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ASIA PACIFIC UNIVERSITY
OF TECHNOLOGY & INNOVATION
SCHOOL OF ENGINEERING

ENGINEERS INSIGHT

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'Engineers Insight' is a quarterly issue by the School of Engineering for the reading pleasure of the staff and students allowing for knowledge sharing and capturing of events for the benefit of engineering education

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The Evolution of Engineering For Sports

Organizations invest millions on sports research and to support this operational function, they hire engineers specializing in aerodynamics, instrumentation, computer aided designs and materials among others in aims of obtaining a product edge. Engineers who support the sporting world of today play a vital role in the development of sporting equipment design. From golf clubs to tennis racquets to swimsuits, engineers design with the objective of creating lighter, faster and stronger equipment. Gears of high technology and superior design assist athletes in higher safety and performance ability.

The key scientific element for sports equipment is energy transfer. In soccer or football the shin pads must absorb high-energy collisions. Organizations such as Nike and Adidas are constantly embarking in this field. The best golf clubs are the ones that can transfer as much energy to the golf ball as possible in order to hit them harder for distance and with precision. Calloway and Mizuno have made this top priority design fields. The companies mentioned have their engineers understand and apply the principles of kinetic and potential energy to design high performance sporting equipment. Table below lists some of the top sports in which engineering latest technology revitalizes the sport in concern.

Sport	Technology for Safety	Technology for Performance
Football/Soccer	Shin Pads, Goalie Gloves	Boots/Cleats, Ball, Goalline Detection, Jerseys
Baseball/Cricket	Helmet, Gloves, Padding,	Cleats/Turf Shoes, ball, Bat, Attire
Hockey (Field/Ice)	Face Guard, Padding, Mouth Guard	Sticks, Turf shoes/skates, ball, puck
Golf	Grip glove	Clubs, shoes
Swimming	Goggles, head cap	Swim attire
Formula 1 – Race Car	Fuelling process, vehicle durability, radio communication, vehicle gauges	Vehicle – fuel vs km, tyre durability, driver comfort, steering,
Skateboarding	Helmet, pads	Skate wheel durability, skate weight

Football is universally loved. Adidas for the 2010 World Cup collaborated with the Loughborough University's Sports Technology Research Group (STI). The institute was formed in 2008 to bring together some of the UK's top engineers and the world's leading sporting brands, working on the design, simulation, testing and manufacture of cutting edge sports equipment.



Figure 1.1 – Football Test Lab at Loughborough University (Ref: www.lboro.ac.uk)

In 2004, STI was given the task of developing the football for the European Championships in Portugal. After developing, STI then started to build computer models of the ball. This meant that STI could examine the ball's performance in even greater detail, looking at how a whole host of other factors such as different materials, panel formation, and surface texture would impact on its behaviour. Ultimately, using these computer models STI were able to predict how the ball's performance would be altered by any number of changes without having to go to the trouble of physically making several different prototypes. Overall STI found that the thermally bonded ball was more consistent than its predecessors. With the stitched balls there were inconsistencies because elements of its construction were done by hand, meaning each ball made was slightly different. The automated mechanical construction of the thermally bonded balls has largely eradicated these differences.

Let's take a sport which is not as popular as you would think for instance the Tour de France cycling competition. For this sport the bicycle is the main element or tool. The race itself is in phases of days of competition encompassing hill climbing and straight road endurance tests. The bike must remain the same and the rider must be capable of enduring all different roads in the entire completion which is outdoors. The bike itself must remain as light as possible yet durable in facing the unpredictable road conditions either in the harsh, dusty, cold or extremely hot outdoor weather conditions. The bike weighs only an astounding 17 lbs.! The less the bike weighs, the easier it is for the rider to propel the bike forward, and the faster he can move. The bike is also very aerodynamic so that the drag (interference) from the wind is reduced. Furthermore, the bike is made of strong durable materials, such as carbon fibre. This allows for the bike to be very stiff and no power is lost through "flexing." A rider towards the finish line will not want the bike to bend and flex beneath and the focus of energy is on the pedals and wheels. The sketch below illustrates the typical potential and kinetic energy utilized in the competition process. The bike and rider requirements have to be engineered for the ultimate performance.

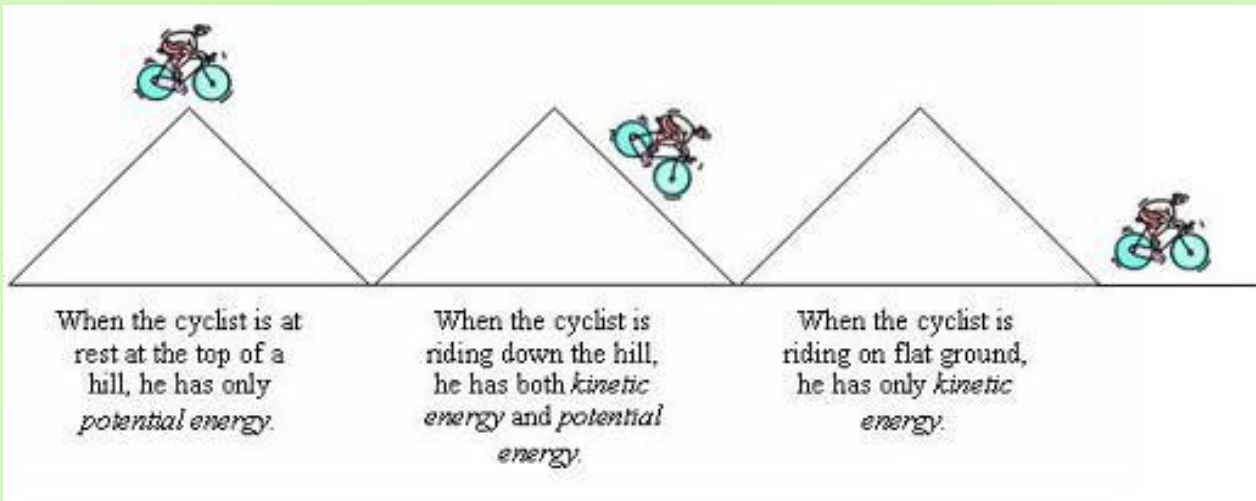


Figure 1.2 – Energy Used in Cycling



Figure 1.3 – Biomechanic Testing for a Cricket Fast Bowler
(Ref: www.quinticsoftware.com)

Engineering in sports is to create, develop or design for anything related which is lighter, faster and stronger. These are the three aims of engineering sports equipment. Lighter equipment allows the athletes to move with as little extra weight as possible. Mechanical friction is the enemy of almost any sport. Faster equipment enables the sportsman/woman to omit as much friction as possible. Different types of engineers focus on different aspects of athletics. Materials engineers may help to decide which material would best be used in a golf club or baseball bat. Biomedical engineers may work on analyzing the body's motion in sports to try to find ways of reducing injury. There are currently studies going on in Perth, Australia to model the action a fast bowler makes when bowling a cricket ball, with the goal of reducing shoulder injuries.

