August 9-11, 2019

Sabah, Malaysia

Horizon Hotel Kota Kinabalu

Address: Jalan Pantai, Locked Bag 2084, 88999 Kota Kinabalu, Sabah, Malaysia

2019 10th International Conference on Manufacturing Science and Technology

ICMST 2019

2019 3rd International Conference on Robotics and Mechantronics

ICRoM 2019

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Welcome Message

Welcome to 2019 the 10th International Conference on Manufacturing Science and Technology (ICMST 2019), and 2019 3rd International Conference on Robotics and Mechantronics (ICRoM 2019) in Sabah, Malaysia during 9-11th August 2019. The conference's theme is "Innovative Green Manufacturing & Technology for Sustainable Development". ICMST has been held successfully in Singapore (2011), New Delhi, India (2012), Dubai, UAE (2013), Sarawak, Malaysia (2014), Bandar Seri Begawan, Brunei (2015), Sarawak, Malaysia (2016), Hong Kong (2017), Kuala Lumpur (2018) respectively.

Nowadays, Automation and Mechatronics Engineering play an increasingly important role in both control and engineering applications. In the real world, the environment is complex and dynamics. As such, the automation systems should learn and adapt accordingly and more efforts should be focused on the methodology of the learning system on one hand. For example, fast adaptation and self-organizing capability are highly desired and research activities on this type of development should be expedited. On the other hand, one should leverage on artificial intelligence and machine learning to enhance their performance. Therefore, the 2019 3rd International Conference on Robotics and Mechantronics (ICRoM 2019) has been organized.

The main goal of ICMST 2019 and ICRoM 2019 is to provide an excellent avenue for academicians, students, researchers, professionals, engineers, and scientists from academia and industry to share their research findings and building network for further collaborative research in their respective areas.

Towards this end, the Technical Committee has assembled an excellent programme comprising of 7 excellent Keynote Speeches and Invited Speeches, delivered respectively by Prof. Kok-Meng Lee (Georgia Institute of Technology, USA), Prof. Li Lu (National University of Singapore, Singapore), Prof. Sujan Debnath (Head of Mechanical Engineering, Curtin University, Malaysia), Assoc. Prof. Vincent Lee Chieng Chen (Curtin University, Malaysia), Prof. Dr. Eric Dimla (RMIT University Vietnam, Vietnam), Assoc. Prof. Petr Valasek (Czech University of Life Science Prague, Czech Republic), Assoc. Prof. Jamaludin Jalani (Universiti Tun Hussein Onn Malaysia, Malaysia) and distinguished oral presentations.

On behalf of the Organizing Committee, we wish to thank the keynote speakers, invited speakers and authors of selected papers for their outstanding contributions. I would also like to thank members of the organizing committee, anonymous reviewers for their great efforts. Without their contribution, dedication and commitment, we would not have achieved so much. We sincerely hope that you will find the ICMST 2019 & ICRoM 2019 beneficial and fruitful for your professional development. We also hope that you will enjoy our hospitality and will have an enjoyable and memorable time in Sabah.

Conference Organizers

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Instructions

Registration Guide:

Arrive at the Conference Venue --> Inform the conference staff of your paper ID --> Sign your name on the Participants List --> Check your conference materials.

Checklist:

1 receipt, 1 name card, 1 printed conference abstract, 1 lunch coupon, 1 dinner coupon, 1 computer bag, 1 USB stick (paper collection).

Devices Provided by the Conference Organizers:

Laptops (with MS-Office & Adobe Reader)

Projectors & Screen

Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF files

Duration of Each Presentation:

Regular Oral Session: 15 Minutes of Presentation including 2-3 Minutes of Q&A

Notice:

*Certificate of Listener can be collected at the registration counter.

*Certificate of Presentation can be collected from the session chair after each session.

*The organizer will not provide accommodation, so we suggest you make an early reservation.

*One best presentation will be selected from each session. The best one will be announced when each session ends and will be awarded by the session chair after each session in the meeting room.

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Agenda Overview

August 9, 2019

13:30-16:30 Participants Check-in & Materials Collection – Hotel Lobby

August 10, 2019--Morning

Venue: Luyang Room-1F

9:00-9:05 Opening Remarks
Prof. Sujan Debnath, Head of Mechanical Engineering, Curtin University, Malaysia

9:05-9:45 Keynote Speech I
Prof. Kok-Meng Lee, Georgia Institute of Technology, USA
Speech Title: Speech: Model-based Data-driven Optimization for Intelligent Manufacturing

9:45-10:25 Keynote Speech II
Prof. Li Lu, National University of Singapore, Singapore
Speech Title: Effect of Graphene on Electrochemical Performance of Sodium-ion Battery

10:25-10:50 Coffee Break & Group Photo <Luyang Room Foyer>

10:50-11:30 Keynote Speech III
Prof. Sujan Debnath, Head of Mechanical Engineering, Curtin University, Malaysia
Speech Title: Mechanical Performance of Lignocellulosic Biomass-Based Polymer Composites

11:30-12:10 Keynote Speech IV
Assoc. Prof. Vincent Lee Chieng Chen, Curtin University, Malaysia
Speech Title: Palm Oil as Alternate Cutting Fluid for Machining Processes

