Introduction

International Conference on Thermal Engineering Theory and Applications (ICTEA) series was inspired to help and to provide an opportunity for professional development of scientists and engineers in the Middle East, including the Gulf region and North Africa. The need for such development persists, despite the strong commitment of regional governments in order to improve the undergraduate education and to build research capabilities in institutions of higher learning. Until recently, attracting highly motivated academic staff to advance research agendas and to make significant contributions to GDP growth were not among the top priorities. But, thanks to the foresight of regional leaders, higher education in this part of the world is starting to change. However, the fact remains that highly skilled scientists and engineers in the region who are dedicated to research, often must seek work abroad in academic and research institutions in order to develop themselves professionally.

Well-defined and focused high quality scientific/technical meetings dedicated to contacts between the academics and researchers in regional institutions of higher learning and their counterparts abroad are scarce. The purpose of starting a biannual international conference ideally to be rotated around the Middle East, Gulf and North African region countries was and still is to meet this need and to provide a well-structured platform to boost research activity and productivity in the region as well as providing a point of contact and networking. Such a conference can serve as a focal point for the gathering of scientists and engineers who hail from this region and who are working abroad in Europe, North America and other industrialized parts of the world. Thermal Engineering was selected as an umbrella title for the Conference series because of its encompassing meaning and because this research area is of great importance to the region. Topics relevant to environment, energy, petroleum, and construction are obvious examples of thermal engineering applications which are crucial to the economic development of the region.

Sunday, February 26, 2017

Opening Ceremony

(Conference Hall)

07:30 – 09:00	**Registration**
09:00 – 10:00	**Opening Session**
	Holy Quran
	Welcome Addresses
	Prof. Abdullah Al-Badi *Dean, College of Engineering, SQU*
	Prof. Ziad Saghir *Ryerson University, Canada*
	Keynote Speakers
	Mr. Ishaq Al Sarhni *General Manager Engineering, Duqm Refinery, Oman* *Industrial Application of Thermal Engineering*
	Prof. Andy Ford *Director, London South Bank University, UK* *Efficient and Renewable Energy in Buildings (CEREB)*
10:00 – 10:30	**Coffee Break**

Sunday, February 26, 2017

Session 1: Numerical Methods in Fluid Flow and Heat Transfer (I)

(Conference Hall)

Session Chair: Dr. Ala'a Al-Muhtaseb
Sultan Qaboos University, Oman

10:30 – 11:00 **Invited Speaker:**

Modeling and Optimization of Practical Thermal Systems to Enhance Output and Reduce Environmental Effect
Professor Yogesh Jaluria
Rutgers University, USA

11: 00 – 11:20 **Investigation of the Flue-Wall Aging Effects on the Anode Baking Furnace Performance.**
Mouna Zaidani, Rashid Abu Al-Rub, Abdul Raouf Tajik, Tariq Shamim

11:20 – 11:40 **Solution of the Reactor Point Neutron Kinetic Equations with Temperature Feedback Control using Matlab-Simulink Toolbox**
Mai Ismail, Dana Abulaban, Filippo Genco, Mohammad Alkhedher

11:40 – 12:00 **A Real-Time Injection Control System for Transient Operation of IC Engines**
Patrick Rushton, Gaganpreet Sidhu, Seshasai Srinivasan

12:00 – 12:20 **Thermal Characteristics of Taylor Bubble Flow**
Hassan Shaban, Stavros Tavoularis

12:20 – 12:40 **A Numerical Analysis of Casing Groove Parameters on the Performance of Wave Energy Conversion Device**
Paresh Halder, Francis Amal Varghese, Afzal Husain, Abdus Samad

13:00 – 14:00 **Lunch & Prayer**

Sunday, February 26, 2017

Session 2: Renewable Energy

(Conference Hall)

Session Chair: Dr. Baback Fakhim
Portsmouth University, Australia

14:00 – 14:30 **Invited Speaker:**

Investigation of Hydrogen Production using Chemical Looping Reforming
Professor Tariq Shamim
Masdar Institute of Science and Technology, UAE

14:30 – 14:50 **Numerical Simulations of Silicon Nanoparticles using Modeified Kuramoto-Sivashinsky Equation**
Giacinto Genco, Filippo Genco

14:50 – 15:10 **Novel Trigeneration Analysis Model (Tam) for Assessing Optimal Cooling and Cchp Scenarios in Urban New Developments**
Princess Opara, Issa Chaer, Tony Day

