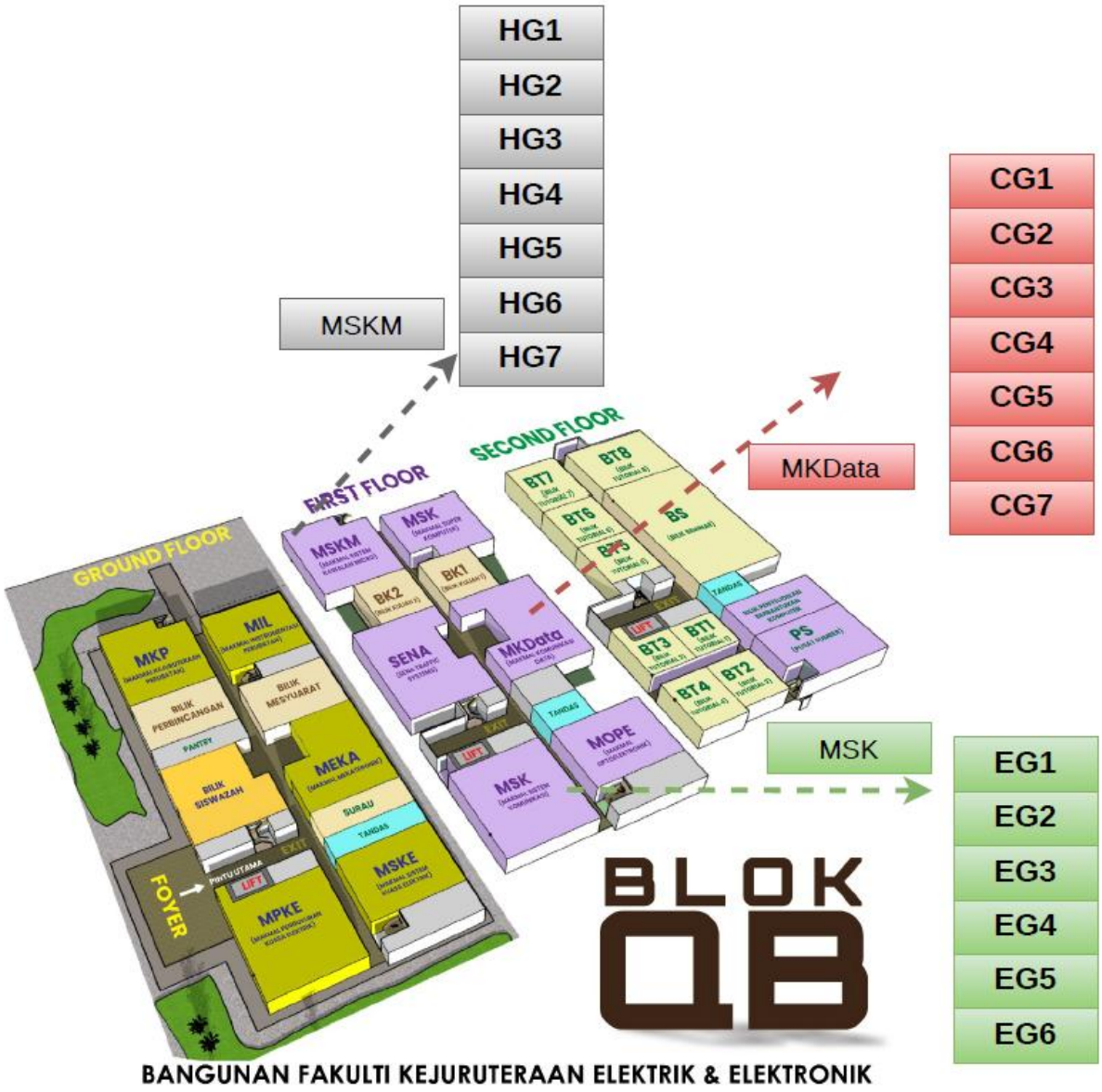
PROGRAM TENTATIVE

FKEE FEST 2026
BLOK QB, FKEE
15 JUN 2026, 8:30 PAGI - 4:30 PETANG

Masa	Aktiviti	Lokasi
8:30 pagi - 9:00 pagi	Pendaftaran Penilai industri IDP Showcase	Foyer Blok QB, FKEE (Depan Lif)
9:00 pagi - 10:00 pagi	1) Kata alu-aluan Dekan FKEE 2) Taklimat Penilai IDP Showcase 3) Taklimat HEPA 4) Sesi bergambar	Bilik Seminar, Blok QB
10:00 pagi - 12:00 tgh hari	Penilaian IDP Showcase	MKSM, MKD, MSK
12:00 tgh hari - 2:00 petang	Rehat dan Makan Tengahari	Bilik Seminar, Blok QB

Masa	Masa (Sub)	Aktiviti	Lokasi
2:00 petang - 4:00 petang	2:00 - 2:30 petang	1) Ketibaan Pelajar dan Pengurusan FKEE	Foyer blok QA (Khemah)
	2:30 - 2:40 petang	2) Nyanyian lagu Bangsa Johor Negaraku, Gemilang UTHM	
	2:40 - 2:45 petang	3) Bacaan doa	
	2:45 - 4:00 petang	4) Ucapan Dekan FKEE	
		5) Penyampaian hadiah IDP Showcase	
		6) Penyampaian hdiah FYP Industry Award	

IDP SHOWCASE LAYOUT BLOCK QB, FKEE



JUDGING GUIDELINE

IDP SHOWCASE EVALUATION

1. INTRODUCTION

On behalf of the Organizing Committee, we would like to express our sincere appreciation to all appointed judging panels for their time, commitment, and willingness to participate in the IDP Product Evaluation – IDP Showcase, Semester 2 2025/2026. This section serves as an official guideline to assist judging panels in conducting the evaluation process smoothly, consistently, and effectively.