In winter sports, skiers and snowboarders put wax on the bottom of their skis and snowboards to create less friction between the snow and the skis or boards. This is very similar to surfing and the utilization of the surfboard. Stronger equipment allows athletes to rely on their equipment and be confident that it won't break even under a lot of force. Other studies are examining how to reduce knee injuries in hockey players and surfers. Engineers look at the forces placed on the joints in these sporting activities and

develop ideas to reduce these impacts. Engineers at d3o and Spyder have developed skiing armour for alpine downhill skiers. The armour allows for protection against high-speed wipe-outs and crashes against the 600mph gates. The armour is of soft, thin and flexible material that moves with the body and hardens upon impact. The key engineering development was the sheer thickening fluid which is used as the reactive material as shown below.



Figure 1.4 – Skiing Armor (Ref: www.liveiscarbon.com)

Another popular winter sport is indoor speed skating. Engineers at Nike have developed ‘Clap Skates’. The blade is attached only to the boot at the toe. The front of the blade is hinged and the heel can lift straight up as the skater is in forward motion. To enhance further, engineers have created the aerodynamic ‘swift suit’ which reduces air drag and Nike assure 1% faster times. These suits undergo wind tunnel testing similar to that of superstructure structural strength test against wind load.



Figure 1.5 – Clap Skates (Ref: www.marcheses.com & www.pbworks.com)

Swimming is a popular recreational sport. The endurance factor is vital in performance. In 2008, for the Beijing Olympics, engineers at Speedo developed the swimwear which compresses the body at the key drag points and allows for the swimmers to be smaller, sleeker and faster. Speedo has utilized computational fluid dynamics (CFD) to improve the performances of their wetsuits as part of the R&D efforts. Speedo used ANSYS Fluent CFD software to predict fluid flows around a swimmer’s body in the outstretched glide position, identifying areas where the slowing effects of drag were likely to occur. During the 2008 Beijing Summer Olympics, 47 gold medals — and 89% of all swimming medals were won by athletes wearing Speedo LZR RACER. The company’s in-house global research and development facility, Aqualab®, has expanded its use of ANSYS simulation software to include optimizing the caps and goggles worn by swimmers, thus creating a comprehensive suite of products that provide an enhanced competitive edge. The result of these years of research is the Fastskin3 Racing System®. (Ref: ‘Dressed for Success’ by Stephen Silvester).



Figure 1.6 – Swimwear Design by Speedo within IOC Regulations (Ref: www.sportstechreview.com)

Who said engineers were not sporty. Engineers are the reason behind what is defined as world class entertainment that is ‘Sports’. All engineering fundamental principles have been applied in creating faster or lighter sporting equipment and also improving performances of the athletes. The above are dream jobs of engineers that is to work for the sporting world hence as engineers we must continue to make this dream a reality in our contribution to the society.....well at least keeping people entertained for now.

By Assoc Prof Ir Dr Vinesh Thiruchelvam

Go Green

Sustainable Development Inspired by Nature

Nowadays, the term sustainability is widely used in many areas such as product design and development, manufacturing, renewable energy, construction, farming, fishery and many more. However many are still not exposed to the term “sustainability” and many among us still ask “What is sustainability?”, “How is the product sustainable?”, and “Why is sustainability important nowadays?”. To answer all these questions in the best possible way will be by introducing “Sustainable Development Inspired by Nature” or can be also called “Bio-mimicry”. What is “Bio-Mimicry”? It is an innovation method that seeks sustainable solutions by emulating nature (B. Janine, 1997, *Innovation Inspired by Nature*) as a model to develop products, processes, materials and many other things. Learning from nature is a good way to look at things as it produces less waste or nothing at times with comparison to the normal human method which is known as “Heat, Beat and Treat” which actually produces 90% of waste in terms of material, time and energy. The examples below will clearly explain how Bio-Mimicry or Nature plays a vital role in Sustainable Development.



Figure 1: Shinkansen Bullet Train Design Inspired by King Fisher
<http://biomimicry.net/about/biomimicry/>

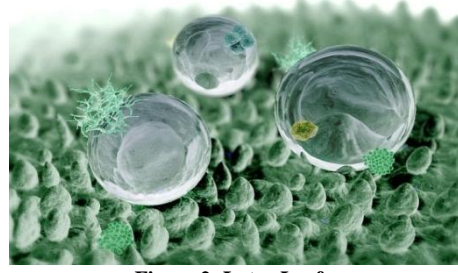


Figure 2: Lotus Leaf
William Thielicke, 2007

<http://earthsky.org/human-world/janine-benyus-biomimicry-is-innovation-inspired-by-nature>



Figure 3: Water droplet on the Lotus Leaf
<http://inhabitat.com/ask-nature-biomimicry-directory/>

Shinkansen Bullet Train is the fastest train in the world with a travelling speed of 200 miles per hour. There was a major problem with the bullet train which was caused by air pressure every time the train emerged from a tunnel. The air pressure caused a large “thunder” sound whenever the train exited the tunnel. To solve this problem engineers worked day and night on the design and finally one of the train’s chief engineer asked his team, “Is there something in Nature that travels quickly and smoothly between two very different mediums?” (biomimicryinstitute.org). The modelling of the bullet train front end was inspired by the kingfishers as shown in Figure 1, which dive from the air into bodies of water to catch fish without a single splash or a very little splash. This resulted not only in a quieter train but eventually reduced the electricity consumption by 15% while the train moved 10% faster.

There is another widely used bio-mimicry from the lotus leaf. As we know lotus grows in muddy areas but still its leaf remains clean and pristine. It has bumps on its surface as shown in Figure 2. When it rains, the water droplets ball and pearls the dirt away as shown in Figure 3. This has been mimicked in building facade paint called Lotusan (designboom.com). The dry paint has that bumpy structure which is similar to the lotus leaf and the rainwater cleans the building, instead of sandblasting or detergents as shown in Figure 4. The mimicry of the lotus leaf product eventually reduces labour cost in cleaning the wall of the buildings and also reduces the maintenance cost in terms of repainting of the walls.



Figure 4: Painted Surface of Wall using Lotusan Paint
<http://inhabitat.com/ask-nature-biomimicry-directory/>

Sea shells have an amazing process to stop scaling and many of the pipelines in the Western countries face serious problems related to scaling. Basically, scaling is a process where build-up of minerals inside pipes eventually causes blockages. Traditionally, many companies in water treatment plants use some type of bacteria that reduces the scaling process. However, that is more likely to be known as bio-processing and not a process inspired by nature or bio-mimicry. Therefore, some engineers asked themselves “how would nature stop scaling” and that when they realised that the sea shells on the beach are basically just a build-up of minerals, mineralisation, self-assembly. The fact that shells are not huge, it actually tells us that these organisms have a way of stopping scaling. The sea shells actually release a mineralisation/ crystallisation protein to build-up the shells and then release stop-proteins that stop the mineralisation/ crystallisation. The product that mimics this similar process is produced by a company called TPA (Trattamento Preventivo Anticalcare). These products eventually stop the scaling process by 90%. For further information on the sustainable development inspired by nature please visit the link below:

http://www.ted.com/talks/janine_benyus_shares_natures_designs.html

Ms. Vickneswari





Seminars & Workshops

Engineering in Medicine



Biomedical Engineering is a dynamic and expanding field of engineering that has the potential to make important advances in biomedical research and health care. The unique combination of basic biomedical sciences together with engineering and physical science can be used to generate many powerful techniques and tools to solve today's pressing medical problems.

