CAPSTONE PROJECT TITLE LIST

NO.	SUPERVISOR	TITLE	SYNOPSIS	CODE
1	PROF. DR. SAAD MEKHILEF	Design of an automatic sun tracker	Efficiency of solar cells depends on many factors such as temperature, insolation, spectral characteristics of sunlight, dirt, shadow and so on. Changes in insolation on panels due to fast climatic changes such as cloudy weather and increasing the ambient temperature can reduce the photovoltaic array output power. In other words, each PV cell produces energy pertaining to its operational and environmental conditions. One solution to improve the Photovoltaic system performance is the use of maximum power point tracker (MPPT) The MPPT main function is to track the best position of the solar panels, the system consists of three parts, mechanical structure, motor drive circuit, and the control system to detect the sun position.	SM
2	PROF. IR. DR. KAHARUDDIN DIMYATI	Laser Plastic Cutter	Introduction With the technological advancement of plastic technologies, the material has been widely used in almost everything, from small utensils up to big vehicle and building parts. In addition, the increasing popularity of digital art that use plastic as base material have contributed to massive industrial plastic production. Nowadays, plastic cutting and engraving have become an essential process to produce nameplate, decoration, windows and utensils. Motivation To cut a piece of plastic is really easy by using scissors or knives. However, this method is less precise, time consuming and tend to generate hand stiffness especially when involved with high volume of plastic sheets. In order to overcome the problem, industrial cutting machine may be employed to increase cutting precision and speed up the cutting process. However, the commercially available cutting machine is very expensive, bulky and require complicated maintenance procedure. Therefore, a simple and compact machine should be constructed so that it is portable and can be used easily. With the availability of compact and high power laser diode, such machine could be realized. Design The system design consists of 3 main elements which are circuit design, programming and electro-mechanical. The laser diodes are powered by a power supply circuit that employ low voltage high current power source. The circuit should be able to control the input currents while monitoring diodes temperature which when the temperature is high, the circuit will automatically lower the current. The cutting mechanism is supported by a moving platform which controlled by stepper motors. Therefore, a motor controller circuit is required to precisely control the movement of the motor. Both circuit will be designed and produced by a circuit designer and the circuits program will be done by a programmer. A mechanical student can also be involved in this project to design the mechanical parts and laser assembly construction. Conclusion The proposed system should be able to aid small scale plastic cutting process that may benefit small industry sector.	KD
3	PROF. DR. HAMZAH BIN AROF	Tomography of a standing tree (suggested by MPOB)	Wood is a biological growth medium, and given that standing trees adapt themselves in their growth to environmental conditions, their material properties vary with age. These changes result in variations that are far more complex than anisotropy. Wood quality and intraspecific variability can thus be studied to gain an understanding of the development mechanisms of trees, and this can be useful for clonal selection and the management of tree communities. A number of techniques are available to determine wood properties in standing trees, but the signal-processing approaches currently used are not always robust and do not always provide the image resolution needed in the particular cases of acoustic or ultrasonic tomography. High-resolution imaging is possible if high-frequency sensors are used together with a signal-processing and inversion algorithm that is well suited to a low signal-to-noise ratio and the effect of wood anisotropy. The effect of various parameters such as frequency, signal-to-noise ratio, number of sensors and inversion algorithm need to be carefully investigated.	HA

4	PROF. DR. MAHMOUD MOGHAVVEMI	Creating a Sensor system for human neck model	In this project we are trying to develop a system with sensors inside a human neck model to indicate when it is under pressure or function normally. This project can assist the surgeon in carrying out proper operation on the neck or spine. Objectives: • Sense the pressure inside the neck • Shows the user which part of neck is under pressure • Differentiate between normal pressure , extra pressure, and abnormal pressure 	MM
5	PROF. DR. SULAIMAN WADI HARUN	Development of 2 micron ASE source		SWH
6	PROF. IR. DR. HAZLIE BIN MOKHLIS	HOME SMART METER	The conventional power meter at home is mainly to measure the power consumption of consumer for billing purposes. Daily usage pattern and the load type that in operation is not able to be identifying by this power meter. The propose smart power meter in this project intended not only measure power consumption but will also (1) Measure and analyze the usage pattern (2) Identify operating load so that consumer aware what should be switch off (3) The measured data will be transferred to smart phone for real time monitoring.	HM
7	ASSC. PROF. DR. NORHAYATI BINTI SOIN	An advanced digital temperature sensor implemented on Field Programmable Gate Array	Ring oscillator is widely used as digital temperature sensor. However due to temperature variation, the propagation delay performance might change when the temperature is unstable. Furthermore this degradation cause the FPGA lifetimes reduce faster than expected. Students must be able to design this sensor using several stages of ring oscillators. The sensor must be verified with System Monitor provided by Xilinx. The correlation between temperature and delay can be plotted when temperature changes.	NS