2. ASSIGNMENT OF IDP GROUPS

Judging panels must refer to the Judging Schedule (Page ix), which outlines the IDP groups assigned to each panel. Each judging panel will be assigned to evaluate two (2) or three (3) IDP groups, as specified in the Judging Schedule. Panels are advised to note the Group Tag (e.g., HG1), which will be used consistently throughout the presentation and evaluation process.

3. IDP PROJECT PRESENTATION

Each IDP group is allocated five (5) minutes to present their project, followed by a Question and Answer (Q&A) session with the judging panels.

For panels evaluating **ONLINE** presentations, the presentation video links are provided on Page xiii of this program book.

4. PROJECT EVALUATION PROCEDURE

All evaluations, for both physical and online presentations, shall be conducted ONLINE using the official Google Evaluation Form.

The evaluation link will be shared in the IDP Showcase WhatsApp Group. Judging panels must ensure the correct Group Tag is selected before submitting the evaluation form. The list of group tags is available within the form for reference.

5. EVALUATION SCHEDULE

- Physical evaluation:
  - Date: 15 June 2026
  - Time 10:00 a.m. – 12:00 p.m.
  - Judging panels are kindly requested to complete all assigned evaluations by 11:45 a.m. to ensure the timely compilation and processing of results.
- Online evaluation:
  - Duration: 8.00 am (14 June 2026) to 11.30 am (15 June 2026)

JUDGING SCHEDULE

GROUP	INDUSTRY PANEL	FKEE PANEL
HG1 HG2 HG3	1) EN. SAFUAN JASNI MMT Probina Sdn Bhd 2) MOHAMAD QAIS AMIRI BIN MANSOR PROTON Tanjong Malim (ONLINE)	1) CIK MASNANI BINTI MOHAMED 2) PROF. MADYA Ir. Dr. FARHANAHANI BINTI MAHMUD
HG4 HG5	1) EN JAMREE BIN ARIFFI WONG Berkat Sejati Sdn Bhd 2) EN MOHD SALLEH BIN MD ROSLAN Brunel Energy (Malaysia) Sdn Bhd (ONLINE)	1) Ts. WAN NUR HAFSHA BINTI WAN KAIRUDDIN 2) PROF. MADYA Ts. Dr. NUR ANIDA BINTI JUMADI
HG6 HG7	1) MUHAMMAD MUZHAFFAR BIN JASMAN CFI Automation 2) NUR IZZATI NABIHAH MOHD ZAINI Advanced Energy Industries, Penang Science Park (ONLINE)	1) PROF. MADYA Ir. Dr. NABILAH BINTI IBRAHIM 2) PROF. MADYA Ts. Dr. NAN BIN MAD SAHAR

GROUP	INDUSTRY PANEL	FKEE PANEL
CG1 CG2 CG3	1) TS. NUR FARIHIN BINTI WAHAB MIE Industrial Sdn Bhd 2) Ts. AABDUL RAZAK BIN ISHAK Dyson Manufacturing Sdn Bhd (ONLINE)	1) PROF. MADYA Dr. MAISARA BINTI OTHMAN 2) PROF. MADYA Ir. Dr. HERDAWATIE BINTI ABDUL KADIR
CG4 CG5	1) HENRY PARAN Petronas 2) MOHD LATIFI BIN MAHMOOD SLM Bina Enterprise	1) PROF. MADYA Dr. NOR SURAYAHANI BINTI SURIANI 2) PROF. MADYA Dr. ZUHAIRIAH BINTI ZAINAL ABIDIN
CG6 CG7	1) MOHAMAD NAQIB Bridge Data Centres 2) Ts. MAIZUL BIN ISHAK CGS SI (Creative Group Solution System Integrator)	1) Ir. Dr. NOORHAMIZAH BINTI MOHAMED NASIR 2) Dr. TASIRANSURINI BINTI AB RAHMAN

GROUP	INDUSTRY PANEL	FKEE PANEL
EG1	1) WONG CHIN KHANG Schneider Electric Industries (M) Sdn Bhd 2) FATHIHAH AMIRAH BINTI AMSANI University of Auckland (ONLINE)	1) PROF. MADYA Ts. Dr. KOK BOON CHING 2) PROF. MADYA Dr. WAHYU MULYO UTOMO
EG2		
EG3		
EG4	1) MOHD AZWADI BIN OMAR MiNT-SRC, IIE, UTHM 2) ASHOK KUMAR A/L GANESEN Racks Central Sdn. Bhd.	1) PROF. MADYA Ir. Dr. DIRMAN HANAFI 2) Dr. MD ZARAFI BIN AHMAD
EG5		
EG6		