The seminar on 'Engineering in Medicine' conducted by SoE lecturer Mr. Chitturi Venkatratnam on April 5, 2013 has given an insight of Functional Electrical Simulation (FES) to the participating group of 30 students and 3 staff. The seminar highlighted the injury or disease in the nervous system that can interrupt the normal communication between the central and peripheral nervous systems. The result of which may be muscle weakness or paralysis. FES applied near the muscle or nerve can substitute artificial electrical signals for the missing normal motor signals. The artificial impulses make the muscle contract. The device can assist a person who is unable to move parts of his or her body due to spinal cord injury (SCI) or paralysis.

Introduction to SolidWorks

Computer-Aided Design software increases the productivity of the designer by an improved quality of design, communications through documentation and by creating database for manufacturing. Computer-aided design is used and named differently in different field of engineering. In Electronics as Electronic Design Automation, or EDA, in mechanical, as computer-aided drafting (CAD) or computer-aided design and drafting (CADD), that describes the process of creating a technical drawing with the use of computer software. CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. SolidWorks offers a suite of tools for engineering design, documentation, simulation, and sustainable design in one easy-to-learn software package. A introductory seminar on SolidWorks was conducted by Six Sigma Synergy, Franchise of CADD Center, on April 12, 2013. 45 students and 7 academic staff attended the seminar.





Seminars & Workshops

DVB & DAB – The future of Broadcasting in Malaysia

The seminar on DVB & DAB – The future of Broadcasting in Malaysia by Ir. V. Jeewa, Deputy Director, IPPTAR, Malaysia on April 24, 2013 was an eye-opener for 60 student and 7 staff attendees on the recent trends of communication engineering. Ir Jeewa is an engineering pioneer in Radio Television Malaysia (RTM) having started his career with them in the late 1970s. The seminar opened with an introduction to Digital Broadcasting evolution from mid 1990's to the recent digital TV standards namely ATSC (USA), DVB (Europe), ISDB (Japan) and DTMB (China) and the digital radio standards namely DAB+ (Europe, Korea), ISDB (Japan), DRM (Europe), and HD Radio (USA). The seminars also introduced the Malaysia's current standards for satellite, terrestrial transmission, DVB-S and DVB-S2 DVB-T2 and RTM standards Digital Audio Broadcast Plus (DAB+) and Digital Radio Mondiale (DRM) for radio transmission.



Virtual Instrumentation with LabVIEW

LabVIEW is a development environment for problem solving, accelerated productivity, and continual innovation. A graphical programming platform that helps engineers scale from design to test and from small to large systems. It offers unprecedented integration with existing legacy software, IP, and hardware while capitalizing on the latest computing technologies. The workshop on April 27, 2013, presented by SoE Lecturer Mr.Chitturi Venkataratnam on Virtual Instrumentation with LabVIEW have provided a hands on experience on LabVIEW for 15 student and 1 academic staff.

Thermodynamics Performance and Heat Transfer Analysis of Parabolic Trough Collector in Solar Power Plants

A seminar on “Thermodynamics Performance and Heat Transfer Analysis of Parabolic Trough Collector in Solar Power Plants” was presented by Mr. Omid Afshar from University Malaya’s Power Energy Dedicated Advanced Centre (UMPEDAC), University of Malaya on May 5, 2013. The seminar as an interactive session of the presenter with 35 students and 9 staff participant, discussed on the performance of solar power plants as a promising renewable energy source.



Seminars & Workshops

Internal Combustion Engines and Nanotechnology

A twin seminar on Internal Combustion Engines and Nanotechnology was held on May 10, 2013. The Internal Combustion Engine session were conducted by SoE Lecturers Mr. Syed Mohd Bahrin and Mr. Low Yee San while the Nanotechnology session was covered by Mr. Lim Siong Chung. In the first session, Mr. Low shared the knowledge on the basic operations principles of the internal combustion engine. Optimization of the internal combustion engine as an extension of the first session was then covered by Mr. Syed Mohd. Bahrin in the second hour. In the final hour, a topic on the properties and applications of nanomaterial's was done by Mr. Lim Siong Chung. 20 SoE students and 4 staff participated in the talk.



Hands on Training and Workshop on Solid Works

In continuation to the seminar that was held by Six Sigma Synergy on Solid Works in the Month of April a Hands on Training and Workshop on Solid Works was conducted by Six Sigma Synergy Sdn. Bhd. on May 25, 2013. 35 SoE students and 1 academic staff participated in the workshop which focused on a wide area of designs that included SolidWorks graphical user interface, sketch constraints/ sketch relations, sketch entities, sketch tools, sketch dimensioning/smart dimensioning 3D sketching with pipe routing concept, creating extrude features, creating revolve features, creating swept features, creating loft features, applying chamfer, applying fillets, creating rib feature, creating shell and creating pattern.





Seminars & Workshops

Non Destructive Testing for Oil and Gas Industry

A seminar on Non Destructive Testing (NDT) for the Oil and Gas Industry was presented by Mr. Suhaimi and Mr. Vijayan of Oil Field and Technical Inspection Sdn. Bhd., Malaysia on June 14, 2013. The presentation aimed at introducing 9 months internship opportunities for students of SoE in the oil and gas industry. The seminar was well received by 45 students and 4 staff of SoE.



Analysis of Circuits Using Simulink

Analysis of Circuits is the heart of electrical engineering which means analyzing the voltage or current at every component of the circuit. There are various tools and techniques of analysis and signals and systems based approach is one commonly used technique. A hands on training and workshop on Analysis of Circuits Using Simulink- Signals and Systems Based Approach was conducted by SoE Lecturer Mr. Shankar Duraikannan on June 15, 2013. The workshop provided a step by step hands on training on development and simulation of analytical model of electrical circuits using Simulink. A comparative study of the analytical model with the exact module simulated using the tool box of Simulink was exciting to the participants. 35 SoE students participated in the workshop.





Industrial Visits

Bidor Research Station (FRIM)

On May 15 2013, 20 students of SoE visited Bidor Research Station at Perak, The research station which is an area of 121.4 hectares of ex-mining land of tin tailings was sanctioned by Perak State Government to FRIM on July 1996 for reforestation. The main objective of establishing the sub-station is to ensure that FRIM fulfils its mandate and mission of developing appropriate forestry systems for rehabilitation of degraded lands as stipulated in the FRIM's Strategic Plan (1991-2000). And today the Research Station has more than 40 species of flora and 25 species of fauna. The students were inspired and had an awareness created on waste management, rehabilitation and sustainable development.



