*** POSTGRADUATE OPPORTUNITY IN INVESTIGATION OF IMPACT STRAIN SIGNAL CHARACTERISTICS LEADING TO FAILURE CLASSIFICATION**

This research presents the correlation of absorbed energy with calculated energy using signal processing approach and the correlation of impact signal pattern with life prediction. The total absorbed energy obtained using the dial/encoder system may significantly vary depending on the strength and ductility of the material. According to ASTM E23, over 80% of absorbed energy is inaccurate and approximate. No studies have been conducted to correlate impact signal pattern with life prediction but these correlations are very important to determine the durability of product when subjected to impact loading. Strain gauges will connect between the charpy impact striker and the high frequency data acquisition system to capture the dynamic impact strain response. Specimens with different materials, velocities and thicknesses, which is design according to ASTM E23 standards, are used. A collection signal will convert from the time domain to the frequency domain using the fast Fourier Transform method, and the area under the power spectral density graph is use to calculate strain energy. Absorbed energy and strain energy will compare and the correlation between the strain energy and absorbed energy can be link. The impact strain signal pattern together with FEA for wheel rim will be used to predict the life using design life software. The wheel rim was selected because it must have sufficient durability to with stand high load in the application of fatigue strength and impact strength. The energy correlation and the correlation impact strain signal pattern with life prediction give an idea to propose a new approach for failure classification of characteristics impact strain signal pattern. The expected outcome the energy correlation as an alternative, can be replace the dial/encoder absorbed energy by using the signal processing approach. Finally the failure classification finding can be used as a guideline to evaluate the durability of the product.

Objective:

1. To determine the correlation of strain energy with absorbed energy
2. To correlate impact signal pattern with life signal.
3. To propose a new approach for failure classification of characteristics impact strain signal with different parameters (velocities, materials and thicknesses).

Contact: Dr. Mohd Basri Ali (basri@utem.edu.my) or call 017 468 5970

* **POSTGRADUATE OPPORTUNITY IN VIBRATION AND ACOUSTICS**

This is a 2-year postgraduate position in the Faculty of Mechanical Engineering leading to the degree of Master of Science (MSc). The project is under the Exploratory Research Grant Scheme (ERGS) from the Ministry of Higher Education, (MoHE), Malaysia.

The project requires a hard working, energic, independent and mobile person as well as good academic qualification to succesfully finish the project in time. Successful candidate will be given around RM1,000-1,500 monthly allowance and must be registered as a full-time postgraduate student at UTeM.

On studying the acoustic performance of natural materials with hollow structure as alternative 'green' sound absorbers

Synopsis:

Researches on finding alternative acoustic absorbers are still progressing.The conventional absorbers are those made from synthetic fibers which are known not only harmful to the environment, but also to human health. Several studies have been done concerning the natural fibrous materials as the sound absorbers, for example fibers from coir, palm, tea-leaf, etc. Good sound absorption was found particularly from mid to high frequencies, although further investigation should be done regarding their durability due to humidity and fungus and also fire retardant. The newest alternative method is the employment of a micro-perforated panel (MPP) as a non-fibrous type absorber. Made from metal, plastic or glass, MPPs serve as a hygenic system and provide attractive appearance in room interior. Constructed with sub-millimeter holes, the absorption mechanism of MPP resembles that for a Helmholtz resonator and therefore controls the sound absorption at low frequency.

This research project will study the sound absorption performance of natural materials having hollow tube structure introduced with micro-size holes to act as sound absorber. The candidates can be bamboo and reed as both have good durability and structural strength. The materials will be arranged as follows: (i) axial configuration, i.e. the sound excites the struture on the cross-section and (ii) transverse/horizontal configuration, i.e. the sound impinges at the structure's side across the length. The micro holes (less than 1 mm) introduced at the structure body will provide absorption at low frequency while absorption at high frequency is expected from the friction loss when the sound propagates inside the hollow path and also in the air gap between the materials.

Mathematical models to predict the absorption coefficient will be developed for a design guide by modifying the existing models. The proposed system could be an alternative green and sustainable acoustic absorber using a more rigid structure which differs from the conventional fibrous type absorber.

Requirement: Basic knowledge in Acoustics (will be given) and prefrerably has experience in MATLAB software.
Contact: Dr. Azma Putra (azma.putra@utem.edu.my) or call 019 448 3009.