LIST OF IDP PROJECTS – POSTED ON YOUTUBE

No	Group	YouTube Link
SMART HEALTH		
1	HG1	https://youtu.be/a17pg3PhihQ
2	HG2	https://youtu.be/QCFMPp42MMo?feature=shared
3	HG3	https://youtu.be/x7yFm1fVqp0?si=VPmSNitTMvVi9qGf
4	HG4	https://youtu.be/IZST5lnt2yI?si=maMS4jFnKBByMawd
5	HG5	https://youtu.be/CAbtMfa32kQ
6	HG6	https://youtu.be/5iM8ZDUYfC8?si=BBNcJQq4yuQ0SVlg
7	HG7	https://youtu.be/EHGuelPNCFc
SMART CITIES/HOME		
8	CG1	https://youtu.be/056x8nFCJm8?si=MGSWTmKiYD8IwjzX
9	CG2	https://youtu.be/3NWqnYnOTyk
10	CG3	https://youtu.be/SNvgnDJjysY?si=qkl98_7J0uyxPgp6
11	CG4	https://youtu.be/Xk5pmS09Vpo
12	CG5	https://youtu.be/SnXto8DMrX0
13	CG6	https://youtu.be/fcPdymT-6Oo
14	CG7	https://youtu.be/JQoNkw3teHw
ENERGY EFFICIENCY		
15	EG1	https://youtu.be/VJ6S5yRxHvA
16	EG2	https://youtu.be/hOgmLmguR2g
17	EG3	https://youtu.be/M4bjUCguzy8
18	EG4	https://youtu.be/hlhLhcu1BC0
19	EG5	https://youtu.be/sWKgihlkhAY?si=dlLLym_5o6Sx5Zen
20	EG6	https://youtu.be/ZXBD-UXgOqk

LIST OF IDP PROJECTS

THEME – SMART HEALTH

(HG1) PATIENT TRIAGE AND MONITORING KIOSK

Team : BE220023 MAHAD ALI WARSAME
DE230031 MUHAMMAD HAZIM BIN SHARIF
CE230005 NURUL FARAH WAHIDA BINTI NOR-MAN
DE230037 MUHAMMAD ANIQ WAZIR BIN DANILO
CE230021 NURDINA AISYAH BINTI ROSIDI

Supervisor : PROF. MADYA Ir. DR. AUDREY HUONG KAH CHING

Abstract : The increasing demand for efficient patient management in healthcare facilities has highlighted the need for automated systems to assist with patient screening and monitoring. This project presents the design and development of a Patient Triage and Monitoring Kiosk that integrates various sensors and identification technologies to support initial patient assessment. The system is designed with an ESP32 microcontroller, an RFID module for patient identification, a MAX30102 sensor to measure heart rate and blood oxygen saturation (SpO_2), and an MLX90614 infrared sensor to measure the patient's body temperature non-contact. Physiological parameters are displayed on a 20×4 LCD screen, providing the user with real-time health information. Built-in buzzer as an alarm signal to alert the user or healthcare staff when abnormal vital signs are detected. The data collected is then analyzed by the ESP32, which facilitates patient triage by providing a quick health assessment prior to medical personnel consultation. The goal of the proposed kiosk is to enhance patient screening efficiency, minimize wait times, and help healthcare staff prioritize patient care based on vital signs measured by the kiosk.

(HG2) A DUAL-SENSOR IOT PLATFORM FOR AUTOMATED PATIENT STRENGTH PROFILING

Team : CE230057 MOHAMMAD AIMAN NURHAKIM BIN MAT NAZRI
CE230091 NUR AINA SAHIRA BINTI HAIRUDIN
DE230101 MUHAMMAD FIQRI AQMAL BIN ABDUL RAZAK
DE230084 LING ZHONG HAO

Supervisor : PROF. MADYA DR HISYAM BIN ABDUL RAHMAN

Abstract : The increasing demand for elderly healthcare services has highlighted the need for more efficient and accurate patient assessment methods. Traditional grip strength evaluations in clinics and rehabilitation centers are commonly performed manually, requiring healthcare professionals to record results on paper forms, which can be time-consuming and susceptible to human error. This project presents a **Dual Sensor IoT Platform for Automated Patient Strength Profiling**, designed to modernize and automate the assessment and management of patient strength data. The proposed system utilizes a CSP 32S2 microcontroller with built-in Wi-Fi and Bluetooth capabilities to enable wireless data transmission and remote monitoring. A grip strength sensor is integrated to measure the patient's hand grip force and provide real-time readings. Additionally, an ICM20948 Inertial Measurement Unit (IMU) sensor is incorporated to detect motion and orientation, enabling future expansion into advanced physical assessments, such as sit-to-stand evaluations for patients with lower disability. Collected data are displayed in real time, enabling healthcare professionals to access and manage patient information conveniently through computers or mobile devices. The developed prototype demonstrates the feasibility of automating grip strength assessment while improving data accuracy, accessibility, and management efficiency. Future enhancements include automatic report generation, which will further streamline clinical documentation processes. Overall, the proposed IoT-based dual-sensor platform offers a portable, scalable, and efficient solution for elderly patient strength profiling, thereby improving healthcare service delivery and patient monitoring.