8	ASSC. PROF. IR. DR. CHOW CHEE ONN	Collaborative Internet-of-Thing (CIoT) for Environment Monitoring	Internet-of-Thing or IoT is defined as the "Infrastructure of the information society" and experts estimate that the IoT will consist of almost 50 billion objects by 2020. IoT is also expected to generate large amounts of data from diverse sources (big data). Undoubtedly, CIoT plays an important role in various applications in the very near future. In this project, the students are required to focus on the use of CIoT for environment monitoring. Among the scopes of this project are: - Identify a current issue on environment monitoring - Propose a solution to the identified problem using CIoT. - Develop the applications.	CCO
9	ASSC. PROF. DR. JEEVAN A/L KANESAN	Courier App Development	Students need to develop a simple app for the logistic optimization, the key objective is to be able to optimize the route and manpower distribution so the overall cost of delivery can be minimized. The setup is as follow 1. Courier/delivery boy location are not fixed at starting point. Similar to Uber setup, the same courier can be at Imbi,KL when he start work today while yesterday he can be at Petaling Jaya when he start work, as start work mean they start login to the app and bid/accept delivery job. 2. Each courier will have different vehicle for delivery, so capacity constraint play a role here 3. Delivery windows, shop closing time or recipient availability time is differs from each other 4. The algorithm will assume all optimization is done one night before the actual delivery. It doesn't need to take into consideration traffic, changes by customer/shop availability, courier not available on the day and additional demand for the same route.	JK
10	ASSC. PROF. DR. NARENDRA KUMAR A/L ARIDAS	REAL TIME LONG RANGE MONITORING DATA ACQUISITION INTERNET OF THINGS	This project addressed on real time smart data monitoring long range IoT technology (sub-technology of IoT) and the students will be working on develop architecture and data processing of simple applications (e.g. weather and air/ water pollution).	NK
11	ASSC. PROF. IR. DR. HARIKRISHNAN A/L RAMIAH	Piezoelectric Energy Harvester	Despite the embryonic market for piezoelectric energy harvesters, there is prolific development of the technology. The development focus is on creating stable, long life, lower cost and smaller piezoelectric energy harvesters. Piezoelectric energy harvesting is still carving its niche with several different types of applications expressing increased interest in the products available. The harvester potentially integrates with IoT wearable solution in pro-longing the life time of the battery driven device.	HR
12	ASSC. PROF. IR. DR. SUHANA BINTI MOHD SAID	Thermoelectrochemical energy harvesting module	A cell containing an electrolyte is able to generate electricity when placed in a temperature gradient. The scope of this project is to produce an energy harvesting module based on the Thermoelectrochemical concept. The scope of work shall include the fabrication of the cell prototype , thermal management of the cell and also circuit modeling of the cell and its external load. The power output expected is approximately 0.5-1 watt per cell.	SMS

13	ASSC. PROF. IR. DR. HAZLEE AZIL BIN ILLIAS	Low-cost small-scale soil resistivity measuring equipment	Electrical resistivity measurement of soil in large area is important for electrical substation design to determine the suitability of its earthing. However, electrical resistivity measurement of soil in small area is also important, especially for home-grown food and agriculture. This is due to the soil resistivity, which is related to corrosion rate level of soil, can influence the growth of a product. Although there have been many soil resistivity testers available in the market nowadays, a resistivity tester suitable for small area of soil is less likely to be found. This is due to the existing testers are only suitable for large measurement area, where they are less accurate when small area is tested. Also, the existing equipment in the market is expensive. Therefore, in this project, a low-cost soil electrical resistivity meter for small area of soil will be developed. The product will be interfaced with a PC to allow quick analysis of the results and enhance the data storage. For preliminary test, the product will be used to measure soil resistivity of different soil types and conditions using Wenner and Schaumberger methods for small soil area. The measurement results of the developed product will be compared with commercially available product to validate its results. Further development of the product may include interface of the product with smart phones.	HAI
14	ASSC. PROF. IR. DR. MAHIDZAL DAHARI	Duct Inspection using UAV robot	Duct cleaning generally refers to the cleaning of various heating and cooling system components of forced air systems, including the supply and return air ducts and registers, grilles and diffusers, heat exchangers heating and cooling coils, condensate drain pans (drip pans), fan motor and fan housing, and the air handling unit housing. If not properly installed, maintained and operated, these components may become contaminated with particles of dust, pollen or other debris. If moisture is present, the potential for microbiological growth (e.g., mold) is increased and spores from such growth may be released into the home's living space. Some of these contaminants may cause allergic reactions or other symptoms in people if they are exposed to them. Methods of duct cleaning vary, although standards have been established by industry associations concerned with air duct cleaning. Typically, a service provider will use specialized tools to dislodge dirt and other debris in ducts, and then vacuum them out with a highpowered vacuum cleaner. As an alternative to this traditional method, an unmanned aerial vehicle is proposed to do inspection inside the duct, whilst able to capture the video image and send its location via any possible network.	MD