15:10 – 15:30 **Combustion and Emission Performance Characteristics of Diesel Engine using Ethanol/Water Mix Blended Diesel Fuel**
Mohammed Mahjoub, Uzaldin Sadick, Abdul Hussain

15:30 – 15:50 **Clean Fuel Production from Waste Date Pits**
Farrukh Jamil, Ala'a H. Al-Muhtaseb, Lamya Al-Haj , Mohab A. Al-Hinai, Mahad Baawin, Ghulam Murshid

15:50 – 16:10 **A Feasibility Study of an Integrated Air Conditioning, Desalination and Marine Permaculture System in Oman**
Muthukumar Ramaswamy, Brian Von Herzen, Theresa Theuretzbacher, Jim Newman, Marissa Webber

16:10 – 16:30 **Study of Energy Utilization Scenario in Bangladesh**
Mohammad Iqbal, Abm Abdul Malek, Salma Akhter, Mohammad Farhad Howladar, Ahm Shamsuzzoha

16:30 – 17:00 **Coffee Break**

Sunday, February 26, 2017

Session 3: Numerical Methods in Fluid Flow and Heat Transfer (II)

(Conference Hall)

Session Chair: Dr. Hasan Abdellatif Hasan
Sultan Qaboos University, Oman

17:00- 17:30 **Invited Speaker:**

Multi-physics and Multi-phase Modeling of Engineering and Natural Processes using CFD
Dr. Seshasai Srinivasan
McMaster University, Canada

17:30 – 17:50 **Exergetic Appraisal of the of Data Centers Cooling :Theory and Applications**
Babak Fakhim, Steven W. Armfield, Masud Behnia

19:00 – 22:00 **Reception Banquet**

Monday, February 27, 2017

Session 1: Multi-Phase Flow and Heat Transfer

(Conference Hall)

Session Chair: Dr. Muhammad Rashid Usman
Sultan Qaboos University, Oman

09:00 – 09:20	**Aliphatic and Aromatic Separation using Deep Eutectic Solvents as Extracting Agents** *Aminu Mohammad, Jamil Naser, Farouq Mjalli*
09:20 – 09:40	**Flow of Two Phase Simulated Fuel-Peg200 in Small Channels** *Marwah Alazzawi, Talal Al Wahaibi, Farouk Mjalli, Abdul-Aziz Al-Hashmi, Basim Abu-Jdail*
09:40 – 10:00	**Dynamics of the Jet Thrust of a Pulsed Detonation Combustor in the Course of Burning Oxygen-Enriched Heptane/Air Mixtures** *Khaled Alhussan, Mohamad Assad, Oleg Penyazkov*
10:00 – 10:20	**A New Modelling Approach for Two-Phase Pressure Drop in Combining Tee Junctions** *Weicheng Wu, Gavin Joyce, Hassan Soliman*
10:30 – 11:00	**Coffee Break**

Monday, February 27, 2017

Session 2: Micro/Nano Heat Transfer

(Conference Hall)

Session Chair: Dr. Emad Elnajjar
UAE University, UAE

11:00 – 11:30 **Invited Speaker:**

Nanotechnology: Applications, Opportunities and Challenges
Professor Ahmed S. Khan
DeVry University, USA

11:30 – 11:50 **Vibration of Gold Nano Beam in Context of Two-Temperature Generalized Thermoelasticity without Energy Dissipation**
Hamdy Youssef, Najat Al-Ghamdi

11:50 – 12:10 **Estimation of Thermodiffusion Factor for Binary Hydrocarbon Mixtures using an Enhanced Non-Equilibrium Molecular Dynamics Algorithm**
Hoda Mozaffari, Seshasai Srinivasan, Ziad Saghir

12:10 – 12:30 **Estimation of Thermophysical Properties of PCM Material**
Tahar Loulou, Patrick Glouannec

12:30 – 12:50 **Simulation of a Hydrogen Fueled Mobile Power Plant Based on a Sustainable Organic Hydride**
Muhammad R Usman, Muhammad S Akram

13:00 – 14:00 **Lunch & Prayer**

Monday, February 27, 2017

Session 3: Numerical Methods in Fluid Flow and Heat Transfer (III)

(Conference Hall)