(HG3) OBSTACLE DETECTION CANE FOR VISUALLY IMPAIRED USERS USING TIME-OF-FLIGHT SENSING

Team : DE220067 EVAN OSBERT ANAK MICHAEL JODI
DE230042 MUHAMMAD AINUR NAZRIN BIN ZEFRI
DE230096 MOHAMMAD ADLI HAKIMI BIN MAHAZER
CE220070 FITRI ALIF BIN MUZAMEL

Supervisor : PROF. MADYA IR. DR. TEE KIAN SEK

Abstract : This project proposes the design and development of an Obstacle Detection Cane for Visually Impaired Users using Time-of-Flight (ToF) sensing technology. Traditional white canes are widely used by visually impaired individuals; however, they can only detect obstacles through physical contact, which may increase the risk of collisions and accidents. The proposed system aims to provide early obstacle detection and improve user safety during navigation. The system utilizes a VL53L1X Time-of-Flight sensor to measure the distance between the user and surrounding obstacles. An ESP32 microcontroller processes the sensor data and determines the appropriate alert level based on predefined distance thresholds. When an obstacle is detected within the warning range, a buzzer emits an audio alert. For close obstacles, a vibration motor is activated to provide haptic feedback, enabling users to respond more quickly to potential hazards. The entire system is powered by a rechargeable 18650 lithium-ion battery, making it portable and suitable for everyday use. The proposed obstacle detection cane offers a low-cost, non-invasive, and practical assistive solution for visually impaired users. The expected outcome is a functional prototype capable of accurately detecting nearby obstacles, providing real-time alerts, and enhancing user confidence, safety, and independence during mobility.

(HG4) IOT-ENABLED POSTURE MONITORING VEST

Team : CE230162 LOKGAN A/L GANESAN
CE230148 NUR IMAN ZULAIKHA BINTI MOHAMAD SHOKRI
DE230107 MUHAMMAD AMJAD BIN ROZLAN
DE230131 MUHAMMAD FAKHRUL AZIM BIN AB RAHMAN

Supervisor : Ts. EZRI BIN MOHD

Abstract : Prolonged sitting and repetitive physical tasks in office environments often lead to poor posture. This can cause musculoskeletal disorders (MSDs), high absenteeism, and reduced workplace productivity. This project proposes an IoT-Enabled Posture Monitoring Vest, a non-intrusive wearable embedded system designed for real-time ergonomic assessment and continuous posture tracking. The system features an ESP32 microcontroller as its central processing and wireless communication unit. It integrates a 4.5-inch flex sensor at the lumbar region to detect spinal curvature, with the signal amplified by a TL074 operational amplifier for high sensitivity. Upon power-up, a personalized baseline threshold is established by averaging the user's initial upright sitting positions. Meanwhile, MPU6050 tilt angles differentiate between ideal (0-10),

mild (11-20), and poor posture (exceeding 20). When poor posture trends are detected, the system triggers a DC vibration motor to provide a silent haptic alert for immediate user correction. Simultaneously, data is transmitted via Wi-Fi to a Cloud Database, enabling centralized long-term monitoring to implement corporate preventive healthcare measures. This proposed system intends to enhance institutional ergonomic awareness and promote proactive occupational health management.

(HG5) DEVELOPMENT OF SMART GLOVE SYSTEM FOR STROKE PATIENT REHABILITATION

Team : DE 220068 NADEN ANTHONY A/L JR.A.ANTHONY RAJA
DE230103 MUHAMMAD AKMAL HAFIZI BIN SAMSURI
DE230024 MUHAMMAD ZHAFRI HARIZ BIN MOHD ROSTAM
DE230103 MUHAMMAD AFIQ BIN ROSLI

Supervisor : DR. WARSUZARINA BINTI MAT JUBAIDI

Abstract : Stroke and paralysis patients often require continuous rehabilitation to regain hand and finger functions. However, traditional physiotherapy can be expensive, time-consuming, and difficult to access regularly, especially for home-based rehabilitation. This project presents the development of a Smart Glove System for Rehabilitation designed to assist patients in performing hand rehabilitation exercises independently while providing real-time feedback. The proposed system utilizes an ESP32 microcontroller, flex sensors, and an MPU6050 sensor to monitor finger bending and hand movements. The ESP32 processes sensor data to detect grip movements and evaluate rehabilitation performance. A buzzer is incorporated to provide immediate audio feedback whenever a complete grip exercise is successfully performed. The system is designed to be portable, affordable, and user-friendly, making it suitable for home-based rehabilitation. By providing real-time monitoring and feedback, the Smart Glove System can help patients and healthcare personnel track rehabilitation progress more effectively. The proposed solution aims to improve rehabilitation accessibility, encourage regular exercise, and advance smart healthcare technologies.

(HG6) GUARDIAN-LINK IOT: A THRESHOLD-BASED WAIST-MOUNTED FALL DETECTION SYSTEM FOR SMART HEALTHCARE MONITORING

Team : DE230129 DEVIKA A/P SIVAANANTHA
DE230076 NUR SHAZWANI BINTI RAMBELI
DE230124 MOHAMAD ZULFAKAR BIN MOHD RAZALI
DE230097 MUHAMMAD ARIF ZULHAIKAL BIN ZULKIFLI

Supervisor : PROF. MADYA Ts. Dr. NAN BIN MAD SAHAR

Abstract : Falls are a significant health problem among older patients, resulting in severe injuries and delayed responses to medical emergencies. The project introduces Guardian-Link IoT, a fall-detection system that provides continuous monitoring and immediate emergency notifications. The system uses an ESP32 C3 Mini microcontroller and an MPU6050 sensor mounted on the user's waist to identify falls using a robust threshold-based algorithm. Using information about sudden changes in acceleration and body angle, followed by a period of inactivity after a detected event, the system can distinguish falls from regular activities. In the event of a detected fall, a local alarm will trigger, and an emergency notification will be sent to caregivers via the Blynk IoT mobile application. Compared to artificial intelligence algorithms, the system has significantly lower energy requirements, lower costs, and longer battery life.