15	IR. DR. CHUAH JOON HUANG	Controllable Thrust Ion Thruster	Ion thruster has been around for a long time, in fact the first public proposal of such a propulsion method was proposed by Konstantin Tsiolkovsky in the year 1911. The fundamental difference between an ionic thruster and conventional rocket booster engine is the propellant and fuel used. While conventional chemical rockets use chemical fuel, which is then combusted to produce expanding gases as the main propellant, ionic thruster as one of the electromagnetic propulsion method, expels ionised atom through electromagnetic expulsion, pushing the ions away from the engine and therefore generating thrust. It has to be stressed that the ion thrusters are not for achieving escape velocity, instead it serves more like a means of long distance, long period of acceleration method of propulsion. This is where it differs from the most from a conventional chemical fuel engines.	CJH
16	DR. ANIS SALWA BINTI MOHD KHAIRUDDIN	Car plate recognition for parking system	The aim of this project is to build full automation prototype system for cars parking area control and charge payment depending on the car plate. This will be including building vision system that can localize and recognize the car and convey this information to the database.	ASMK
17	DR. CHOW LI SZE	Driver Safety Detector	Video processing is used to detect the condition of the driver. For example, if the driver is dozing off, an alarm will be triggered to wake up the driver. This can be done by using pattern recognition on the decreasing size of the eyes. If the driver starts using phone, either talking over the phone or watching the phone, another gentle alarm will be triggered to warn the driver. Other safety features can be added as proposed by students.	CLS
18	DR. EFFARIZA BINTI HANAFI	Smart Parking System	Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. And generally people are facing problems on parking vehicles in parking slots in a city. In this study, a Smart Parking System which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere. The smart parking system will be based on ARTIK cloud. By using the system, users could easily locate a free parking slots using mobile or web app from anywhere.	EH

19	DR. MARIZAN BINTI MUBIN	Smart Home Automation System (SHAS)	Smart Home Automation System using Android app, which can be used for home security and to control electrical appliances. Home security: using normally-closed reed switches connected to doors and windows and additional passive infrared (PIR) motion sensors to detect movement of a burglar or an unwanted intruder. The security system can dial phone numbers to alert the owner. Control electrical appliances: using Android app to switch ON/OFF electrical appliances with clicks or voice commands. Commands are sent via Bluetooth to Arduino Uno.	MBM
20	DR. MOHAMADARIFF OTHMAN	Smart Air Quality Monitoring System	Considering the importance of indoor air quality monitoring to ensure healthy and vibrant lifestyle, different sensor measuring system architectures and associated monitoring systems will be designed. Not only the system capable of monitoring CO_2, but it can also measure the temperature, volatile organic compounds (cosmetics, air fresheners) and humidity levels. This is all made possible by the Arduino circuit and premium sensors embedded into the unit. This monitoring system is integrated with Arduino system which gives possibilities to communicate with the existing wireless router and other third-party devices. This technology gives users remote control capabilities, utilizing their iOS and Android devices. Once downloading the associated monitoring app to the mobile device, complete the initial setup, and pair with the existing Internet router, smart air quality monitoring system can be materialized.	MAO
21	DR. MOHAMAD SOFIAN ABU TALIP	A PWM Digital Design and FPGA Based Control System to Control DC Motor using Verilog	This project try to control DC motor using pulse width modulation (PWM) technique. We will try to implement in FPGA platform using Verilog hardware description language (HDL)	MSAT
22	DR. MOHD FAIZ MOHD SALLEH	Development of In-lab radiation sensor for thermoelectric module application	Thermoelectric devices have been attracting much attention due to their wide applications not only as a power generator but also as a sensor. Moreover, these devices are small in size and no mechanical parts needed which resulted in less damage, long durability and lightweight. Currently, health concerns about man-made and natural electromagnetic radiation have been raised in some countries, such as possible human carcinogen due to radiation generated by Wi-Fi routers and possible fatal illness due to El Nio impact on global climate. Thus, a radiation sensor is needed in order to alert or to provide the information on level of exposure for human to avoid acute health effects. Therefore, in this study, it is expected to develop an electromagnetic radiation sensor by utilising the thermoelectric device which has fascinating benefits.	MFMS
23	DR. NORAISYAH BINTI MOHAMED SHAH	Classroom attendance taker	This is a continuation of previous work. The student are required to upgrade the system so that it the sensor is not required to be connected to a computer/laptop in order to operate in collecting attendence. For example, an all in system that has its own microcomputer that can collect and process the data. Student must come up with a complete working system on how this product can be used in UM to collect and manage attendence info.	NMS