Session Chair: Dr. Issa Chaer
London South Bank University, UK

14:00 – 14:30 **Invited Speaker:**

Designer Solvents; New Findings and Challenges
Dr. Farouq. S. Mjalli
Sultan Qaboos University, Oman

14:30 – 14:50 **Influence of Insect Screens Porosity on Greenhouse Climate: Cfd Approach**
Nacima Tadj, Belkacem Draoui, Constantinos Kittas

14:50 – 15:10 **Development of Novel Magnetostrictive Energy Harvester**
Mojtaba Ghodsi, Hamidreza Ziaiefar, Samir Emam, Khurshid Alam

15:10 – 15:30 **A Heuristic Algorithm for Optimal Design and Thermomechanical Processing of High Carbon Bainitic Steels**
Gaganpreet Sidhu, Seshasai Srinivasan, Sanjiwan Bhole

15:30 – 15:50 **Investigation of Suitable Oxygen Carriers for Chemical Looping Reforming**
Mohammed Khan, Tariq Shamim

16:00 – 16:30 **Coffee Break**

16:30 – 22:00 **Sightseeing Tour and Dinner**

Tuesday, February 28, 2017

Session 1: Heat and Mass Transfer (I)

(Conference Hall)

Session Chair: Dr. Tariq Shamim
Masdar Institute of Science and Technology, UAE

08:30 – 09:00 **Invited Speaker:**

Water Desalination by Humidification-Dehumidification Process Powered by Solar Energy
Professor M. K. Abu Arabi
Kuwait University, Kuwait

09:00 – 09:20 **Chaotic Mixing using Vortex in a Cylindrical Micromixer**
Amin Safi, Mohammad Hamdan, Emad Elnajjar, Afzal Hussain

09:20 – 09:40 **Parametric Study of Raised-Floor Data Centres to Improve the Cooling Efficiency**
Babak Fakhim, Steven W. Armfield, Masud Behnia, Atef Badr

09:40 – 10:00 **Thermal Characteristics and State Diagram of Freeze-Dried Broccoli: Freezing Curve, Maximal-Freeze-Concentration Condition, Glass Line and Solids-Melting**
Sithara Suresh, Nasser Al-Habsi, Nejib Guizani, Mohammad Shafiur Rahman

10:00 – 10:30 **Coffee Break**

Tuesday, February 28, 2017

Session 1 (A): Heat and Mass Transfer (II)

(Exhibition Hall)

Session Chair: Dr. Seshasai Srinivasan
McMaster University, Canada

09:00 – 09:20 **Production of Irrigation Water by Crystallization of Salts from Reject Water of Solvay Process**
Hameed Muhamad, Omar Chaalal

09:20 – 09:40 **Characterizing the Thermal Inertia of Building Envelope: Experimental Measurement of the Effective Heat Capacity**
Berangere Lartigue, Mactar Faye

09:40 – 10:00 **Multi-Objective Optimization of Fed-Batch Bioreactor Towards Lysine Production**
Ashish M. Gujarathi, Badriya Al-Siyabi, Nallusami Siva Kumar

10:00 – 10:30 **Coffee Break**

Tuesday, February 28, 2017

Session 2: Fuel/Porous Media

(Conference Hall)

Session Chair: Dr. Ashish Gujarathi
Sultan Qaboos University, Oman

10:30 – 11:00 **Invited Speaker:**

A Novel Thermochemical Model for Nanomaterials
Professor M. R. Islam
Dalhousie University, Canada

11:00 – 11:20 **The Effect of Date Seeds Size and Type on the Oil Extraction Percentage**
Emad Elnajjar, Sulaiman Al-Zuhai, Salah Al Omari, Ali Alnagbi, Shereen Hasan

11:20 – 11:40 **Study and Analysis the Physical Properties of Oman Date Palms Compare to Date Palm of Al-Madina**
Ahmmed Saadi Ibrahim, Abduallah Khamis Ali Al Saidi

11:40 – 12:00 **Evaporation and Heat Convection through a Smartly Designed Structured Topsoil**
Kacimov Anvar, Al-Maktoumi Ali, Said A-Ismaily, Yurii Obnosov, Hamed A-Busaidi

12:00 – 12:20 **Thermal Conductivity Measurements in Phase Change Polymer Composites Doped with Carbon Nanotubes**
Andre Bontemps, Seyed-Amir Bahrani, ReMy Osipian, Essole Padayodi, Laurent Royon