12:20-14:00 Lunch at Lobby

August 10, 2019—Afternoon

Venue: Luyang Room-1F

14:00-14:25 Invited Speech I
Prof. Dr. Eric Dimla, RMIT University Vietnam, Vietnam
Speech Title: Planned Obsolescence: Aesthetic over Functional - The Emergence, Effects and Ethics

14:25-14:50 Invited Speech II
Assoc. Prof. Petr Valasek, Czech University of Life Science Prague, Czech Republic
Speech Title: Natural Fillers in Composite Systems

14:50-15:15 Invited Speech III
Assoc. Prof. Jamaludin Jalani, Universiti Tun Hussein Onn Malaysia, Malaysia
Speech Title: The Need of Robust Compliance Control for Robotic Hand

15:15-15:30 Coffee Break <Luyang Room Foyer>

15:30-17:15 Venue: Luyang Room-1F
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Presentations: MT005 MT008 MT0002 MT021 MT009 MT019 MT023

15:30-17:15 Venue: Likas Room-1F
Parallel Session 2: Manufacturing Technology
Presentations: MT014 MT001 MT0003 MT011 MT0004 MT015 MT0005

14:00-17:30 Poster Session <Luyang Room-1F>

18:00-20:00 Dinner Time

Keynote Speakers Introduction

Prof. Kok-Meng Lee
Georgia Inst. of Tech., USA; Huazhong Univ. of Sci. and Tech., China

Model-based Data-driven Optimization for Intelligent Manufacturing

BIO:

Kok-Meng Lee received his M.S. and Ph.D. degrees in mechanical engineering from the Massachusetts Institute of Technology in 1982 and 1985, respectively. He has been with the Georgia Institute of Technology since 1985. As a Professor of mechanical engineering, his research interests include dynamic systems/control, actuators/sensors, mechatronics, machine vision, robotics, and intelligent manufacturing. He is also Distinguished Professor with the School of Mechanical Science and Engineering at the Huazhong University of Science and Technology, and Pao Yu-Kong Chair Professor of the Zhejiang University.

Dr. Lee is a Life Fellow of ASME and a Fellow of IEEE. Currently, he is founding Editor-in-Chief (EIC) for Springer International Journal of Intelligent Robotics and Applications, and serves as co-Chair on the Conference Advisory Committee for the IEEE/ASME International Conference on Advanced Intelligent Mechatronics since 1997. He was EIC (2008-2013) for IEEE/ASME Trans. on Mechatronics (TMech), and served on the Executive Committee of ASME Dynamics Systems and Control Division (2013-2107, Chair 2016). Prior to serving as EIC for TMech, he served as its Technical Editor (1995-1999) and guest edited four focused sections. He had also held representative positions within the IEEE Robotics and Automation Society: served as Associate Editor for its Trans. on Automation Science and Engineering (2003-2005), Trans. on Robotics and Automation (1994-1998), and Robotics and Automation Magazine (1994-1996), and as Chair or Co-Chair for numerous international conferences; and founded/chaired Technical Committees on Manufacturing Automation and on Prototyping for Robotics and Automation.

Recognitions of his research contributions include Presidential Young Investigator (PYI) Award, Sigma Xi Junior Faculty Award, International Hall of Fame New Technology Award, Woodruff Faculty Fellow and more recently, ASME Michael J. Rabins Leadership Award. He is also recognized as advisor for more than ten Best Student Paper and Thesis Awards.

ABSTRACT:

Rapid advancements in imaging/computing technologies and machine intelligence have motivated manufacturers to develop online sensing methods to maintain product quality with improved production rate. This talk introduces methods to derive potentially low-cost solutions that combine non-contact field-based measurements with high-fidelity physics-based computational models for process optimization, parameter estimation and

direct field-based feedback control. Illustrated with findings from an intelligent machining research involving multiscale and multi-fields (mechanical, thermal, magnetic and electric), a method to derive closed form solutions to physics-based models, reconstruct the distributed-parameter physical fields, and infer its system properties from limited measurements for analyzing and controlling its dynamic behaviors, will be presented. This talk will conclude with a discussion on existing challenges and future opportunities in response to global calls for developing new "intelligent" technologies to meet challenges of emerging applications.

Prof. Li Lu
National University of Singapore, Singapore

Effect of Graphene on Electrochemical Performance of Sodium-ion Battery

BIO:

Dr. Lu was promoted to Full Professor in 2004 and is still heavily involved in the research of functional materials, mainly in two directions; i) materials for Li-ion rechargeable batteries which include traditional bulk batteries and all-solid-state batteries, and supercapacitors, and ii) piezoelectric and ferroelectric materials. He has published over 300 papers in international journals and 3 monographs. He has awarded millions of dollars in his research funding in the past 20 years. Recently, he received two prestigious Proof-of-Concept project grants awarded by the National Research Foundation of Singapore for development of fast charging Li-ion batteries.

Dr. Lu is the Editor-in-Chief of Functional Materials Letters (World Scientific Publisher), Associate Editor of Materials Technology (Maney Publisher) particularly in charge of functional materials, and member of Editorial Board of Scientific Report (Nature Publishers) in charge of energy storage materials. Due to his contributions to functional materials, he has been invited to deliver plenary, keynote and invited lectures by numerous conferences and institutions.