OGA 2013: 14TH ASIAN OIL, GAS & PETROCHEMICAL ENGINEERING EXHIBITION

OGA 2013, the 14th Asian Oil, Gas and Petrochemical Engineering Exhibition was an showcase of the latest technology, equipment and machinery in the fields of oil, gas and petrochemical engineering. 20 students and 3 staff had a visit to the exhibition on June 3, 2013. The visit provided a great opportunity to meet up with world renowned companies in the oil & gas industry, under one roof. The students had an opportunity to interact with Industry experts and big names like Aker Solutions, Cameron, Delcom, Global Process Systems, IHC Merwede, Neu Dimension, Olio Resources, Sapura Crest, Scomi, Siemens, Sime Darby, Tanjung Offshore, Technip and UMW Oil & Gas . OGA 2013 was an excellent platform for students to acquire the knowledge of oil, gas and petrochemical industry.





Industrial Visits

Pasoh Research Station



On 20th and 21st June 2013, 20 students together with 5 staffs made a trip to Pasoh Research Station, Forest Research Institute of Malaysia (FRIM), located approximately 8km from Simpang Pertang, Negeri Sembilan. The journey to Pasoh took a tiring 2.5 hours but all students were excited when they reached the forest reserve which was an island surrounded by an Oil Palm Plantation. The group was welcomed by Research Station coordinator Dr Christine Fletcher and station manager Mr Ahmad Awang. After room and dorm assignments were done, Dr Christine presented "Research in Tropical Forests". It was an eye opener on the on-going projects undertaken at Pasoh and the fact that Pasoh is a research destination for many researchers worldwide. Many questions were posed by students as well as staffs regarding the forests and research activities. This continued during the nature walk lead by Pasoh staff in which different types and usage of plants were explained. During the night there was a fun session of "2 Truths and 1 Lie" organized by the lecturers, where students were also exposed to environmental and sustainability issues. The following day started with morning stretch led by SoE's Mr Rasdi before the more exciting canopy walk. The students enjoyed the panoramic view of the forest by walking on the 30 meters high walkway suspended between trees. The final activity of the trip was a video session on environmental issues to create awareness among the students. The SoE would like to thank the lecturers/instructor who sacrificed their time/weekend in spending fun time with the students. Kudos to Jacqueline Lukose , Sathish Kumar, Rasdi Razalie, Lioe De Xing and Dr Vinesh in making this student event come true and additional appreciation to Shankar Duraikanan for making the necessary arrangements with FRIM.



SoE Collaborations

MoU Signing with University Malaya

On the 9th of April 2013, the Memorandum of Understanding (MoU) was signed between University Malaya (UM) and Asia Pacific University on the research and development of Low Power Radio Frequency Integrated Circuit (RFIC) for Front-End Receiver for Cognitive Application. The MoU ceremony was attended by APU's Assoc Prof Ir Dr Vinesh Thiruchelvam, Dr Lai Nai Shyan, Tan Gim Heng and Dr Firas Ismail. UM was represented by Tan Sri Gauth Jasmon, Assoc Prof Dr Faisal Rafiq and Dr Harikrishnan Ramaiah. The research leaders for both universities are Tan Gim Heng (APU) and Dr Harikrishnan (UM). The research has moved forward in a positive manner with recent activities on 27th to 30th of May 2013 at CEDEC, Penang in which the measurement and testing of the RFIC (mixer & VCO measurements) have been concluded successfully.



MoU Signing with Erode Sengunthar Engineering College

On the 14th of April 2013, the Memorandum of Understanding was signed between SoE APU and Erode Engineering College (ESEC) from India. The MoU is based on 2 main areas of collaborations – Knowledge sharing for development of publications and research supervisor sharing. The coordinators for the collaboration are Arun Seeralan (APU) and L. Boopathi (ESEC). To date APU technical seminars/talks have been broadcasted to ESEC live for their 1500 students to view and participate.



SoE Competitions

Malaysia International Robot Competitions (MIROc)



April 12 – 14, 2013, APU SoE students took part in the Malaysia International Robot Competitions (MIROc) for the first time. This competition was held at University Malaysia Perlis, with participants from all universities in Malaysia. There were 3 categories of competition held which were the Fire-Fighting robot, Rope climbing robot and Paintball robot.

For this year we took part in the Fire Fighting Robot competition. This is a competition based on an imaginary fireman rescuing the victims and extinguishes the fires. The Fire Fighting Robot will move around the house (field) to rescue the victims represented by ping pong balls, as much as possible and extinguish the fire in three minutes.

The team consist of 5 SoE students Rajaram Govindarajal, Gangatheren Kolandaivelu, Ankush, Yugan Velusamy and team leader Yogeswaran Ganesan The team supervisor was SoE's Mr Suresh Gobee. The team was named 'APU Nexus' and we were the top in our group of 4 universities. We qualified for the quarter finals and were in the top 5 out of 16 universities who participated. The student had good exposure towards mobile robot technology and this was helpful for their next attempt in 2014.



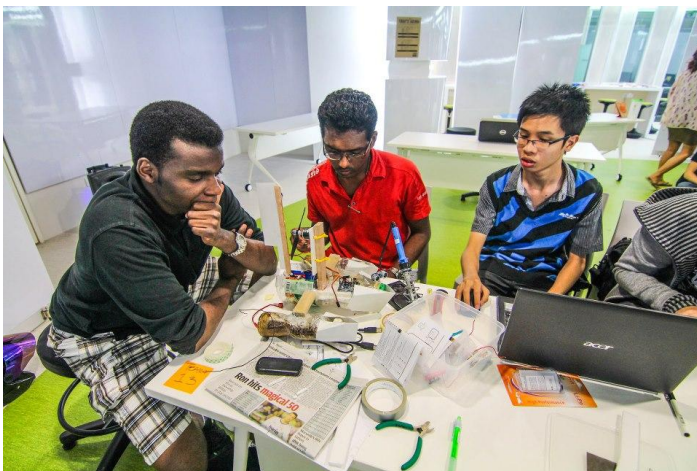
SoE Competitions

Makeweekend Robotics and Drone Hackathon



Two days workshop and competition was conducted by the Hackathon Team at Taylors University on April 27 & 28, 2013 towards the objective of building the robots that can move over the water and land within the specified track. There were nearly twenty teams participating from different Universities in Malaysia which included 3 teams of students participants from APU SoE. In the category of the Water Drone Challenge, participants were given a task to build a robot that can move on water within the specified track.

Two teams of our students participated in the competition, the robot built by our students' team of Ahmed Adam, Ganga, Ben Yen and Jonathan won the first prize. In the other category of the Creativity and Awesomeness Challenge, participants were given a task to build a robot that had the capability to move both on water and land. The Robot built by our students team Chu Chee Wee, Kok Khah Whey, Sina Enteshari, Ali Ahmadian and Tee Chinka won the first prize. All students were guided by SoE lecturer Mr Arun Seeralan who spent his Saturday in engineering guidance/mentoring.



SoE Competitions

SoE Won Gold and Silver at 24th International Invention, Innovation and Technology Exhibition ITEX



Two teams from our School of Engineering participated and won Gold and Silver medals at the 24th International Invention, Innovation and Technology Exhibition (ITEX) which was held at the KL Convention Centre from 9th to 11th May 2013. Projects showcased by Universities at ITEX compete for awards in a range of categories during the Exhibition, and this year marked the first time that teams from APU were represented at this annual Exhibition.