12:20 – 12:40 **Pool Boiling Heat Transfer in Dielectric Fluids for Electronic Cooling**
Wei Tong, Simiao Fan, Fei Duan

13:00 – 14:00 **Lunch & Prayer**

Tuesday, February 28, 2017

Session 2 (A): Thermo Fluid

(Exhibition Hall)

Session Chair: Dr. Hameed Mohamad
Abu Dhabi University, UAE

11:00 – 11:20	**Discrimination of Models for Hydrodynamics in a Turbulent Bed Contactor (Tbc) with Non-Newtonian Fluids** *Hadil Abu Khalifeh, Chandra Mouli R. Madhuranthakam, Ramdhane Dhib*
11:20 – 11:40	**An Experimental Technique for Measuring Minimum Miscibility Pressure** *Waqar Ahmad Butt, Gholamreza Vakili Nezhaad, Ali Al-Bemani, Yahya Al-Wahaibi, Ali Vakilinejad*
11:40 – 12:00	**Growing Axially Uniform Low Silicon Content Sige Crystals using Liquid Phase Diffusion: A Numerical Investigation** *Mandeep Sekhon*
12:00 – 12:20	**Experimental Investigation of Thermal Performance of Bi-Porous Wicks for Loop Heat Pipe Evaporator using Ir Thermography** *Prem Kumar, Bhimashankar Wangaskar, Sameer Khandekar, Kantesh Balani*
12:20 – 12:40	**Volumetric Behavior Study of Petroleum Fluids Mixtures through Shrinkage Factor** *Ali Vakilinejad, Waqar Ahmad Butt, Gholamreza Vakili-Nezhaad*
13:00 – 14:00	**Lunch & Prayer**

Tuesday, February 28, 2017

Session 3: Numerical Methods in Fluid Flow and Heat Transfer (IV)

(Conference Hall)

Session Chair: Dr. Stavros Tavoularis
University of Ottawa, Canada

14:00 – 14:30 **Invited Speaker:**

Modeling and Simulations
Professor Dean Vucinic
Vrije Universiteit Brussel, Belgium

14:30 – 14:50 **Thermal Performances of Heat Transfer Devices with Self-rewetting Fluid**
Stephan Van Vaerenbergh

14:50 – 15:10 **Modified Diesel Fuel of Omani Engine Oils using Bio Waste**
Ahmmed Saadi Ibrahim, Zainab Ahmed, Lamees Mohammed, Lamia Ali, Muna Aqeel

15:10 – 15:30 **Boundary Conditions Effects on the Mixed Convection in a Square Cavity Filled with Air**
Bachir Meziani, Massinissa Adnani, Ouerdia Ourrad

15:30 – 16:00 **Coffee Break**

16:00 – 16:20 **Convective Heat Transfer in Vertical Annular Channels**
Stavros Tavoularis, Abdulkarim Busedra, Mathieu Nicolay, Nathan Kline

16:20 – 16:40 **A Numerical Study on Turbulent Flow Characteristics in the Near Field of Co-axial Jets**
Sayeed Mohammed, Maliha Farruz, Sumon Saha, Mohammad Nasim Hassan

16:40 – 17:00 **Performance Analysis of a Horizontal Anode Baking Furnace for Aluminum Production**
Abdul Tajik, Tariq Shamim, Rashid Al-Rub, Mouna Zaidani

Tuesday, February 28, 2017

Session 3 (A): Numerical Methods in Fluid Flow and Heat Transfer (V)

(Exhibition Hall)

Session Chair: Dr. Fei Duan
Nanyang Technological University, Singapore

14:30 – 14:50	**Experimental Analyses of Natural Convection and Radiation Heat Transfer from a Horizontal Cylinder** *Himangshu Bhowmik, Ahmed Faisal*
14:50 – 15:10	**A Fuzzy Virtual Temperature Sensor for an Irradiative Enclosure** *Morteza Mohammadzaheri*
15:10 – 15:30	**Effect of the Length of the Spike Attached to the Blunt Nose on Drag Reduction at Mach 6** *Ziba Eghlima, Kamyar Mansour*
15:30 – 16:00	**Coffee Break**
16:00 – 16:20	**Assessment of Turbulence Models for Turbulent Heat Transfer in Axi-Symmetric Pipe Flow** *Saikat Saha, Indrajit Nandi, Sabir Subedi, Mohammad Nasim Hasan, Sumon Saha*
16:20 – 16:40	**Weathering of Stored Liquefied Natural Gas (Lng)** *Calogero Migliore, Amin Salehi, Velisa Vesovic*
16:40 – 17:00	**Deep Desulfurization with Deep Eutectic Solvent using Small Channels** *Zainab Al-Ani, Farouq Mjalli, Talal Al-Wahaibi, Abdul-Aziz Al-Hashmi, Basim Abu-Jdayil*