ABSTRACT:

Li-ion batteries have dominated in the current consume market due mainly to their high specific energy and long cycle life. With fast development, Li-ion batteries are not only used in portable electronics but also in electronic vehicles. Fabrication of large quantity of batteries has led to gradually deficient of lithium. As such, exploring new types of energy storage become necessary. Sodium ion has the valency of 1+ with slightly larger radius size than that of Li. In addition, Na is earth abundant. We present here the Na ion batteries made of NASICON-type Na3V2(PO4)3 (NVP) with 2D BiOCl (BOC). we report rGO riveted bismuth oxychloride (BiOCl) by inducing interfacial Bi-C bonding as the high-performance anode for SIBs. This new composite structure can deliver an initial charge capacity of 266.6 mAhg-1 at 50 mAg-1, and a cycling stability maintaining 81.7% after 100 cycles, which is much superior to recent data of metal oxyhalide. The excellent charge/discharge cyclability is associated with the strong interfacial coupling that significantly reinforces charge transfer and structural stability of the electrode. At the same time, the remarkable mechanical stretching could mitigate the volume expansion and hence maintain the integrity of BOC nanosheets during cycling. Finally, we fabricate the full battery using NVP as the cathode and BOC as the anode showing excellent cyclability

Prof. Sujan Debnath
Head of Mechanical Engineering, Curtin University, Malaysia

Mechanical Performance of Lignocellulosic Biomass-Based Polymer Composites

BIO:

Dr. Sujan (CEng MIMechE) Joined Curtin University, Sarawak Malaysia in October 2008 after completion of two years tenure in Multimedia University, Malaysia. Since 2014, he has been appointed as the Head of Mechanical Engineering, Curtin Sarawak. Dr. Sujan obtained his PhD Degree from the University of Science Malaysia in 2006 majoring applied mechanics with specific research focuses on interfacial thermal mismatch stress analysis in layered structure.

Over the years, he has been working in the area of thermo-mechanical stress analysis, green composite materials, and polymer composite materials. He has more than 65 publications in reputable international journals and conference proceedings.

At present, Dr. Sujan is supervising four PhD and three MPhil students. Dr. Sujan is a Chartered Engineer and member of the Institute of Mechanical Engineers, UK.

ABSTRACT:

Lignocellulosic bio-mass or natural fibers have the potential to be processed to produce the cellulosic fibers. Cellulosic fibers in micro and nano scales are attractive to replace man-made fibers as reinforcement to create environmentally friendly products. Various types of cellulose and nanocellulose can be used straightaway or converted into unique forms of reinforcement, including distributed reinforcements, planar reinforcements, or continuous networked structures. Although there have been many promising achievements in the development and application of cellulosic nanocomposites under lab/pilot-scale conditions, there are several challenges relating to the capacity to produce cellulose-based composites at large-scale. This presentation attempts to address the opportunities and challenges of utilization of lignocellulosic bio-mass in polymer bio-composites. The key challenges related to the compatibility between polymer matrix and the lignocellulosic fiber and the research conducted by the author in this direction are also highlighted in this presentation.

Assoc. Prof. Vincent Lee Chieng Chen
Curtin University, Malaysia

Palm Oil as Alternate Cutting Fluid for Machining Processes

BIO: Dr. Lee is an Associate Professor of Mechanical Engineering at Curtin University Malaysia. He is a Chartered Engineer (CEng) registered with the Engineering Council (UK), Chartered Scientist (CSci) with the Science Council (UK), and a Project Management Professional (PMP). He received his Bachelor of Engineering with Honours, and Doctor of Philosophy from The University of Nottingham in 2009 and 2013, respectively. He joined Curtin University Malaysia in 2013. Prior joining Curtin University Sarawak Malaysia, he served as a Research Engineer at Daikin Malaysia. Dr. Lee' s research focuses on the use of numerical and experimental methods of non-linear dynamics to solve engineering problems. Dr. Lee has received more than RM 200 thousand research grants from government to develop his research.

ABSTRACT: Our world is now entering a new era of high speed connectivity. It is evident in our surroundings where everything is moving in a pace faster than ever before, high speed internet i.e. 5G, building construction using 3D printings, high volume production in manufacturing, etc. The similar goes with machining processes where manufacturers are looking into innovative ways to increase its efficiency, be it on the machine itself, cutting tools or cutting fluid. This is especially true for difficult-to-cut materials such as Titanium. Titanium and its alloys are advanced materials widely used in the aircraft engines, biomedical applications, automotive applications, as well as the energy industries. However, machinability of Titanium and its alloys under high speed conditions is very challenging. While cutting fluids have been used to mitigate these challenges, these fluids have also been questioned due to the negative effects that came along. This topic introduces palm oil as the alternate cutting fluid. Palm oil has a high proportion of unsaturated fatty acids which enables the oil to provide high strength lubrication. The presence of fatty acids and polar carboxyl groups in palm oil have the ability to change the coefficient of friction and form a thin film of intermolecular layer, which promotes the boundary lubrication and significantly increases its reactivity and improve the lubricity. Therefore, it is expected that a better lubricating effect can be achieved.