The first team consisted of four students (Choo King Xin, E Gin Leon, Khoo Yik Ban and Gabriel Chong) under the supervision of Mr. Pang Jia Yew. The project was titled 'Real time Intelligent Parking Allocation System for Smart Phone'. This project involves the development of a novel intelligent parking service called *iParking*. With the *iParking* service, multiple parties such as users, parking facilities and service providers are connected through the internet within a distributed architecture. Taking advantage of the emerging concept of the connected car, the usage of smartphones, mobile Internet, and the precise indoor locationing of the cars, the parking experience can be improved and in parallel increase the efficiency of the parking facilities.

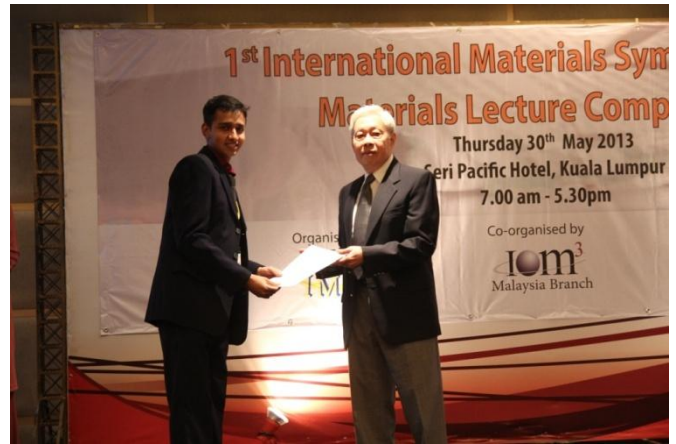
The second team consisted of two students (Chu Yee Chaw & Gary Tan Jun Ao) under the supervision of Dr. Firas Ismail. The project entitled 'Hybrid Power Systems For Agriculture Irrigation'. This project's aim is to design a power system based on utilizing unlimited solar energy for use in agriculture irrigation systems. The outcome is to increase the system's efficiency and to monitor the input/output variables of the system. The objective of the project is to reduce the probability of pollution and the usages of non-renewable energies.

In addition to the awards won by the students, both the lecturers Mr. Pang and Dr. Firas picked up Gold Medals in the Innovation category for the same projects. This is indeed a major achievement for the School of Engineering and for APU.



SoE Competitions

1st International Materials Symposium Cum Materials Lecture Competition



The Institute of Materials, Malaysia (IMM) is a non-profit society of professionals whose aims are to promote honorable practice and professional ethics and encourage education in Materials Science, engineering and technology. Numerous technical talks, seminars, certification programmes, conferences, short courses and master classes had been organized by IMM over the years. The 1st International Materials Symposium IMS was organized by The Institute of Materials, Malaysia (IMM) on 30th May 2013 at the Seri Pacific Hotel, Kuala Lumpur. The materials symposium series was an for postgraduate students, university lecturers & professors, academic & industry researchers, and industry technologists to showcase their technical research and development works.

These 1-day technical symposiums was held in Kuala Lumpur and various regions such as Langkawi, Melaka and where IMM Regional Chapters are based. SoE took part in the 1st International Materials Symposium and Materials Lecture Competition 2013 at the Seri Pacific Hotel, Kuala Lumpur. Our student representative, 4th year student, Awais Farooqi qualified for the finals and finished in the top 10. He was under the academic mentoring of lecturer Lim Siong Chung. Among all participants from the private institutions, Awais was ranked the highest.

SoE Students Engineering Essay Writing Competition

SoE had its first engineering essay writing competition in which 24 students participated and the panel of 4 SoE lecturer judges (Dr Lai, Dr Raed, Low Yee San, Chandrasekharan) voted on the winners. The first prize was won by Gabriel Chong and the second prize winner was Albert Jimwanga.



SoE Competitions

APU SoE Participation at UNITEN Engineering And Technology Fair

APU participated in Engineering and Technology Fair (ETF) organized by the IEM Student Chapter of Uniten. The event was aimed to promote engineering awareness among the students. There were quite a number of organizations who had participated in the event. Education institutions such as UTAR, UTM, UNISEL, participated and most of them displayed their student projects. Our student group displayed the refurbished Go Kart from the "Bosch Cordless Drill Competition" of two years ago. The public are intrigued by the go-kart powered by cordless-drill. Government institutions such as TNB Research, Petrosains and Nuklear Malaysia had the students involved in games. Other private companies such as Cytron, Robotics Club, etc. were there to promote their robotic products and training to participants. The crowd has a good time with the exhibition of engineering projects. The host UNITEN also displayed their go-karts for the participation of the Shell-Eco Marathon. Our students under the guidance of SoE's Mr Alvin Yap, had the opportunity to exchange knowledge and ideas with the teams and learned quite a lot from them. It was a good event that encouraged our students to learn and grow technically, while promoting our students' projects to the public.



SoE Competitions

IEEE Circuits and Systems Innovation Award 2013

SoE student Chew Kean Ho received the IEEE Circuits and Systems Society (CAS) Malaysia Chapter Innovation Award 2013 during the IEEE event held on 29th June 2013 at Residence Hotel, Kajang. He received a RM200 honorarium and a certificate. The selection was open to all universities in Malaysia for outstanding final year projects that have illustrated innovation in the theory and/or applications of circuits and systems. Chew's final year project titled "Integrated Embedded Input/Output Tester Design- I2C and USB (WIRED)", supervised by Mr. Suresh Gobee, is a collaboration project between APU and Intel, extended from Chew's internship in Intel Penang. Chew has since graduated from APU and is now working for Intel.



SoE FYP Projects



Students' FYP Poster Presentations , April – June 2013

DESIGN AND DEVELOPMENT OF LOWER LIMB EXOSKELETON FOR REHABILITATION

Introduction: While the prosthesis has been widely used to replace the body parts lost during injury or diseases, exoskeleton has been the recent phenomenon as it acts as the extra limb rather than replacing the current limb.

Design	Info
Parallel or Series limb	Parallel limb
Architecture	pseudo-Anthropomorphic
DOF	2
Range of Motion	Walking motion
Joint Torque	Active Torque
Sensors	Inertial Measurement Unit
Actuator	DC motors (Automotive Power Window)
Control Hardware	Arduino, LabView & Computer
Wireless	Bluetooth

Problem Statement: High complexity and cost have hindered the researchers from applying the exoskeleton in rehabilitation which actually helps the mankind in the recuperating process. The ideas starts form building of an exoskeleton to assist a user in his walking which focuses on the lower limb will be proposed in this project. The existing commercial exoskeletons are more concentrating on military usage while the ones available for medical purpose are complex. Moreover, the adjustability factor is often ignored as the commercialized systems require a large amount of work to alteration. The implementation task can be proved not arduous if the exoskeleton is redesigned from scratch to suit the user or patient. There is a need for the user or patient to make a trip to hospitals for the rehabilitation process. To make it worse, the user has to stay in the hospital for a longer period as the system is not mobile and some need the supervision of the doctors, physiotherapists and nurses. Furthermore, the more portable the system, the more convenient the user gets to use it as the user can have the rehabilitation process at home without holding back the daily routine of the user.