Poster Session

Monday, 27 February 2017
14:30 – 16:30
(Exhibition Hall)

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

- **Experimental Investigation of using Al_2O_3 Water Nanofluid Flow in Aluminum Foam Heat Sink**
  Ayman M. Bayomy, M. Ziad Saghir

- **Innovation in Oil: A sustainable EOR Technique for High Salinity and High Temperature Formations**
  Omar Chaalal, Hameed Mohamad

- **Evolutionary Approach to Find Kinetic Parameters for Bioreactor for Lactic Acid Production**
  Asma Khalid Al-Harthi, Ashish M Gujarathi, Gholmamreza Vakili-Nejad

- **Detailed Analysis of Mdea Based Gas Sweetening Process**
  Debasish Tikadar, Ashish M. Gujarathi, Chandan Guria

- **A CFD Model for Air Flow vs Pressure Loss Coefficient in Hvac Circular Ducts with a Motorized Damper**
  Samir Moujaes, Annabattulla Pallavi

- **Conceptual Modeling and Analysis of a Solar Receiver for Thermochemical Hydrogen Generation**
  Samir Moujaes, Derek Taguchi

- **High Temperature PEM Fuel Cell (HTPEM)**
  Tawfiq J. Jaber, Mohamad Ahmad Sulaiman , Rihab Jaralla

- **Impact of Urban Density on Energy Consumption**
  Naima Fezziou, Belkacem Draoui,Claude-Alain Roulet

- **Experimental and Simulating Study of Water Immersion Cooling of Canned Carrot Puree**
  Hakima Acheheb, Amina Adjout, Sabrine Gouba

- **Application Acu-Wcns Schemes in Problems with Severe Shocks**
  Kaveh Fardipour, Kamyar Mansour

- **Numerical Study of a Vertical Axis Wind Turbine in Unsteady Inflow**
  Kamyar Mansour, Hamid Reza Ahmadi

- **Lateral Ejection During Fusion Laser Cutting Process**
  Samia Aggoune, El-Hachemi Amara

- **A Study of Gasoline Flow through Sand by Changing the Angle of Cylindrical Reservoir with Respect to Vertical**
  Ahmmed Saadi Ibrahim, Alyaa Musallam, Nidhal Ali

- **A Study of Gasoline Flow through Sand by Changing the Height of Cylindrical Reservoir with Respect to Vertical**
  Ahmmed Saadi Ibrahim, Noor Salim Almasshaani , Tufool Amor Almashiki, Latifa Said Alkathiri, Nada Mohammed

- **A Study and Analysis of Gasoline Flow Rate through Sand by Changing the Diameter of Cylindrical Reservoir**
  Ahmmed Saadi Ibrahim, Mohammed Said Masoud Al Amri , Hamid Issa Musallam Al Awaid , Shihab Ahmed Omar Al Safiyan , Saeed Ali Mohammed Rafeet

- **The High Performance of the High-Aspect-Ratio Film-Cooling Scheme**
  Hao-Ming Li, Wahid Ghaly, Ibrahim Hassan

- **Numerical and Experimental Approaches to Study the Effect tf Humidity tnd Cement Content on the Thermal Conductivity of Compressed Earth Block**
  Najat Zakham, Kamal Gueraoui, Hamid Bouabid

- **Study of the Possibility to Industrial Symbiosis within Selected Omani Smes**
  Abdullah Al-Harrasi, Ali Abu Qasida, Hamza Al-Qassabi, Ahm Shamsuzzoha

- **An Evaluation of the Performance of Mixture Viscosity Correlations on the Prediction of Pressure Drop in Horizontal Dispersed Oil-Water Flow**
  Ebtisam Al-Nassri, Talal Al-Wahaibi, Yahya Al-Wahaibi, Abdul-Aziz Al-Hashmi

Invited Speakers

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Industrial Application of Thermal Engineering
Mr. Ishaq Mohammed Al Sarhni

Mr. Al Sarhni is the General Manager of Engineering at Duqm Refinery & Petrochemical Industries Company. He provides executive leadership to the engineering department responsible for designing the new grass root oil refinery and petrochemical complex at Duqm.