*** POSTGRADUATE OPPORTUNITY IN NEW STRATEGIES FOR ENERGY SAVING: THE FUTURE FOCUS ON ENERGY EFFICIENT VEHICLES (EEVS) IN MALAYSIA**

Field of study: Mechanical / Materials / Manufacturing / Automotive engineering
Summary of project: Energy is a vital input for social and economic development. As a result of the generalization of agricultural, industrial, transportation and domestic activities the demand for energy has increased remarkably. Transportation sector is the second most energy consuming sector after industrial sector and accounts for about 40% of the total energy consumption in Malaysia. Road transport is the main energy consumption within the transportation sector. The rising energy demand compounded with fuel subsidies and a volatility of oil prices has set the transport sector on an unsustainable course posing a threat to national energy security. Moreover, since the transport sector in Malaysia is heavily reliant on petroleum, it contributes significantly to the greenhouse gas emissions.
Therefore, this project is proposed to focus on energy saving strategies, which in line with the upcoming National Automotive Policy to turn Malaysia into a regional hub for energy efficient vehicles (EEVs) with high technology uptake among industry players for domestic and regional and international exports. This is achieved by introducing a new thermal energy storage system to optimize the energy use, sustainable and eco-friendly materials for lightweight design, bio-lubricant for friction & wear reduction, and smart energy harvesting suspension which substantially reduces vibration.
The nature of this proposed project requires multi disciplinary fields and expertises. Thus, the trend towards more collaborative research projects between three research groups (Green Tribology and Engine Performance, Advanced Vehicle Technology, and Advanced Materials) will benefit the groups and their partners, offering new opportunities for data enrichment. The outcomes of the proposed project will be implemented on energy efficient vehicles (EEVs).

This research program comprises the following four projects:

Project 1 - New strategic approach for thermal effectiveness of pcm/carbon-based materials.
Project 2 - Lightweight oil palm shell derived carbon black/kenaf reinforced thermoplastic hybrid composite for thermoforming prepregs.

Project 3 - New energy balance active control formulation of energy regenerative hybrid suspension system.
Project 4 - New bio-lubricants for friction and wear reduction.
This research funding is awarded under the Trans-disciplinary FRGS grant with the total funding of RM443,280. Successful candidate for each project may be paid a maximum wage of RM1,500/month included with a tuition fee waiver.

If you are interested, please contact Dr. Mohd Fadzli Abdollah
at mohdfadzli@utem.edu.my
http://www.utem.edu.my/myweb/mohdfadzli
https://sites.google.com/site/tribologyengine

*** POSTGRADUATE OPPORTUNITY IN AN INTEGRATED CAD AND DESIGN FOR MANUFACTURE AND ASSEMBLE FOR MECHANICAL COMPONENTS IN AUTOMOTIVE INDUSTRY**

Project summary: Design for Manufacture and Assembly (DFMA) is a systematic and logical technique used to focus on meeting customer requirements while balancing among cost, quality and performance. It is a concurrent engineering team approach that involves engineering, manufacturing and suppliers early in the design cycle. The best results occur when DFMA is used in the product conceptual stage. The cross functional team work towards minimizing the number of components, manufacturing steps and operations while designing to proven manufacturing capabilities. CAD systems are powerful tools and are used in mechanical design and geometric modelling of products and components. When using a CAD system, the designer can conceptualized the object to be designed more easily. DFMA is one of the quality analytical tools and an important tool during the early design stage of mechanical components. The technique able to considers manufacturing issues early to shorten product development time and ensure smooth transitions to manufacturing, thus, accelerating time-to-market with the least development cost. The DFMA available in the market are stand-alone system and perceived as a difficult, laborious and time consuming technique. Sometimes, insufficient time to carry out the analysis properly due to poor understanding of the importance of DFMA and inadequate training of practitioners, lack of senior management commitment are the major problems faced by industries. Thus, there is a need for an integration of DFMA and CAD system that will reduce the effort in preparing and analyzing mechanical components right from design stage. The integration of CAD data model with DFMA data is proposed in this project to identify manufacturability and promote assembles ability of mechanical parts such as automotive components at an

early design stage. It hoped this will facilitate decision making/support and knowledge sharing at the product development stage in automotive design industry.
The postgraduate student (PhD/ MSc) is expected to do research, write a thesis and write research papers on the research project. The candidate also participates in the UTeM postgraduate education program. A small part of the position involves teaching in bachelor courses.
For the PhD candidate position, the applicant should have completed (or be close to completion of) a Master's degree in engineering, with a solid background in quantitative research methods. The candidate is required to have the knowledge Java programming, engineering design and prototyping. Knowledge of DFMA is a preference, but not required. The candidate's file should demonstrate evidence of the ability to interact with industry, since this is a key part of each project. Fluency in English is required.
If you are interested, please contact Dr. Ir. Tan Chee Fai at cheefai@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN NOVEL RESPONSIVE MODEL OF AIR-BASED SEAT CUSHION FOR AIRCRAFT SEATING COMFORT**