(HG7) MEDISNAP, AUTOMATED HEALTH TRACKING FOR ELDERS

Team : CE230061 WOO MING HUANG
CE230075 MUHAMMAD DINI NAJMI BIN MOHD ZAKARIA
CE230073 INDRAPUTERA SHAZMAN BIN MOHD SHAHARUN
DE230079 MUHAMMAD NAJWAN BIN ABD RAHMAN

Supervisor : PROF. MADYA Ts. Dr. SIM SY YI

Abstract : In this modern era, many elderly Malaysians suffer from either hypertension or diabetes and need to record their reading every day by themselves. However, the traditional way of writing the results in a logbook is inconvenient and not always precise. Even with the availability of various mobile applications, many older users find it very uncomfortable to write or connect their Bluetooth devices, as they may have eye or hand problems. Thus, even if nurses manage to see some data on their patients at the Klinik Kesihatan, it will be far from complete. The goal of MediSnap is to make this process much easier. The user does not have to enter anything; they just use their phone to take a picture of the meter reading. It is automatically uploaded to the cloud, where the Google Cloud Vision API recognizes numbers and stores them in the Firebase database along with the user's date and personal information. Clinic personnel can access all data through the provided web interface, track each patient's progress, and be notified whenever something out of the norm occurs. At the same time, the app will help patients avoid missing their appointments or fasting.

THEME – SMART HOME/CITIES

(CG1) IOT-BASED BUS CAPACITY AND ARRIVAL PREDICTION SYSTEM FOR STUDENT TRANSPORT OPTIMIZATION

Team : DE230126 MAHIR ADAM BIN DAUD
CE230064 HARITHARAN A/L RAVI
CE220135 NURUL NAZIHAH BINTI SHAARI
AE220027 MUHAMMAD HAFIZUDDIN BIN NOVY RASYUHANDI
CE230137 AHMAD AFIQ BIN AHMAD AZMIR

Supervisor : Dr. NOOR AZIZI BIN MARDI

Abstract : To address the long wait times and overcrowding that university students experience due to unpredictable campus shuttles, we introduce a budget-friendly, IoT-based bus-tracking system. Built with an ESP32 microcontroller, a GPS module, and infrared passenger-counting sensors, the system tracks a bus's real-time location and occupancy, then uploads the data to a Google Firebase database. When the bus hits specific coordinate checkpoints along its route, a server triggers a custom Telegram bot to automatically message students with real-time capacity and arrival updates. By replacing rigid manual schedules with this dynamic, data-driven approach, the project effectively eliminates commuting uncertainty, improves campus transit efficiency, and supports smart university infrastructure.

(CG2) SMART CONTAINER GARDENING WITH SOLAR ENERGY

Team : AE230065 JOSHUA LIM KAH LOK
DE230074 PUTRA MUHAMMAD NUR AIMAN BIN MOHD TUAH
CE230128 MUHAMMAD NAIM BIN MOHAMAD
DE230043 MUHAMAD DANIAL WAIZ BIN RAZALI

Supervisor : Dr. CHUA KING LEE

Abstract : Water management is important in modern agriculture and gardening to ensure efficient irrigation and reduce water wastage. This project focuses on the design and development of a Smart Watering System using the ESP32 microcontroller. The system automates the watering process by monitoring soil moisture levels and supplying water only when needed. A soil moisture sensor detects soil moisture, while the ESP32 processes the data and controls a water pump via a relay module. The system also uses Internet of Things (IoT) technology, which allows users to monitor and control the watering process remotely. When soil moisture drops below a preset level, the water pump is automatically activated. The pump stops once the soil reaches a suitable moisture level, preventing overwatering. This project shows how sensing, control, and communication technologies can be combined to create an efficient irrigation system. The results indicate that the system can monitor soil conditions accurately and respond effectively to environmental changes. Overall, the Smart Watering System is a low-cost, energy-efficient, and user-friendly solution suitable for home gardens, greenhouses, and small-scale farming applications.

(CG3) SMART HIGHWAY SYSTEM

Team : AE220098 USMAN ABDULRAHMAN SHEHU
CE230079 MUHAMMAD AMIRUL HAZIQ BIN SUDERMAN
DE230045 ABIGAIL SU KWONG ROU
DE230029 MUHAMMAD LUQMAN HAKIEM BIN YA'COB

Supervisor : Dr Roziah bt Aziz

Abstract : The Smart Highway System is an intelligent traffic management system designed to improve road safety, traffic flow, and energy efficiency using sensor technology and embedded systems. The system uses ultrasonic or infrared sensors to detect vehicles, LDR sensors to monitor surrounding light intensity, and PIR sensors to detect movement on the highway. All sensor data is processed by an Arduino microcontroller, which serves as the system's main controller. Based on real-time conditions, the system automatically adjusts traffic lights to account for traffic congestion and controls streetlights, turning them on only when movement is detected under low-light conditions. This adaptive approach helps reduce traffic congestion, improve highway safety, save energy, and increase the efficiency of transportation management. The Smart Highway System also demonstrates the practical application of IoT and embedded technologies to support sustainable transportation development.