Prof. Dr. Eric Dimla
RMIT University Vietnam, Vietnam

Planned Obsolescence: Aesthetic over Functional - The Emergence, Effects and Ethics

BIO:

Prof Dr Eric Dimla received the MEng (Hons) degree in Mechanical Engineering in 1994 from University College London (University of London) and did a PhD immediately after that on 'Tool condition monitoring using neural networks in metal turning operations' awarded in June 1998.

Assoc. Prof Dimla is Head of School of Science and Technology, RMIT University Vietnam. Prior to joining RMIT Vietnam, he was Dean of the Faculty of Engineering at Universiti Teknologi Brunei (UTB) and Professor of Mechanical Engineering. Preceding joining UTB, he was Academic Leader (Engineering) at Southampton Solent University UK and a Senior Lecturer in CAD and Engineering at Portsmouth University, UK. Between 1998 to early 2000, he was a postdoctoral research fellow in Robert Gordon University Aberdeen Scotland, preceding his appointment as a lecturer in De Montfort University in Leicester UK. His research interest is within the area of metal cutting tool-wear and condition monitoring/fault diagnosis, intelligent sensor fusion and signal processing for industrial applications. He has published well over 50 papers in International Journals and conferences mainly in high speed machining of metals and the application of AI techniques in metal cutting tool wear monitoring.

Prof Dimla is a chartered mechanical engineer (CEng), FIMechE and FIET as well as Fellow of the Higher Education Academy (FHEA) of the UK.

ABSTRACT:

Aesthetic Obsolescence is a form of planned obsolescence involving the alteration of superficial characteristics of a product to create a new model, and in turn make the previous undesirable, thus rendering it obsolete despite it still performing its primary function. By continually introducing new designs and discontinuing others, the manufacturer creates a cycle of fashion aided by marketing.

This paper presents a brief overview of the emergence of aesthetic obsolescence in the 1930s, and its initial utilization in the automotive industry. An attempt is made to provide an explanation for its formidable rise in the marketing strategies of the 20th century, the effects of this on the consumer, and the resulting over-consumption that created the 'disposable society'.

A selected case study of the mobile phone is subjectively used to illustrate modern exploitation of the aesthetic obsolescence strategy. The attitudes of major brands are assessed by looking at particular marketing strategies employed.

To conclude, the design issue of sustainability is dealt with in relation to an ethically sound route for the much-criticized concept of aesthetic obsolescence. Issues of sustainability in design continue to come to the forefront of the design press, and obsolescence in products is gaining more exposure. This highlights that the solution is not such a move into a static aesthetic but a transition into attractive sustainable products that accommodate the sustainable materials and processes available to the designer.

Assoc. Prof. Petr Valasek
Czech University of Life Science Prague, Czech Republic

Natural Fillers in Composite Systems

BIO: Petr Valášek is associate professor in the field Technology and mechanization of agriculture on Faculty of Engineering – Czech University of Life Sciences Prague (CULS), Czech Republic. Currently he works at the Department of Material Science and Manufacturing Technology and he is Vice-Rector for Quality of Academic Activities on CULS. He defended his dissertation thesis "Polymer particle composite systems" in the doctoral study program Special technology in the field of study quality and reliability of machines and equipment. He attended of more than hundred lectures at European universities in Italy, Estonia, Latvia, Poland, Spain, Portugal etc. He has passed several Keynote lectures at international non-European universities as well. As part of research projects, he actively participates in various international conferences, and cooperates with foreign universities (e.g. China, Malaysia, and Indonesia). Assoc. Prof. Ing. Petr Valášek, Ph.D. is the author or co-author of 94 entries in the database Scopus, h-index 15 and 44 entries in the database Web of Science. Professional interests: Composite systems, Biocomposites, Biomass usage in materials engineering, Composites with Natural Fibres, Manufacturing Technology.

ABSTRACT: At present, it is necessary to reflect the relationship to the environment more and more. Even in the field of material engineering, it is possible to work with environmentally sensitive materials. These are, for example, polymeric composites with a filler based on natural materials/fillers. However, natural materials have different properties and it is therefore necessary to use the experimental description for to define application areas. The lecture describes the chemical treatment of fillers, which leads to the optimization of interfacial interactions and describes the mechanical changes that occur in natural materials after this process. An important property of, for example, natural fibers, is their porosity, which have to also be defined because it is directly correlated with the resulting mechanical properties of the fiber. It is further necessary to optimize the composites production process, where vacuum methods are described for this purpose. Theoretical assumptions are supported by image analysis on an electron microscope.

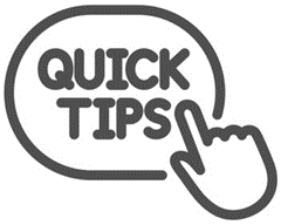
Assoc. Prof. Jamaludin Jalani
Universiti Tun Hussein Onn Malaysia, Malaysia

The Need of Robust Compliance Control for Robotic Hand

BIO: Jamaludin Jalani is an Associate Professor at the University of Tun Hussein Onn Malaysia (UTHM). Currently, he is the head of the Department of Electrical Engineering Technology, Faculty of Engineering Technology (FTK), UTHM. Before, he was the Head of the Department for Students Affair and Alumni (HEPA) at the FTK. He received a Bachelor of Engineering Degree in Electronic and Electrical Systems Engineering in 1998 from Leeds Metropolitan University in the UK. He joined and gained industrial experience at Sharp Manufacturing Malaysia from 1999 until 2002. In 2005, he received a Master of Science in Mechatronics Engineering at the International Islamic University of Malaysia. He obtained a PhD at the University of Bristol, UK in 2013. His research considers the compliant control, human-robot interaction, sensors, development of robotic hand and mechatronic system, and control system.