Project summary: For many years seat cushions have been studied for their ability to reduce seating discomfort. Comfort, is defined as the pleasant and satisfying feeling of being physically or mentally free from pain and suffering, or something that provides this feeling. For this research, foam based vehicle seat is replaced by air-based cushion. The objective of this research is to study a responsive model for air-based seat cushions to determine how seating comfort is affected by changing various parameters of the cushion. Integrated measurement methods such as subjective and objective methods will be used to study and quantify the effect of air-based seat cushion on seating comfort. Different parameters of the air-based seat cushion, such as seating area, contact area between seat and human body, air outlet size, air cell height, and material elasticity are varied to determine how they each affect seating comfort. Next, we will study on the air cell of air-based seat for different base radius, the cell height, the outlet diameter, the material elasticity and different air pressure. The seated area can be modified in two ways, one way was to vary the number of cells over which the drivers seated weight will be distributed, while maintaining the cell radius and the other to maintain the number of cells while varying the radius of each cell. A mathematical model will be built with MatLab and SimuLINK using structure, relationship, principles and content of the framework design to accurately represent the cushion and its response. Lastly, the results generated by a responsive model will be tested and evaluated. This research will contribute and generate important data and non-aircraft structure product innovations for Malaysia aviation industry, which will elevate Malaysia

to be at the forefront and will be a potential contender in the competitive world aviation market place.

The postgraduate student (PhD/ MSc) is expected to do research, write a thesis and write research papers on the research project. The candidate also participates in the UTeM postgraduate education program. A small part of the position involves teaching in bachelor courses.

For the PhD candidate position, the applicant should have completed (or be close to completion of) a Master's degree in engineering, with a solid background in quantitative research methods. The candidate is required to have the knowledge on MatLab/Simulink programming, engineering design and prototyping. Knowledge of ergonomic is a preference, but not required. The candidate's file should demonstrate evidence of the ability to interact with industry, since this is a key part of each project. Fluency in English is required.

If you are interested, please contact Dr. Ir. Tan CheeFai at cheefai@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN GROUND VEHICLE FOR FIRE FIGHTING PURPOSE IN HAZARDOUS ENVIRONMENT**

Project summary: The developed Fire Fighting Ground Vehicle (FIGOV) is a remotely controlled machine consists of a mobile and rigid chassis. The machine is wirelessly controlled via mobile computer. The nozzle of the machine can directed at different angle and can be elevated in order to control fire at different height. One of the great importance of the development of the FIGOV is it can reduce the risks faced by fire fighters in performing their duties. This is due to the fact to the current fire fighting techniques require fire fighters to intervene in hazardous conditions. Working at very high temperature, dusty, low humidity, dangerous and others are among usual working conditions associated with fire fighting. The results from previous study showed that the developed FIGOV encountered the problems such as mobility limitation caused by the need to drag heavy water hose, vibration of the machine affect the quality of real time image produced, and poor two way communication quality of web cam due to disturbance from machine noise. Therefore, this research integrates required technical aspects such as design optimization, improvement of machine mobility, improvement of industrial grade long range wireless control an improvement of fire fighting techniques to up-scale the developed FIGOV that aim for pre-commercialization purpose. The proposed up-scaling FIGOV system is a ground vehicle that can move fast, light weight, able to locate people, equipped with long-range control and monitoring ability for firefighting and rescue purpose in hazardoud environment. In addition, the prototype is

using green energy, which is electric, to power the machine. The prototype will be equipped with state of the art sensor and imaging system to detect and locate fire victim. Besides, the proposed FIGOV will equip with stand alone chemical fire suppression system.

The Master student is expected to do research, write a thesis and write research papers on the research project. The candidate also participates in the UTeM postgraduate education program. A small part of the position involves teaching in bachelor courses.The candidate is required to have the knowledge on mechanical engineering, machine design, engineering design and prototyping. Knowledge of fire fighting is a preference, but not required. The candidate's file should demonstrate evidence of the ability to interact with industry, since this is a key part of each project. Fluency in English is required.