(CG4) REAL-TIME INTEGRATION FOR SMART PARKING MANAGEMENT IN UTHM

Team : DE230053 MUHAMMAD AMMAR HAZIQ BIN MUHAMAD RAZI
CE230006 FARINA ADILAH BINTI OTHMAN
DE230082 ZAINUL ARFAN BIN ZAINI
JE250009 ZAHROTI SYAKIRA NIAMI

Supervisor : ENCIK AIZAN BIN UBIN

Abstract : Finding a parking space at UTHM during peak hours is often difficult. Drivers spend extra time searching for vacant parking spaces. This situation can cause traffic congestion, fuel wastage, and increased carbon emissions. This project proposes a Real-Time Smart Parking Management System to improve parking efficiency and provide real-time parking information. The system uses IR sensors to detect parking occupancy. RFID RC522 modules are used for gate access control, while servo motors operate the barrier gate automatically. ESP32 microcontrollers manage data communication between the hardware and the cloud platform. Parking status is stored in Firebase Realtime Database and displayed through a web-based monitoring system. A camera module is also included to provide live monitoring of the parking area. The proposed system is expected to reduce parking search time and improve parking space utilization. Users can check parking availability before entering the parking area. The system also improves convenience through automated gate access. This prototype demonstrates the application of IoT technology in supporting smart campus development and smarter parking management at UTHM.

(CG5) AI-BASED ADAPTIVE TRAFFIC LIGHT SYSTEM FOR EMERGENCY VEHICLE PRIORITIZATION

Team : CE230120 MUHAMMAD NABIL HANNAN BIN MUSTAPHA
DE230050 MUHAMMAD AQIL BIN ZAIHAN
CE230092 FATIN FAQIHAH BINTI NASRUDDIN
DE230127 TAN XUAN ZE
JE250007 ADIL MUHAMAD DARMAWAN

Supervisor : Dr. SHIPUN ANUAR BIN HAMZAH

Abstract : Traffic congestion at road intersections can significantly delay ambulances and reduce the effectiveness of emergency response services. Conventional traffic light systems typically operate on fixed timing sequences and cannot automatically detect or prioritize approaching emergency vehicles. To address this issue, this project proposes an AI-based adaptive traffic-light system for Emergency Vehicle Prioritization at a three-way intersection. The proposed system utilizes a hybrid detection approach that combines sound sensors and AI-based computer vision. When an ambulance siren is detected, ESP32-CAM modules are activated to capture live video, which is then processed on a laptop using the YOLO object detection algorithm to identify the ambulance and determine its direction. Upon successful detection, the ESP32 controller overrides the normal traffic signal sequence and provides priority access by adjusting the traffic lights accordingly. A Blynk-based IoT platform is also incorporated to enable remote monitoring and manual override functionality. The project aims to improve ambulance movement efficiency, reduce emergency response delays, and demonstrate the application of artificial intelligence and IoT technologies in smart traffic management. The expected outcome is a functional prototype that provides safe, efficient, and intelligent traffic signal prioritization for emergency vehicles in a Smart City environment.

(CG6) SMART THREE-WAY TRAFFIC LIGHT CONTROL SYSTEMS USING ESP32 AND IR SENSORS WITH IOT MONITORING

Team : DE230015 MCLESTER DILANG ANAK SENIP
CE230067 MUHAMMAD ZACKRY HAKIMIIE BIN MOHAMAD AZWAR
CE230011 MUHAMMAD ALAUDDIN BIN RAHIMAN
DE230092 MUHAMMAD ALIFF HAIKAL BIN MOHD AZARUDIN

Supervisor : Dr. SURIANA BINTI SALIMIN

Abstract : Traditional traffic light systems operate on fixed time intervals, often causing unnecessary delays, increased fuel consumption, and traffic congestion at intersections during off-peak hours or when lane flows are unbalanced. This project presents the design and implementation of an IoT-based smart traffic light management system powered by an ESP32 microcontroller, designed to dynamically optimize traffic flow at a three-lane intersection. Real-time traffic density is monitored using a dual Infrared (IR) sensor array (front and back) deployed in each lane. The system implements an adaptive control algorithm with two primary operational modes: an interruptible fallback sequence that rotates 5-second green signals when the intersection is empty, and a dynamic priority escalation mode that instantly allocates targeted green phases (ranging from 8 to 15 seconds) to lanes experiencing higher congestion. To prevent gridlock, the firmware incorporates smart lane-skipping for empty roads and an early-exit timer that shortens green intervals if a lane remains empty for more than 2 seconds. Furthermore, the system leverages the Blynk IoT cloud platform via Wi-Fi to continuously stream intersection statuses, sensor logs, and lane decisions directly to a remote dashboard terminal. Experimental prototyping validates that the system significantly improves vehicular throughput, eliminates idle wait times, and provides robust remote monitoring capabilities suitable for smart city applications.