ABSTRACT: The focus of this project is on compliance control in robots, in particular for the humanoid robot hand, which is capable of working in the same environment as humans, able to interact with humans and to grasp any objects safely. The applications of humanoid robots, in particular in the fields of service robots, medical applications, and operation in hazardous environments are of primary importance. This requires a robot to be equipped with sensors for monitoring vital signs and emotional states. Hence, providing robust and compliance control for the robot hand can be one of the solutions to resolve safety issues. In order to provide compliance control, understanding the function of the human hand is essential. The human hand is one of the most important sensory organs and actuators of the human body. It has the capability to distinguish a touched object in various forms such as object thickness, object softness and object weight. Eventually, the hand will respond accordingly when grasping such objects without damaging them. Likewise, a robot hand should be able to perform the same tasks before entering the human environment. Different compliance control strategies are proposed in this project to mimic the same or close to human hand characteristics and performance.

Parallel Sessions



- ✓ Please arrive at the session 15 minutes earlier to copy your files for presentation to conference computer.
- ✓ It is recommended bringing two versions of your presentation files on USB in case of any error.
- ✓ There will be a session group photo part at the end of each session.
- ✓ One best paper will be chosen after each session and the certificate will be awarded by the chair.
- ✓ Please note no food or drink is allowed in the room.

Session 1: Material Science

Chair: Prof. Sujan Debnath, Curtin University, Malaysia

15:30-17:15 Venue: Luyang Room-1F

MT021 **15:30-15:45**	Enhancing Mechanical Performance of Bagasse Fiber-Epoxy Composite by Surface Treatment Abdul Hamid Abdullah, **Sujan Debnath**, Mahmodd Anwar and Wong Felix Wei Zie Curtin University, Malaysia Abstract: Surface treatment is one of the methods used to enhance the mechanical performance of natural fiber composite by improving the compatibility of fiber and matrix. Nevertheless, no proof can be shown on which surface treatment is the absolute solution in improving the mechanical properties of natural fiber composite. Different surface treatments might have needed for different kinds of natural fiber composites. In this research work, water, alkaline, permanganate, bleaching and acetylation treatment on bagasse fiber are evaluated and the effect of soaking temperature as well as the effect of fiber loading are investigated. The mechanical performance of bagasse fiber-epoxy composite was studied by carrying out three-point bending test and optical microscopy test. Among 0w/w% and 5w/w% fiber loading, composite with 1w/w% and 2w/w% fiber loading possessed the highest flexural strength and modulus respectively. However, poor wettability between fiber and matrix was observed at higher fiber loading. Water, bleaching, permanganate and acetylation treatment have minor positive effect on the mechanical performance of the composite, yet a great increment in flexural properties of alkali treated fiber composite was noticed such that 21.48% and 23.95% of improvement was made on flexural strength and flexural modulus respectively. Optical microscopy test indicated that alkali treatment is responsible for roughening the fiber surface, and improving the fiber wettability and dispersion. Depend on the surface treatment, effect

	of soaking temperature may vary. In some treatments, hotter soaking temperature led to faster rate of reaction, which resulted in greater surface roughening and greater cleansing effect. Despite of that, over reaction can be happened in some cases, which will result in lower flexural properties due to over damaged fiber. Hence, it was concluded that the alkaline treatment at room temperature could be the most effective surface treatment to enhance the mechanical performance of bagasse fiber-epoxy composite.
MT005 15:45-16:00	Energy consumption prediction model of SiCp/Al composite in grinding based on PSO-BP neural network **Peng Gu**, Chuanmin Zhu, Yinyue Wu, Andrea Mura Tongji University, China Abstract: As the typical particle-reinforced aluminum matrix composite, SiCp/Al composite has low density, high elastic modulus and high thermal conductivity, and is one of the most competitive metal matrix composites. Grinding is the main processing technique of SiCp/Al composite, energy consumption of the grinding process provides guidance for the energy saving, which is the aim of green manufacturing. In this paper, grinding experiments were designed and conducted to obtain the energy consumption of the grinding machine tool. The Particle Swarm Optimization(PSO) BP neural network prediction model was applied in the energy consumption prediction model of SiCp/Al composite in grinding. It showed that the Particle Swarm Optimization(PSO) BP neural network prediction model has high prediction accuracy. The prediction model of energy consumption based on PSO-BP neural network is helpful in energy saving, which contributes to greening manufacturing.
MT008 16:00-16:15	The effect of aging on the decrease in tensile strength of composites with palm oil kernel shell powder Habrova, **Petr Valasek** and Miroslav Muller Czech University of Life Science Prague, Czech Republic Abstract: Polymeric composite materials with natural renewable fillers are materials that are environmentally sensitive and can be an important alternative to conventional materials. One of the possibilities of using natural fillers is to use natural secondary sources. This paper describes the use of natural waste produced in the processing of palm oil fruits. The experiment describes a change in tensile strength due to an aging of the epoxy resin-based material and particles prepared from palm fruit (PKS). Specifically, the concentration was 30 wt. % and particle size up to 100 µm, 100-200 µm and 200-300 µm. To simulate the aging of the material, a climatic chamber was used which, at regular intervals for 840 hours, changed the ambient temperature from +70 ° C to -40 ° C and humidity. This process caused a decrease in tensile strength of 18.73 MPa for the unfilled epoxy resin and up to 19.27 MPa for the composite system. Comparison with unfilled