If you are interested, please contact Dr. Ir. Tan CheeFai at cheefai@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN ONEBAJA: NEXT GENERATION GREEN AND ECONOMICAL UREA**

Project summary: A single line urea granulation plants nowadays have reached capacities of more than 3,500 MTPD. With increasing environmental and health awareness, more and more attention is paid to the insoluble binder being used in the urea granules and the ammonia emissions from such plants. These nondegradable binder such as formaldehyde may well be absorbed by the plant and get into the food cycle. If large amount is consumed and untreated in a prolong period of time it may cause a detrimental effect to human. The challenge is to come up with a “new biodegradable binder” for the urea granulation process with comparable quality and cost against the current available technology. The scope of the study will focus on identifying the suitable biodegradable binder, degradation characteristic of binder, physical (viscosity and surface tension) and thermal properties characterization of the binder, binder + urea and binder + NPK mixture, mechanical characterization (hardness, wettability and uniformity of granule size) of binder and NPK effect on urea granules. Among the expected outcome from this study is preliminary work using agricultural source as the biodegradable binder may transform public perception towards this industry and a new approach by looking into the binder segregation model to study the effect of binder on the urea granules properties.The postgraduate student (PhD/ MSc) is expected to do research, write a thesis and write research papers on the research project. The candidate also participates in the UTeM postgraduate education program. A small part of the position involves teaching in bachelor courses.

For the PhD candidate position, the applicant should have completed (or be close to completion of) a Master's degree in engineering, with a solid background in quantitative research methods. The candidate is required to have the knowledge on machine component design, engineering design and prototyping. Knowledge of nozzle is a preference, but not required. The candidate's file should demonstrate evidence of the ability to interact with industry, since this is a key part of each project. Fluency in English is required.
If you are interested, please contact Dr. Ir. Tan CheeFai at cheefai@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN SYSTEM IDENTIFICATION**

Candidates are invited to apply for a Masters degree studies in system identification. One of the studies involves the development of an alternative algorithm, specifically for model structure selection stage. The selection is based on predefined loss function and the algorithm shall be developed from well-known algorithms, such as population-based evolutionary computation and regression methods. Another study involves an in-depth look into the effectiveness of common loss functions, or also written as objective functions or information criterion. It requires a thorough investigation of how these loss functions tackle the importance of accuracy and parsimony in model structure selection. The study is expected to end with a proposal of a novel loss function resulting from the investigation. These studies are expected to be completed in 1 1/2 year. Successful candidate may be paid a wage of RM1500 per month, depending on registration as Graduate Research Assistant. Literacy in Matlab software is an advantage.
For further information, contact Dr Md Fahmi bin Abd Samad @ Mahmood, Department of Structure & Materials at mdfahmi@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN TRIBOLOGICAL INVESTIGATION OF NANO-BASED ENGINE OIL DILUTED WITH BIODIESEL FUEL**

Field of study: materials/mechanical/manufacturing/automotive engineering
Summary of project: Many studies revealed that biodiesel fuel produces engine oil dilution especially when late post-injection are used. This problem potentially accelerates engine wear. However, the use of nanoparticles as lubricating oil additives to address engine oil dilution caused by biodiesel fuel has not been study yet. Thus, the main focus of this research is to investigate nanoparticles effect on the tribological properties of engine oil dilution caused by biodiesel fuel. A series of nano-oil samples will be prepared by dispersing different concentrations of graphite nanoparticles in

conventional engine oil. The samples will be characterized using viscometer, Petrotest flash/pour point meter and 716 DMS Methrohm. Design of Experiment (DoE) via Taguchi Method will be performed in order to determine the optimal concentration of graphite nanoparticles. By using the optimum parameters, maximum allowable percentage of biodiesel for dilution of nano-oil will be determined. The tribological properties will be measured using four-ball tester and follow applicable ASTM test methods. The friction coefficient encounter by the balls will be recorded in situ and the test data will be acquired with a computer automatically. Wear scar diameter on the steel balls will be measured using Optical Microscope (OM). Besides, the worn surfaces will be observed qualitatively using Scanning Electron Microscopy (SEM) and profilometer. From this study, nanoparticles, as lubricating oil additives, could enhance the tribological properties of engine oil dilution caused by biodiesel fuels. Successful candidate may be paid a wage of RM1000 for one year. Postgraduate student MUST apply MYBRAIN15/MYPHD scholarship after the enrollment. This research is funded by UTeM.