(CG7) OFF- GRID WIRELESS INTERNET BRIDGE FOR UNDERSERVED RURAL COMMUNITIES

Team : CE230142 JIVAASHINIE A/P BALASUNDRAM
DE230090 AZZA EZZATI BINTI ADI EZANI
DE230028 MUHAMMAD IRFAN BIN JOFARIS
DE230113 UMAYR HAZIQ BIN MOHAMED FADRI

Supervisor : PROF. DR. MUHAMMAD RAMLEE BIN KAMARUDIN

Abstract : Geographic constraints and the cost of providing traditional wiring infrastructure make internet access for rural and remote communities of interest a challenge. We suggest a Wireless Bridging System (WBS) as a cost-effective way to provide Internet access from any existing network facilities to communities not covered by them. The system leverages IEEE-standard wireless communication to establish point-to-point connections with MikroTik and TP-Link wireless bridging devices. The TP-Link routers have been included within the system to provide Internet connectivity to the end users. The project includes the setup and deployment of wireless bridging systems to deliver high-

speed, reliable internet connectivity to hard-to-reach areas. A functionality test was conducted to verify communication between the transmitter and receiver units and to assess the effectiveness of internet distribution via the TP-Link routers. The proposed system has several benefits over conventional wired network infrastructure: reduced installation costs, easy deployment, and scalability. The implementation suggests that Wireless Bridging is a practical solution for enhancing Internet connectivity in rural areas. The system can help bridge the digital divide and support education, healthcare, and economic activities in underserved communities by offering affordable, reliable connectivity.

THEME – ENERGY EFFICIENCY

(EG1) SMART CLASSROOM AIR QUALITY MONITORING SYSTEM

Team : BE220024 ABDISHAKUR BASHE JIBRIL
DE230122 FATIN SYAZANA FARISHA BINTI MD RAFIN
CE230062 MUHAMMAD KHAIRUL AZMI BIN MAT WI
DE230089 MOHAMMAD HAKIMI AZLAN BIN HAIRUSYAM
DE230052 MUHAMMAD SYAKIR BIN MOHD FAIZA

Supervisor : Ts. Dr. SYED ZAHURUL ISLAM

Abstract : Academic performance, comfort, and health are significantly affected by indoor air quality (IAQ) in educational settings such as Universiti Tun Hussein Onn Malaysia (UTHM). Overcrowding in classrooms and inadequate ventilation frequently result in the buildup of dangerous gases, high humidity, and higher carbon dioxide levels, which impair students' ability to focus and cause headaches and weariness. Real-time feedback and simultaneous multi-parameter detection are usually absent from conventional environmental management techniques. This project creates an energy-efficient, solar-powered Smart Classroom Air Quality Monitoring System (AQMS) powered by an ESP32 microcontroller in order to overcome these constraints. A variety of specialist sensors are integrated into the hardware architecture, including the MQ-135 for general air pollution, the MQ-2 for smoke and leakage risks, the MQ-7 for carbon monoxide detection, and the DHT22 for recording ambient temperature and humidity. Using a 20x4 LCD panel and a tri-color LED traffic light alert network, real-time data processing divides air safety into three simple stages: Normal, Caution, and Risky. These tiers are communicated to occupants instantly. With a predicted retail value of RM 695.40 and a total production cost of RM 347.70, the system, powered by a sustainable solar management network, maintains a competitive 28.09% profit margin. In the end, this scalable solution creates a safer, healthier learning environment at UTHM and has great promise for larger smart-campus and industrial IoT applications.

(EG2) REAL TIME MONITORING AND ENERGY OPTIMISATION IN RESIDENTIAL SPACES

Team : DE230060 MUHAMMAD HAMIZAN BIN AFANDI
DE230120 MUHAMMAD FAIZ HAFIZUDDIN BIN SAMSUDDIN
CE220127 SAFI' SYAMIMI ZAHRA BINTI ZAHAR
CE230115 MUHAMAD DANISH ERFAN BIN ZAINUDIN)
JE250006 MOCHAMAD RIZQI NUR'AZMI

Supervisor : Ts. Dr. Mahyuzie Bin Jenal

Abstract : The increasing use of electrical appliances and smart devices in residential environments has led to higher energy consumption and greater energy wastage due to the lack of real-time monitoring and control. This project proposes the development of a Real-Time Monitoring and Energy Optimization System for Residential Spaces using the Internet of Things (IoT). The system uses an ESP32 microcontroller and a PZEM-004T energy monitoring module to measure electrical parameters, including voltage, current, and power consumption, for household appliances. The collected data is transmitted via Wi-Fi to the Blynk IoT platform, allowing users to monitor energy usage remotely through a smartphone dashboard. In addition, the system incorporates energy management features that enable users to control appliances and reduce unnecessary power consumption. The proposed solution aims to increase energy awareness, minimize electricity wastage, lower utility costs, and promote sustainable energy practices. By employing low-cost, open-source hardware, the project offers an affordable, accessible alternative to expensive commercial energy management systems while supporting smart home and energy-efficiency initiatives.