	resin was used to describe the effect of PKS particles on the aging rate. Interphase interaction was described by electron microscopy.
MT0002 16:15-16:30	The Development of Sensing Architecture for Inferior Alveolar Nerve Block Clinical Simulator Kit **S Z Zainudin[1]**, M H Mohd Ramli[1], T I B Tengku Jamaluddin[2], H Abdul Wahab[2], A Husin[2] and S A Abdullah[1], [1]Faculty of Mechanical Engineering, Universiti Teknologi MARA, Malaysia [2]Centre of Oral & Maxillofacial Surgery Studies, Faculty of Dentistry, Universiti Teknologi MARA, Malaysia Abstract: This paper presents the development of sensing architecture for Inferior Alveolar Nerve Block (IANB) clinical simulator kit. The ultimate objective of this project is to emulate the environment of anaesthesia administration on an IANB which considers the integration of 3D printing technology and internet of things (IoT) concept. The 3D model of a lower jaw is obtained through Digital Imaging and Communications in Medicine (DICOM) data via dental Cone Beam Computed Tomography (CBCT) on a patient. The obtained model is further refined to facilitate the integration of the electronic circuit by utilization of a commercial computer-aided design (CAD) software package. The printed model is then integrated with a sensing mechanism to provide real-time data feedback during simulation of local anaesthesia administration training. From the validation results, it shows that the prototype able to give real-time data feedback and display the results on the user interface.
MT009 16:30-16:45	An Experimentally and Numerically Comparison between E-Glass/Epoxy and Basalt/Epoxy pipes Pressurized Internally **Thamir A. D. M. S. Almula**, Ikram H. Amori, Mohd Yazid Yahya, Amran Ayob Northern Technical University, Iraq Abstract: The current composite pipes such as E-glass have better properties compared to metallic pipes. However, these pipes are prone to failure during its service life. In contrast, natural fiber such as basalt fiber composite pipes has better mechanical characteristics compared to current composite pipes. Hoop tensile, longitudinal tensile and internal pressure loads were carried out through experimentally and numerically investigation on the basalt/epoxy and E-glass/epoxy pipe performance. The basalt/epoxy and E-glass/epoxy composite pipes have been manufactured with ±55o winding angle using dry filament winding with impregnation of epoxy resin used Vacuum Infusion Process (VIP) technique and investigated. Basalt and E-glass composite pipes with winding angles of ±45o, ±55o, ±65o, ±75o were fabricated in order to assess the optimal winding angle which can resists the subjected loads. There were good agreement between numerical and experimental results have been recorded. For internal pressure test, the basalt pipes have more internal pressure carrying capacity more than E-glass by

	2.41%. Through this investigation, can be concluded that the natural based fiber of basalt can be used as a suitable replacement than E-glass, has further advantages of being cheap, abundant, renewable and easily recyclable. The also possess high strength, excellent flexural stiffness to cost ratio and low thermal conductivity.
MT019 16:45-17:00	Machinability and Delamination studies on Glass fiber reinforced polymer matrix Compositecut by Abrasive water jet Machin **Wasif Mumtaz Wani**, Madhav Murthy, Dr.S.Srinivas Srinivas and Prajwal H.V Visvesvaraya Technological University, India Abstract: Abrasive water jet machining possesses inherent technological and manufacturing advantages unmatched by most machine tools. They are generally used in automotive, marine and aerospace industries for machining of composites. However, abrasive water jet cutting of GFRP laminates possesses several challenges, such as surface finish and delamination of the cut specimen. Henceforth, more experimental work is needed to provide sufficient machinability databases for manufacturing industries. This paper presents an experimental study for cutting GFRP laminates. Different AWJM conditions including pressure, traverse speed and abrasive flow rate are analyzed using full factorial design of experiments. Machining process responses such as surface roughness (Ra), top and bottom kerf width, kerf taper, delamination of fibers have been evaluated using analysis of variance (ANOVA) technique. The optimum process parameters for AWJM of glass fiber reinforced polymers have been suggested.
MT023 17:00-17:15	Degradation Behaviour of Nanosilica Enhanced Oil Palm Empty Fruit Bunch Fiber Epoxy Composites Anslem Wong Tsu An, Sujan Debnath, **Vincent Lee Chieng Chen**, Alokesh Pramanik and Moola Mohan Reddy Curtin University, Malaysia Abstract: In recent years, studies regarding natural fiber reinforced composites have been increased as they are biodegradable with good mechanical performance therefore can help to overcome the environmental issue. As the natural fibers are easy to obtain, many industries have started to make use of natural fiber composites which are light in weight and possess good mechanical properties. However, the natural fiber composites also possess certain limitations most importantly their high moisture absorption ability which makes them incompatible at degradable environment. The fiber constituents of natural fiber composite may have different type of interactions at different environmental conditions. In addition, the involvement of nano particles in the composite may be the solution to overcome the deficiencies. In this research, the degradation behaviour of Oil palm empty fruit bunch (OPEFB) fibers reinforced epoxy composites upon exposure to degradable environmental conditions and the effect of