Basically, you will experience several phases for this project:

Phase 1: Design of Experiment via Taguchi Method

Phase 2: Preparation and development of nano-oil

Phase 3: Perform the tribological testing

Phase 4: Discuss the results based on statistical analysis (taguchi and ANOVA)

If you are interested, please contact Dr. Mohd Fadzli Abdollah
at mohdfadzli@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN NOVEL THERMAL MANAGEMENT OF HEVS/EVS BATTERY MODULES WITH MICROPCM/CNT COMPOSITES**

Field of study: materials/mechanical/manufacturing/automotive engineering

Summary of project: The temperature of battery modules in hybrid electric vehicles (HEVs) or electric vehicles (EVs) must be controlled adequately to remain within a specified range for optimum performance. More effective, simpler, and less expensive thermal management would assist in the further development of affordable battery modules and increase market penetration of HEVs/EVs. Therefore, in this proposed research, a novel thermal management of battery modules with microencapsulated phase change material (microPCM)-filled carbon nanotube (CNT) matrix composites will be investigated experimentally and numerically. PCM will be microencapsulated into a CNT matrix to prevent leaking of the melted PCM. The CNT matrix holds the PCM like a sponge would. The high-conductivity CNT also provides a low-resistance heat path for

effective heat transfer to the PCM. An electric heater will be used to simulate the heat source of a battery cell. The heater will be installed in the microPCM/CNT composites. The thermal effectiveness of various volume fraction of microPCM in CNT matrix under variable heating rates and variable ambient temperatures will be examined. Further thermal analysis and heat transfer principles aids in designing better thermal management systems will be performed using Computational Fluid Dynamic (CFD) modeling in order to obtain temperature distribution and heat transfer pattern of microPCM/CNT composites. From this proposed research, novel battery thermal management using microPCM/CNT composites has potential to bring benefits, such as passively buffering against life-reducing high battery operating temperatures. Successful candidate may be paid a wage of RM1000 for two years. Postgraduate student MUST apply MYBRAIN15/MYPHD scholarship after the enrollment. This research is funded by Ministry of Higher Education Malaysia.
Basically, you will experience several phases for this project:
Phase 1: Development of PCM microencapsulated into a CNT matrix (crucial phase)
Phase 2: Design a thermal test rig
Phase 3: Perform the thermal analysis test
Phase 4: Perform CFD analysis

If you are interested, please contact Dr. Mohd Fadzli Abdollah at mohdfadzli@utem.edu

*** POSTGRADUATE OPPORTUNITY IN STAMP FORMING PERFORMANCE OF LIGHT WEIGHT MATERIAL**

This is a 2 years postgraduate position in the Faculty of Mechanical Engineering leading to the degree of Master of Science (MSc). Master studentship includes tuition fee and monthly allowance RM 1,000 to RM 1500 for 18 months. The concern about the environmental impact of emissions from automobiles has been a strong move to use composite materials for automotive applications which could tremendously reduce vehicle weight. The automobiles are mass produced and before these materials can be manufactured; their forming behaviours for applications in the automotive industry environment need to be researched. This research studies the stamp forming behaviour of composites in order to improvise material characteristics in the production processes.
Please submit your CV to Dr. Sivakumar Dhar Malingam via email at
sivakumard@utem.edu.my

*** POSTGRADUATE OPPORTUNITY IN HYDROGEN ENRICHMENT IN DIESEL ENGINE**

This is a 2 years postgraduate position in the Faculty of Mechanical Engineering leading to the degree of Master of Science (MSc). Master studentship includes tuition fee and monthly allowance RM 1,000 to RM 1500 for 18 months. Raising price of fossil fuel, concern over energy shortage and environmental have trigger many research in alternatives fuel, emission reduction and improving fuel economy and engine efficiency. Hydrogen fuel has been explored across the globe as it shows prominent solution for replacing fossil fuel due to its high energy contents. However, many challenges associated with hydrogen need to be solved such as embrittlement, storage, high electrolysis energy, fuelling station, high NOx formation and many others. The objectives of this research are to investigate an on-board hybrid hydro-methane injection to diesel engine with aims to improve fuel economy and reduce CO emission. Hydrogen electrolyser requires great amount of energy therefore a hybrid on-board hydrogen electrolyser will be installed and utilized to produce hydrogen and blended with CO2 from exhaust system to produce suitable methane (CH4) mixture for diesel combustion.

For more details please contact Dr. Noreffendy Tamaldin via email at noreffendy@utem.edu.my