Mr. Al Sarhni has more than 23 years of work experience in project engineering and management in both downstream and upstream oil and gas sectors including oil refining, LNG, petrochemical and gas processing. Al Sarhni started his career as a project engineering at Oman Refinery as a project engineer and then at Oman LNG until July 2000. Between 2007 and 2010, Al Sarhni took the role of Senior Project Manager of Oman Methanol project in Sohar following his 7 years' experience at Sohar refinery. Before joining Duqm Refinery, Al Sarhni has led the engineering team in building the gas processing plant at Abu Tubul Block 60 gas field. Al Sarhni holds a Bachelor degree in Mechanical Engineering from Sultan Qaboos University and an MBA from University of Hull.

Since human discovered how to make fire, heating stared becoming important in the daily life on earth. The modern science of physics and algebra shaped this relationship to maximum benefit and seldom industries will see the light without a thermal relationship with the nature. Commercial production early 20th century have further strengthened this formula by having the fossil fuel as a primary raw material for a vast majority of commodities and consumables.

Processing fossil fuel (crude oil or natural gas) starts at oil refineries and moves to downstream petrochemical industries where heat transfer and heat conservation are key elements in these complex processes. Heat integration between various process units is equally important for plant efficiency where approximately 60% of thermal input in refinery crude units are recovered on continuous basis through preheat exchangers which would reduce fuel consumption to almost 40%. There must be more room for further integration but it is becoming increasingly challenging due to excessive cost increase. Exothermic reactions in chemical and nuclear reactors generate tremendous heat which are normally utilized within the processes but controlling the reactions is a thermal function itself. Thermal cracking is also a common process in cracking complex hydrocarbon chains into simpler valuable forms e.g. heavy fuel oil thermally cracked to produce lighter products (vis-breaking).

Natural thermal radiation is increasingly used nowadays in the echo friendly renewable energy including photovoltaic techniques, concentrated solar panels and thermal heating oil. Geothermal is also used in some occasions. Turbo machinery are based on thermal engineering where thermal energy is converted to kinetic and potential energies. This is also the case in propulsion and explosives.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Balanced Energy Network
Professor Andy Ford

Professor Andy is Director of Research and Enterprise at the School of the Built Environment and Architecture at London South Bank University and leads the Centre for Efficient and Renewable Energy in Buildings (CEREB). In 1983 at the age of 30, he left to establish his own consulting practice ‹Fulcrum Consulting› which became famed for advanced integrated low energy building design and sustainable master planning. The practice has won many industry awards. Whilst the buildings he collaborated on have won architectural acclaim. Fulcrum as a practice continued independently for 25 years and grew to 150 staff before becoming part of Mott MacDonald in 2008. Andy›s involvement with the future direction of the industry has grown over the years. Fulcrum proactively lead the industry debate around sustainability and was founding members of the UKGBC. He has had a long interest in research, innovation and knowledge transfer working as a research manager in DTI Partners in Innovation program and serving on the Modern Built Environment Knowledge Transfer Network steering group since its foundation. He was awarded the IMechE Built Environment Prize in 2008 and an honorary doctorate from Herriot Watt University in 2012.

This talk will describe progress on the construction of a demonstration ‘Balanced Energy Network’ (BEN) on LSBU’s site in central London. The Balanced Energy Network (BEN) is the first of its kind worldwide. BEN combines next generation heat networks with smart-grid technology to balance the production of heating, cooling, and electricity in a way that minimises costs and carbon emissions. BEN seeks to answer to UK’s energy trilemma: delivering secure, affordable, and sustainable energy. Using an ambient temperature ‘cold water heat network’ to move and store thermal energy, linked with heat pumps and Aquifer Thermal Energy Storage. BEN aims to provide the efficiency benefits of a heat network without the added pollution of energy centres in dense urban areas. BEN allows us to completely rethink how we provide heating and cooling services, simply moving heat away from a place that needs cooling, towards a place that needs heating ,storing the heat, either hot or cold until needed and rejecting the surplus of either at the most efficient time. No combustion, just efficient thermal energy management. That management is enabled by a cloud based aggregator that delivers ‘virtual energy storage’ This set of algorithms tells BEN systems when to turn on and off, when to store electricity as heat, or when to deliver cooling by moving heat to storage. This permits the integration of thermal storage into grid balancing demand response scenarios delivering heating, cooling, and electricity at optimal times to create a Balanced Energy Network.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Multi-physics and Multi-phase Modeling of Engineering and Natural Processes Using CFD