	adding nanoparticles have been studied. The tensile tests were conducted before and after the exposure to different environmental conditions including plain water, moist soil, brine solution, and cooking oil. Results shows that the addition of 10wt% of OPEFB fiber to the epoxy composites had improved the mechanical tensile strength up to 15.97% and composites exposed to brine solution have the most prominent sign of degradation in mechanical properties in both composites with and without nanosilica. Nevertheless, the composites with nanosilica have shown up to 24.28% improvement in tensile strength after exposure to different environmental conditions. The improvement were attributed due to filling the voids of the composites with nanosilica and good interfacial adhesion between the nanofiller, fiber, and matrix.

Session 2: Manufacturing Technology

Chair: Asst. Prof. Muhammad Azhar Ali Khan, Prince Mohammad Bin Fahd University, Saudi Arabia

15:30-17:15 Venue: Likas Room-1F

MT014 **15:30-15:45**	Simulation Based Mold Design Optimization of a Spring Flap Casting **Muhammad Azhar Ali Khan** Prince Mohammad Bin Fahd University, Saudi Arabia Abstract: The complex nature of metal casting process brings about a need to simulate it before undertaken in a foundry. Casting simulations provide insights on flow of molten metal within the mold, solidification sequence, nature and location of defects etc. Moreover, mold design can be optimized to minimize defects without undergoing physical trials-and-errors as previously practiced in traditional metal casting. This study is based on casting an ASTM A216 WCB steel spring flap for automotive suspension system using a simulation based optimized mold design. The initial and optimized mold designs are simulated in MAGMASoft for mold filling, solidification, stress distribution and defects prediction. The results of simulations and actual castings are found to be in good agreement. It is concluded that simulations are accurate in modeling casting process and in predicting defects followed by their minimization through mold design optimization. The use of auxiliary components in a carefully designed mold can lead to a nearly defect-free and high quality cast product.
MT001 **15:45-16:00**	Research on FJSP Rescheduling Execution Cost Based on Modified Genetic Algorithm Zhou Qicai, **Huang Yuankai**, Xiong Xiaolei, Zhao Jiong Tongji University, China Abstract: In order to achieve dynamic production of smart plants, it is necessary to dynamically adjust schedule for disturbances in the manufacturing process. An executable optimized rescheduling plan needs developing, so the study of rescheduling cost is necessary. Based on the essential analysis of the rescheduling problem, a new flexible job shop rescheduling execution cost is proposed. The correctness of the execution cost is illustrated by the application in a modified genetic algorithm. The result shows that the rescheduling method with the execution cost as the fitness can generate a new plan with less deviation from the original schedule, which has a great significance for actual manufacturing.
MT0003 **16:00-16:15**	Redesigning of Agarwood Extracting Machine Applying DFMA Principle M S Salim[1], **M A Lajis[1]**, Z C Ros[2], A Nawawi[3]

	[1]Sustainable Manufacturing and Recycling Technology, Advanced Manufacturing and Materials Center (SMART-AMMC), Universiti Tun Hussein Onn, Malaysia [2]Center for Diploma Studies, Universiti Tun Hussein Onn, Malaysia [3]Faculty of Engineering Technology, Universiti Tun Hussein Onn, Malaysia Abstract: This paper presents the comparative study of design efficiency of two different designs of agarwood extracting oil machines by performing using the Design for Manufacturing and Assembly (DFMA) method. The DFMA method was used as it is a well-established technique for improving the efficiency of the product leading to minimizing production costs. It also shortens product development time by reducing the number of components in a product. The study used two different designs of agarwood extracting oil machines as a case study. The result shows that the percentage of the design efficiency of existing design model 1 is 9.25%, whereas it is 15% of redesign. Thus, the redesign model 2 is much better as compared to existing design model 1 in terms of its assembly operation and design efficiency. Therefore, the redesign model 2 is greener than existing design model 1. Therefore, the application of the DFMA method to enhance the development of an agarwood extracting product has been proven to be highly useful in the design work.
MT011 16:15-16:30	Value-driven Manufacturing Planning using Cloud-based Evolutionary Optimisation Shuai Zhao, Piotr Dziurzanski and **Leandro Indrusiak** University of York, UK Abstract: This paper considers manufacturing planning and scheduling of manufacturing orders whose value decreases over time. The value decrease is modelled with a so-called value curve. Two genetic-algorithm-based methods for multi-objective optimisation has been proposed, implemented and deployed to a cloud. The first proposed method allocates and schedules manufacturing of all the ordered elements optimising both the makespan and the total value, whereas the second method selects only the profitable orders for manufacturing. The proposed evolutionary optimisation has been performed for a set of real-world-inspired manufacturing orders. Both the methods yield a similar total value, but the latter method leads to a shorter makespan.
MT0004 16:30-16:45	Development of Two-Fingered Underactuated Robot Gripper using 3D Printer **Amirul Syafiq Sadun**, Jamaludin Jalani, Siti Hana Nasir, Mohd Nazrul Roslan, Hairulazwan Hashim, Syazwani Mohd Anuar. Faculty of Engineering Technology, Universiti Tun Hussein Onn, Kampus Pagoh, Malaysia Abstract: This research presents the development of a two-fingered underactuated robot gripper by using 3D printed machine with a material of Polylactic acid or PLA. The gripper design consists of two individual servo motors that drives the finger movement to