Aims & Objectives: The hardware model is simulated in a simulation software package. Then, a prototype is built. An exoskeleton control unit consists of a microcontroller is implemented to control the actuators by receiving feedbacks from the sensors. With the sensors, vital data acquisition is done for the enhancement of the exoskeleton. This helps to automate the movement of the weakened limb without compromising the support for the leg to stabilize the user. The focus is on the lower limb and the implementation of wireless module eases the data acquisition process.



By YUGAN VELUSAMY

MIMICKING HUMAN FINGER MOTION USING EXOSKELETON WITH GRIP FORCE FEEDBACK SYSTEM

Introduction

This research is to investigate a better and user friendly remote control system on robotic grip. This control system will consist of master and slave manipulator. In order to remotely operate robot grip conveniently and dexterity, force feedback system is applied in the system. Instead of using complex programming to assemble the motion of the robot work line, human can directly demonstrate their finger on master manipulator, so slave will follow the motion of the master manipulator.

Aim of the research is to make a robot control system with exoskeleton which controls by mimicking human finger motion using exoskeleton with force feedback system from robotic grip to control the gripping force.

Used:

- As gripping force amplifier, to help old and less strength on finger for assist them on finger strength
- As telerobot for telesurgery
- human will not put their life in risk from disposal hazardous or radioactive task
- help stroke patient to rehabilitation on hand motion

There are three main components to develop this project, which is force sensor, exoskeleton mechanical structure, and Labview program and circuit.

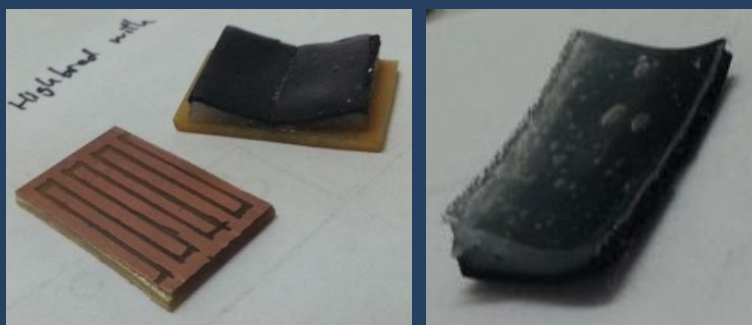


Figure 1: Force sensor using Highbred 1:1 conductive rubber with triangular method

Highbred of 1:1 ratio of graphite to silicone is made of thin layer of 1:1 graphite to silicone ratio conductive rubber, then the rest is fill with pure silicone and form it into triangular shape using mold. In Figure 43 shows the highbred conductive rubber is made. The transparent part is pure silicone and dark part is the 1:1 conductive rubber. The highbred conductive rubber is then sticks on a hard flat surface plastic, and creates a vertical interdigitated mark PCB

This logic is applied for a finger movement. Every finger using the same logic as the flowchart shows. For each finger the Arduinos will read both force sensors, master and slave. The analog reading from the sensor will be filter by equation that makes the sensor output to be linear. If there is reading form the sensor, both linear reading will minus each other as a result for the decision on both slave and master servo movement. If no reading, the servo will return to its original position. When master force sensed is high, the servo for master and slave will move forward. When slave force is higher, then slave and master servo will force to return. If both master and slave force almost equal, the servo will stop at their current position

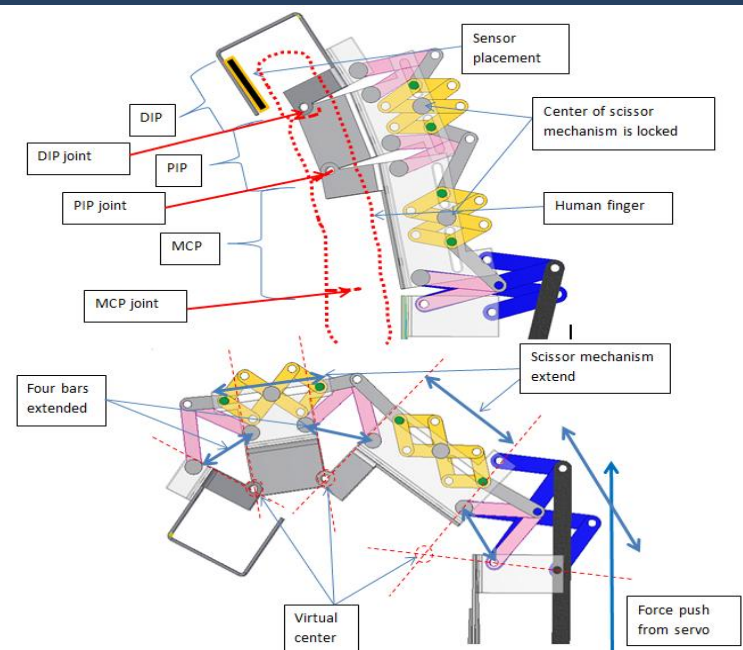


Figure 2: Exoskeleton mechanical structure

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By CHAN CHEE LEONG

HYBRID SOLAR WIND ENERGY TOWER (HSWET)

Introduction

The HSWET is a combination of photovoltaic system and a wind energy conversion system on a tower. For the photovoltaic system, a two-axis solar tracking system is covering the north-south axis and east-west axis. The wind energy conversion system is using a vertical axis wind turbine for power generation. The HSWET is designed to suit the housing and industrial areas as the alternative source of electricity. This project is to solve the research problems which are the increasing of energy demand, constraint of space for large renewable energy systems in residential area, and the efficiency of renewable energy systems do not allow for maximum utilization of renewable energy infrastructure.

Aim of the research is to produce a more efficient and effective design for the Hybrid Solar Wind Energy Tower (HSWET) to be used for residential housing areas.

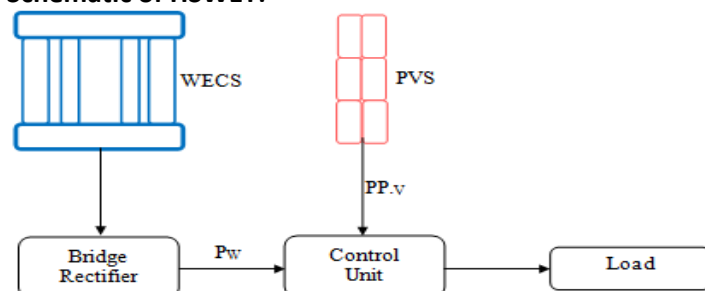
Advantages:

- Simple and easy to maintain
- As an alternative electricity source for residential areas
- Suitable to be used for powering street lamps
- Maximize the Solar and Wind energies by using dual-axis solar tracker and vertical wind energy conversion system (WECS)
- Residents may use more electricity and paying less on the electric bills