24	DR. NORRIMA BINTI MOKHTAR	Intelligent Rain Energy Harvester System	The main objective of this project is to make use of kinetic energy using raindrops for electricity production. This device harvests a green energy from water droplets (rain drop) with a piezoelectric sensor. The piezoelectric will converts mechanical energy into electrical energy that can be supplied to a load directly. However, students are required to use their own creativity to make system become portable and reliable for remote application.	NM
25	DR. SHARIFAH FATMADIANA BT WAN MUHAMMAD HATTA	Fingerprint authenticated voting system	A major factor that needs to be considered in a voting process is the authentication of the voter. A voting system needs to check the authenticity of the voter and to allow only legitimate voters to vote. The system needs also to avoid double vote casting by an individual. The process in checking these conditions can be an exhausting task. This project thus proposes a fingerprint based voting system in which a fingerprint module interfaced with a microcontroller is used. The fingerprint module is used to sense fingerprints and provide to the microcontroller for further processing. The system has list of eligible voters in it (input prior to the voting), the voting system then tallies the recognized fingerprint against the ones stored in database. If match is found that person is allowed to vote. Once a vote is casted by that person his ID is rolled out for that voting process. This avoids double vote casting. Thus this system provides for a fully automated voting system with finger print based authentication	SFH
26	DR. TARIK BIN ABDUL LATEF	RFID tag for Grocery Items	This project aim to develop a system for item detection whenever customer placed grocery items in the trolly during shopping (instead of queuing at the checkout counter to check and pay the items). The system will instantly detect and list down all the items together with the prices, so that the customer know how much money need to be paid beforehand. This system will be integrated with current bar code systems that have been used widely in shopping mall.	TAL

27	DR. TENGKU FAIZ TENGKU MOHMED NOOR IZAM	Hydroponics Control and Data Acquisition Station (HCDAS)	Hydroponics is a type of farming method where soil is not needed to grow the plant, but instead, it uses mineral nutrients in water as the medium. Managing and maintaining a hydroponics farm can be a labor intensive task. In order to obtain high yield, adequate water, nutrient and light, as well as the optimum pH of the medium need to be ensured. A Hydroponics Control and Data Acquisition Station (HCDAS) will be able to automate all these tasks to minimize human interaction. The supply of different nutrients and water can be automated controlled by using dispensing system. PH sensor will be able to determine the resulting pH of the solution while automated roof or shade system will be able to control the amount the light. When there is any issue in the system, HCDAS will immediately alert the user. Apart from performing those tasks automatically, the HCDAS will also capture various parameters such as pH of the medium, temperature, light, atmospheric pressure and amount of rain. These data will be transferred through WIFI or mobile internet to a database server for future analysis. Once adequate set of data has been acquired, correlation analysis between those parameters with the plant yield can be performed. In the next season, improvement to the hydroponics farm can be implemented in order to achieve even better yield. This system will also be able to collect rain to reduce water consumption. The HCDAS will be powered by rechargeable battery which is charged by solar panel. Among the skills needed to complete this project are basic of hydroponics, circuit theory, microcontroller programming, website authoring, database access, and android application development.	TF
28	DR. WAN AMIRUL WAN MOHD MAIYIDDIN	Designing the next generation wireless communication technology	The objective of this project is to design the next generation wireless technology through the use of computer simulation (Matlab). Multiple antenna systems, commonly known as MIMO systems, have been shown to increase wireless transmission data rate. The basic idea of MIMO is to use more than one antenna at the transmitter and receiver in a wireless transmission system. Massive MIMO has been gaining attention recently due to its potential to become a key technology in next generation wireless standards or 5G. The basic concept of massive MIMO is to use very large number of antennas to focus the transmission energy into much smaller target areas which results in higher throughput and reduces interference in other area. Other than massive MIMO systems, millimeter wave (mmWave) has also been proposed as a key component of next generation wireless technology. The idea is to use a very high carrier frequency for wireless transmission in the range of tens to hundreds of Gigahertz. The mmWave and massive MIMO systems do not have to be two competing wireless technologies. Hence, through the aid of analytical works and software simulation, the project aims to design an optimal wireless system that combines both of the mentioned technologies.	WA
29	DR. WONG WEI RU	Audio transmission using light fidelity (Li-Fi) technology	Light fidelity (Li-Fi) operates in the visible light spectrum of the electromagnetic spectrum i.e. it uses visible light as a medium of transmission rather than the traditional radio waves. Due to its faster switching speed Li-Fi can be used for transferring data at better data rates compared to Wi-Fi. In this project, a prototype of real-time audio system using inexpensive commercially available LED will be constructed to transmit audio signal from one device to another. The emitted light will be detected by an optical receiver. In other words, the prototype should consist of two major parts, the transmitter and the receiver. The performance of this prototype should be investigated after it is successfully built.	WWR