(EG3) IOT-BASED SMART STREET LIGHT SYSTEM WITH FAULT DETECTION

Team : DE230073 MOHAMAD ISYRAF HAZIQ BIN ISNIN
DE230071 MUHAMMAD AKHYAR BIN MOKHTARUDDIN SHUBLEE
CE230063 NAJMI FARHA BINTI JAMIL
DE230016 MOHAMAD HAZIM FIKRI BIN MOHAMAD KHALID

Supervisor : PROF. MADYA Dr. DANIAL BIN MD NOR

Abstract : Traditional street light systems are less efficient due to high energy consumption, increased carbon dioxide (CO2) emissions, and the absence of detection and monitoring features. This project presents an IoT-based smart street light system with Fault Detection, designed to improve energy efficiency and enhance the safety of Universiti Tun Hussein Onn Malaysia (UTHM) community at night. The system uses an ESP32 microcontroller with a Light Dependent Resistor (LDR) sensor for automatic night detection and Infrared (IR) sensors to save power by dimming the lights when the pathways are empty. Then, they will switch to full brightness when motion is detected. To eliminate manual maintenance checks, a digital current sensor, the INA219, has been chosen for real-time electrical data monitoring and broken light detection. All collected data are streamed directly to the Favoriot platform for live viewing on a centralized web dashboard. In addition, the system uses a Telegram Bot for

instant fault notifications and an Elegant OTA that enables wireless firmware updates. Overall, this prototype reduces electricity consumption on campus, minimizes maintenance downtime, and supports UTHM's sustainable initiatives.

(EG4) PORTABLE EMERGENCY POWERBANK CHARGING SYSTEM USING BICYCLE DYNAMO

Team : CE230022 MUHAMAD RIDHWAN BIN MUHAMAD RAHIM
DE230104 MUHAMMAD ZULIZZUAN BIN ZULKHAIRI
DE23010 MUHAMMAD FITRI HAKIMI BIN MOHD ZAHARIZAN
CE230133 NURYASMIN BINTI YAHAYA

Supervisor : PROF. MADYA Ir. Dr. SITI ZARINA BINTI MOHD MUJI

Abstract : The availability of electricity, especially during energy crises and emergency situations such as floods, natural disasters, and power outages, when electrical grids may become inaccessible, is crucial. Therefore, there is a need for alternative energy during such events. This project presents the design and development of a portable emergency power bank charging system powered by a bicycle dynamo, with a monitoring system. This project uses human pedaling effort to generate kinetic energy, which is then converted to alternating current (AC) by a dynamo using the electromagnetic induction principle. A bridge rectifier converts AC to direct current (DC), as AC cannot be used directly to charge power banks for emergency electrical energy storage. A 4700 μF capacitor is used for smoothing and acts as temporary energy storage to reduce ripple voltage and stabilize the DC output. A boost converter is used to step up the low voltage to regulate a constant 5V output to charge the power bank. A real-time monitoring system is also implemented using two INA219 sensors interfaced with an ESP32 to evaluate the system's efficiency. The collected data, such as voltage, current, power, and efficiency, is then processed by the ESP32 microcontroller and can be monitored via the Blynk application, transmitted over Wi-Fi.

(EG5) RECYTECH CRUSHER

Team : AE210010 MOHD HASSANUDDIN BIN MOKTAR
DE230112 MUHAMMAD AQEIL EIMAN BIN SHARIFUDIN
CE230034 MUHAMMAD FAIZ BIN MOHD SHUKUR
CE230153 MOHAMAD WAN KU IZWAN BIN ISHAK

Supervisor : Dr. MOHAMED NAJIB BIN RIBUAN

Abstract : This project presents the development of an automated can crushing and weighing system integrated with IoT technology to improve recycling efficiency and security. The system is designed to address issues with conventional recycling methods, such as manual handling, time-consuming processes, and the risk of aluminum cans being lost or stolen before measurement. A high-torque motor with a crankshaft mechanism crushes aluminum cans, reducing their volume for more efficient storage and handling. After crushing, the cans are automatically transferred to a load cell system for accurate weight measurement.

An ESP32 microcontroller serves as the main control unit, processing sensor data and managing system operations. In addition, the system integrates with the Blynk IoT platform, enabling real-time monitoring of weight and the automatic calculation of the estimated monetary value based on predefined scrap rates. Users can view weight and price information directly in the mobile application interface. Overall, the proposed system provides a compact, low-cost, and automated solution that enhances recycling efficiency, improves data transparency, and minimizes manual intervention in waste management processes.

(EG6) HYDROGEN-BASED FUEL SAVING SYSTEM USING ELECTROLYSIS WITH IOT INTEGRATION

Team : DE230086 TAN YA LING
DE230040 NAZRIN AMIRUL NAIM BIN NAZRUL AZHAR
AE200010 AFIF JAZIMIN BIN MOHAMAD HUSSIN
CE230066 ABDUL KARIM BIN KHAIRIZAM

Supervisor : PROF. MADYA Ir. Dr. NOR AKMAL BINTI MOHD JAMAIL

Abstract : Increasing fuel consumption and environmental concerns have encouraged the development of alternative technologies to improve engine efficiency and reduce dependence on conventional fuels. This project presents the development of a hydrogen-based fuel-saving system using electrolysis with IoT integration. The system generates hydrogen gas by electrolyzing distilled water mixed with sulfuric acid (H_2SO_4) using stainless-steel electrodes. The generated hydrogen gas is then supplied to the intake manifold of a 7.5 HP gasoline engine to assist combustion. The system is controlled by an ESP32 microcontroller, which manages electrolysis and enables real-time monitoring via the Blynk mobile application over WiFi. A voltage sensor and ACS712 current sensor are integrated into the system to monitor electrical parameters during operation. Users can remotely switch the system ON or OFF and monitor system performance through a smartphone application (Blynk). This study covers the design and construction of the hydrogen-assisted combustion system and measures its impact on combustion efficiency and fuel consumption. By embedding IoT monitoring and electrolysis technology alongside control systems, the system is the first example of a hydrogen-assisted combustion system that can be implemented in practice.

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