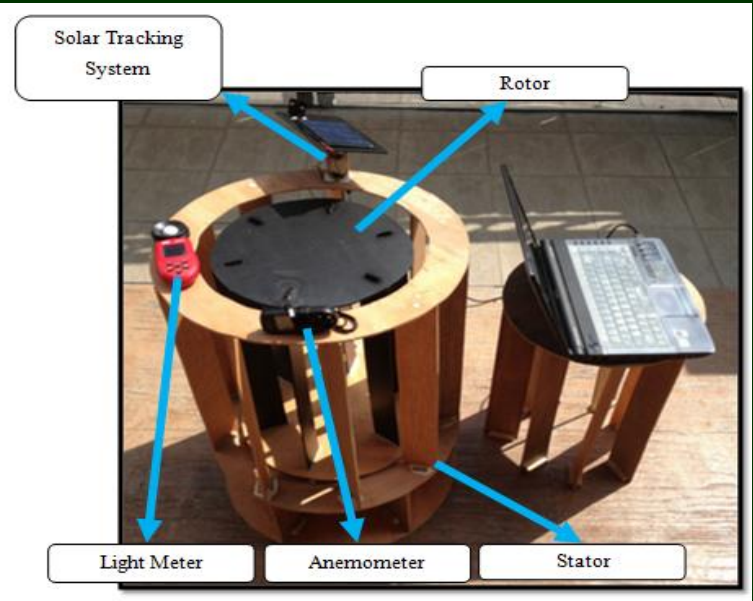
Material Selection:

Prototype Parts	Material Used	Reason
Stator (WECS) & Solar Tracker Structure	Wood (5mm thickness)	<ul style="list-style-type: none"> • Cheaper in cost • Easier to cut compare to PVS and Fiberglass • Availability to purchase
Rotor (WECS)	Plastic Board	<ul style="list-style-type: none"> • Cheaper in cost • Lighter than Aluminium plates

Schematic of HSWET:



The energy conversion process begins with 2 individual renewable energy sources which are wind energy conversion system (WECS) and photovoltaic system (PVS). The WECS, which utilizing a rotary mechanism powered by wind energy to turn an attached DC motor on the mechanism, and converting the wind energy to AC voltage (rotary motion to electricity). It is then converted to DC voltage by a bridge rectifier. On the other hand, the PVS is generating DC voltage through the solar energy with a solar panel (sunlight or photons to electricity). The total power generated by the HSWET, which equals to the summation power from WECS, P_w and power from PVS, P_{PV} . A charge controller is used to combine the voltage and used to charge a 6V battery. Thus, the battery is used as a power source for the load. Yet, in the real life application, a larger capacity of battery will be used so as to supply a sufficient power to the home electrical equipments.



Results:

Theoretical Total Power Output (Ideal)	Theoretical Total Power Output (after considering the loss)	Experimental Total Power Output	Efficiency of the HSWET
1.0368 W	0.829 W	0.703 W	84.8%

By: GARY TAN JUN AO

Everyday is a New Learning Experience



I'm reminded of a quote that goes something like this - everyday is a new learning experience. Now, allow me to give you all a little bit of insights on my life journey. In high school, I was a science stream student and one of the students who get good grades in the exams. Ever since my SPM examinations, I hadn't figured out what I wanted to become in the future. I remembered being told by families and teachers, the career of a doctor, a pilot, an engineer, a teacher and so on. During that time, my mind was set to take up engineering course solely because my father was one. I got accepted in one of the government university in Kuala Lumpur doing foundation in science physics. Man, was it tough! So during one of the long semester break I had, I was invited to work with a friend on this production company and they're shooting a Malay movie. I happily accepted and the pay was generous for a student who never worked before. I learnt and experience a lot during that period of time and it opened my eyes to something I never would imagined before, that is, the reality behind the screen.

After finishing the shooting of that film, I enrolled a course in Broadcasting. I wanted to know more about filming, I wanted to learn to edit, to write a script, to direct a movie or produce one. I have been working for the past 10 years since I left college and I have been doing a lot of work for a film and video production, dramas, advertisement and so on starting just the position of a wardrobe assistant to continuity, editor, director and assistant producer. Each day was a challenge and experience for me.

Even though I loved the work I have been doing all those years behind the cameras in movie sets, I then stepped into advertising and finally to cameras. I manage projects, deal with clients getting billboards, newspapers, and TV or radio ads to learning technical specifications of a camera to servicing and also teaching class for Nikon camera users'. I went back to my hometown after so many years in Kuala Lumpur, to my family in Miri. While looking for a job there, I fell into the Oil and Gas industry. A little bit about Miri city, it is the birthplace of Malaysia's petroleum industry, which remains the major industry of the city until today. Working as a contractor for Petronas, I have to face the diesel tanks and the plant every day. This field was something new for me. We used to have engineers that come to inspect the sites and they are the ones that design, monitors and manages the power system, consoles, instrumentation in the plant. And so, I got acquainted with few very interesting engineers from all over the world and get to hear their exploration stories.

As you can see, every day to me is a learning experience even before I decided to quit work and go back to college full time for every day we learn something new just by living. I am currently doing my first year diploma in Electrical and Electronics Engineering and I have picked up a lot of interesting new things along the way, who knows where I will be heading next. I am curious to find out. So, my advice to anyone who has made plans on how life should be - Go to college, get a degree, get a career, fall in love, have a family and work all before the age of 30; stop planning and start enjoying what life brings your way! Even if things don't work out, it doesn't mean it wouldn't. Life is what you make of it and so no matter what age you are at now, age is just a number and it is not the end of the journey for you and even for me. It is never too late to set another goal or dream a different dream. The sky is the limit.

By Daphne Tersan Anak Dublin (TP029204)

My experience at Water Drone Challenge

Over the weekends of 27-28 April 2013, four of us (Obay Fares Alashkar, Suhail Sadeq Noman Al-Nabhani, Rajaram G., Lew Yew Ken and Logashrri R. Gangatharan) represented Asia Pacific University (APU) of Technology and Innovation to join the Makeweekend Robotic and Drone HACKATHON Competition at Taylor's University. Proudly, we emerged as the champion. The challenge is to build an autonomous boat which can complete a U-shaped racecourse laid on the lake of Taylor's University. The autonomous water drone must be designed and built over just two days.

On the very first day, each team was provided with basic components such as Arduino-main board, DC motor, servo motor and ultrasonic range finder. As time and materials are limited, we sprang into action immediately. By applying what we had learnt in project management, we divided our team members to perform 3 critical tasks: mechanical assembly, electronic design and efficient programming.

To build the boat creatively and cheaply, we utilized basic materials – two empty water bottles and a piece of plastic sandwiched between them, as shown in Figure 2. For controlling the direction of the boat, we designed a rudder under the boat connected to the servomotor provided. Servomotor is actually a rotary actuator which allows for precise control of angular position.

In addition to that, we fixed a DC motor at the back of the boat to move the boat forward. Also, an ultrasonic ranging sensor has been installed on the right side of the boat. This is to detect obstacles at a certain distance. Lastly, all the electronic components were connected to the Arduino-main board for programming.



Figure 1: The winning team from APU.



Figure 2: Our water drone that advanced all the way to the finishing line.