	perform a certain amount of grasping force. The new design of the finger using Solidworks was inspired by several existing robot gripper however with a low cost approach to obtain a good finger tracking and angular control. The fully fabricated and assembled gripper was then tested to determine the operation results during basic grasping and ungrasping by connected to Arduino Mega and MATLAB software. The angular data during the operation shows that the gripper successfully perform a stable operations despite some minor disturbance due to the mechanical defect on the servo plate. Further analysis will be conducted in the future in order to identify the full capability of the gripper in real world application such as force control operations.
MT015 16:45-17:00	Comparison and transmission studies of commercial glass and laminated glass with PDLC film for heat resistant and other building structure applications **Pornnapha Mangthong**, Phalatt leowkijsiri, Nattapon Srisittipokakun and Jakrapong Kaewkhao Nakhon Pathom Rajabhat University, Thailand Abstract: The work emphasizes on energy saving in multi-layered glasses. Appropriate multi-layer designing was envisaged with various possibility and measured the transmittance of light in UV-Vis-NIR range. Various glasses were selected to study their transmittance for their specific advantages among each other for designing the multi-layer.Visible region showing higher transmittance revealing that these glasses allows more light in this range. While in the IR region these glasses show less transmittance revealing that these glasses doesn't transmit much heat, this being the interest of study to stack the glasses for multi-layered glass with smart film then subjected to study their optical behavior and understood their energy saving phenomenon from window 6 program to obtain Solar Heat Gain Coefficient (SHGC) and Light to Solar Gain (LSG) data. Such multi-layered glasses can be used as a database in industrial plants.
MT0005 17:00-17:15	Automatic fire fighting robot with notification **J Jalani**, D Misman and L C Hong Department of Electrical Engineering Technology (JTKE) Faculty of Engineering Technology (FTK) Universiti Tun Hussein Onn Malaysia Abstract: In real life, fire accidents can happen anytime and anywhere that hardly controllable. Fire can damage the buildings, kill humans and may cause unpredictable losses. In addition, the death not only from burnt, but also from smoke inhalation and toxic gases. This project is to develop the fire security system that allows us to warn and monitor the fire. However, human are incapable to detect the burnt in the unreachable location. In addition, human, also may take a longer time to extinguish the fire. Therefore, an automatic firefighting robot has been designed and present in this study. This robot used 3 flame sensors to detect the fire. It also equipped with 3 ultrasonic

	sensors for obstacle avoiding protecting the robot and the internal components from any obstacles. Each sensor on the robot is controlled by an Arduino. Apart from the sensors, the robot is also equipped with the water tank that produces water once the fire is detected. The robot will move randomly in the room when it power on. When the flame sensors detected the fire, the robot will move to the fire source and send a warning message to the user. After the robot reached the fire area, it will stop before the robot hit the flame. Then the robot extinguishes the fire by using water.

18:00-20:00 Dinner Time

Poster Session

MT018	Digital Twin Process and Simulation Operation Control Technology for Intelligent Manufacturing Unit He Yichao, Zhang Niansong, Wang Aimin Nanjing University of Science and Technology, China Abstract: In the manufacturing process, the intelligent manufacturing unit will produce unexpected situations with different forms and a large amount of data. How to control the intelligent manufacturing unit more intuitively and effectively control the operation and control of the trolley is an urgent problem to be solved. This paper proposes a digital twin process and simulation operation control technology for intelligent manufacturing units, including virtual workshop and actual workshop real-time mapping technology and digital twin-based simulation control technology. Through these two technical means, intelligent manufacturing unit realized visual real-time management and control. In the end, the author designed an intelligent manufacturing unit management system to successfully verify the effectiveness of the above technology.
MT0006	A Novel Robust Adaptive and Compound Control of an Adaptive Neural Network, SMC and PI for Manipulators Duc Ha Vu[1,2], Shoudao Huang[1] and Thi Diep Tran[1,2] [1]College of Electrical and Information Engineering, Hunan University, Hunan, P.R. China [2]Faculty of Electrical Engineering, Sao Do University, Hai Duong, Vietnam Abstract: In this paper, a new compound control scheme is proposed for manipulator based on radial basis function neural network (RBFNNs), sliding mode controller (SMC) and proportional–integral (PI) controller. In this control scheme, the filtered tracking error is the input of the RBFNNs update laws, SMC, and PI controller. The RBFNNs uses three-layer to approximate uncertain nonlinear manipulator dynamics. A robust sliding function is selected as a second controller to guarantee the stability and robustness under various environments. By using additional PI controllers, the goal of manipulator tuning is to minimize chattering signal, tracking performance, and overshoot can be realized. Simulation results highlight performance of the controller to compensate the approximate errors and its simpleness in the adaptive parameter tuning process. To be concluded, the controller is suitable for robust adaptive control and can be used as supplementary of traditional neural network (NN) controllers.

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