For the programming part, we controlled the motor in such a way that the DC motor worked at maximum speed to push the boat forward. The ultrasonic ranging sensor was to measure the distance between the boat and the racetrack barrier. If the barrier is near to the right side of the boat, the boat would continue to move forward straight. When the boat reached the U-shaped turning, the ultrasonic ranging sensor would not detect the right barrier. This was the time that the boat would need to make a right turn by controlling the servo motor. Simultaneously, the speed of the DC motor was reduced to allow the boat to turn smoothly.

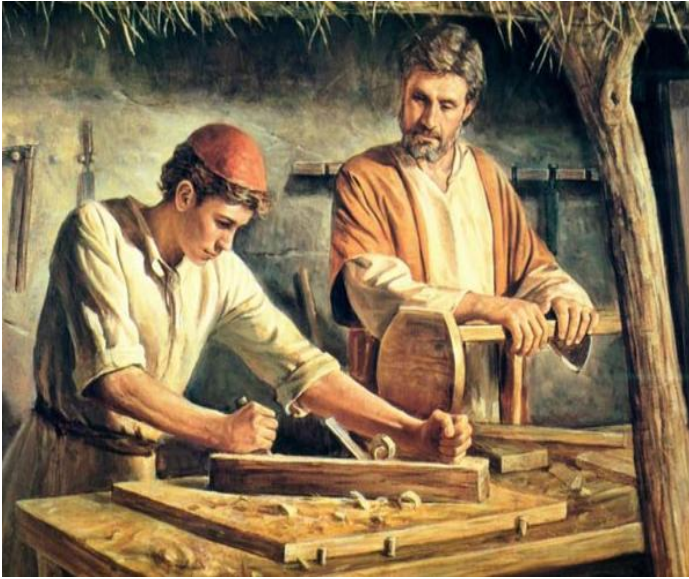
During the designing and constructing phase, we encountered numerous issues and problems. First of all, we were inept at programming the Arduino-main board. To overcome this challenge, we spent hours in searching and studying the programming language on the spot. During the testing phase, after all the mechanical structures and electronic parts were programmed and assembled, the boat did not work at all. We were exhausted but we did not give up easily. We troubleshooted every part of the boat and discovered that one of the cables was damaged due to overheating.

Eventually, the boat managed to move and we were ready for the competition. Among all the participating teams, our water drone was the only one which managed to complete the entire racetrack.

A lot of invaluable experience was gained from this competition. We learned to think fast and work efficiently in order to accomplish a mission in a limited time. More importantly, we learned the importance of teamwork. Without any one of us, we could never complete the task, let alone winning a trophy! Thank you, my team members!

Obay Fares Alashkar TP023181

Outcome Based Education – My Take



<http://rhythmtherock.com/images/ROTRJournCarpHeaderWEB.jpg>

In ages past, before the creation of structured education systems, skills were transferred and acquired through the practice of apprenticeship. This was the only mode of transfer of knowledge and/or skills from the learned to the novice. In many Asian cultures, this was very evident with the coining of specific terms for the learned. For example, “Guru” (Indian), “Sensei” (Japanese) and “Sifu” (Chinese).

In these arrangements, the only evidence that a novice has mastered his subject matter was that he was able to perform at least as well as his teacher. Questions of how he accomplished that level were irrelevant. Thus, when a person claimed to be a carpenter, for example, those seeking his services never doubted his ability to perform, and most of the time, never needed to.

With the advent of the modern-day structured educational system, this level of performance has deteriorated. This could partly be attributed to the immense increase in the volume of those seeking to acquire education. It appears that “mass production of the educated” has failed. Nevertheless, it is highly unlikely that this demand for education would ever decline. Thus, altering the current education system does seem like the sound approach to take to arrive at a creative solution.

Outcome based education (OBE) is an endeavor in that direction. It has simply shifted the focus back to the one seeking to acquire the knowledge. The emphasis is placed on what he is, or should be, able to perform by the end of the prescribed time period. OBE has maintained an element of the old education system in that, on the surface, it appears that it is not concerned with how the student achieves his target. On the other hand, it has adapted a part of the modern day education system in that it requires a structured mechanism that continually tests whether each student’s trajectory in the programme will take him to his intended target. The magnificence of this system is that it flags students that may be deviating from the mark and thus allows for apt and timely interventions, thereby increasing the student’s chances of meeting his mark.

Even though talks on this system of education has been popular in the United States from the 1980’s, implying that the concept was birthed much earlier, here in Malaysia, it is still considered a revolutionary march through uncharted waters. And true transformations call for time. Wide scale implementation will require patient hewing into rigid mindsets. And only on such a basis, can a conclusion be drawn on whether this effort is a step in the right direction, or not.



By Jacqueline Lukose

http://www.picturesof.net/_images_300/A_Colorful_Cartoon_Hispanic_Boy_Carrying_a_Stack_Books_Royalty_Free_Clipart_Picture_100908-153153-975053.jpg

SoE Students Representing APU Basketball

We don't have to go far to watch NBA stalwarts when we have them here in APU with core representation from the School of Engineering. The APU basketball team for over 2 years now has been led by SoE's very own Paul Mogeni with excellent support from the likes of other SoE students – Raffael, Imran and Errick Yassin. With their usual show time performances, opponents have been bewildered with the flair and skills shown on the court. It must be the application of physics. Ironically, physics in basketball is fairly irrelevant. Instead the physics in basketball is simply interesting to people who really try to break down the art of shooting, passing, and dribbling. "Physics" in basketball is a product of a person's memory. A person has a kinesthetic memory in how they remember how they shot from where and with a certain amount of velocity. This is achieved by hours of practice and playing. Basketball then becomes more of a series of reflexive behaviors and playing on instinct. However, understanding the physics of basketball can be very beneficial to a teacher of the game. Specifically, understanding the physics behind shooting, passing, and dribbling the basketball are the most beneficial and critical. So basically basketball demands high memory power 😊.



SoE Staff Sporting Achievement

Lecturers – Bunch of Geeks? No way! They have muscled their way into winning 3rd place at the recent APU Staff Bowling tournament. Not too shabby for a quartet that define themselves as 'amateur' bowlers. Again did engineering play a part in obtaining sporting results.....statics & dynamics possibly. Making SoE proud – Lim Siong Chung, Lioe De Xing, Dr Lai Nai Shyan and Dr Lim Wee Han.



SoE IEM Student Membership



IEM Student Chapter Membership Ceremony

A simple ceremony of handing over IEM membership cards and admission certificates to 104 new student members of IEM was held on 25th April 2013. The ceremony started with introduction to The Institution of Engineers, Malaysia by Head of School of Engineering, Assoc Prof Ir Dr Vinesh Thiruchelvam, followed by introduction of the IEM web portal by SoE's Mr Lioe De Xing. Many students who are also interested to become a member submitted their applications after the event. For students who wish to become a member, application is open throughout the year.



IEM Web Portal by Mr. Lioe De Xing



Head of SoE Assoc Prof Ir Dr Vinesh Thiruchelvam handing over IEM membership card and admission certificates to the students

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