Dr. Seshasai Srinivasan

Dr. Seshasai Srinivasan obtained his BE in Electronics and Telecommunications from University of Mumbai in 2000. He obtained his MS in Electrical Engineering and PhD in Computational science and engineering from Michigan Technological University in 2002 and 2006, respectively. Since his PhD, he has held postdoctoral positions at the University of Wisconsin-Madison, Swiss Federal Institute of Technology and McMaster University. He is currently an assistant professor at McMaster University's School of Engineering Practice and Technology, adjunct professor at Ryerson University's Department of Mechanical and Industrial Engineering and Associate member of McMaster University's Department of Mechanical Engineering. He is the co-founder and director of GRAS Child Development and Educational Association, a non-profit Canadian start-up since 2015.

Computational Fluid Dynamics has become an indispensable tool to study and understand various engineering and natural processes. With the current state of computing power, it is convenient and feasible to apply this tool to design and investigate the outcome of process variations over a very short turn-around time, which might otherwise be expensive and more time-intensive if pursued using experimental approaches. Without undermining the importance of experimental validation, it is now an established practice to conduct a thorough feasibility analysis using CFD tools before narrowing down the search to a set of optimal solutions that are experimentally verified. In this presentation, the use of CFD to study a variety of natural and engineering processes including thermo diffusion in liquid mixtures, optimization and multi-phase flow modeling of internal combustion engines, multi-scale modeling of electrochemical processes in a lithium ion battery and food rheology will be highlighted.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Nanotechnology: Applications, Opportunities and Challenges

Professor Ahmed S Khan

Dr. Ahmed S. Khan is a Professor of Electronics and Electrical Engineering in the College of Engineering and Information Sciences at DeVry University, Addison, Illinois. Dr. Khan has Thirty-two years of experience in research, instruction, curricula design, development, evaluation, implementation and program accreditation, management and supervision. Dr. Khan received an MSEE from Michigan Technological University, an MBA from Keller Graduate School of Management, and his Ph.D. from Colorado State University. His research interests are in the areas of Nanotechnology, and Social and Ethical Implications of Technology. He teaches Wireless Engineering, Network Engineering, Fiber Optic Communications, Science Technology and Society (STS), and Project Management. He also advises students on their senior design projects. He is the author of many educational papers and presentations. He has authored/coauthored many books, including the most recent "Nanotechnology: Ethical and Social Implications," CRC Press (2012). Dr. Khan is a senior member of the Institute of Electrical and Electronics Engineering (IEEE), and a member of American Society of Engineering Education (ASEE), and has been listed in Who's Who among America's Teachers. Dr. Khan has been serving as the faculty adviser to the student chapter of IEEE at DeVry, Addison, IL since its inception in 1986. Dr. Khan also serves as an ETAC program evaluator for the ABET. There is a concern that some nanoparticles could be toxic because elements at the nano scale behave differently than they do in their bulk form and these particles could easily cross the blood-brain barrier.

Nanotechnology has many commercial applications in the area of computer technology, health care, manufacturing, environmental clean up, agriculture and others. It already has significant impact in countless industries and its full implementation will have broad economic and social impact. Innovative materials, components, and systems based on nanotechnologies are recognized as promising growth innovators for the years to come. From a macro, economic growth perspective, it is important to facilitate the ability to exploit the innovative and added value of nanotechnology into practical applications. The projected impact of nanotechnology has been touted as a second industrial revolution – not the third, fourth, or fifth, because despite similar predictions for technologies such as computers and robotics, nothing has yet eclipsed the first. Society is undergoing a revolution that will transform the ways in which materials and products are created. How will this revolution develop? The opportunities that will develop in the future will depend significantly upon the ways in which a number of challenges are met. The future opportunities in nanotechnology will significantly depend on how all stakeholders deal with its short- term and long-term benefits, limitations, uncertainties, potential risks and ethical issues. They will be tasked with navigating a variety of new challenges associated with the areas such as privacy, environment, energy, population, genetics, agriculture, food, and security.
The keynote address will cover the overview, applications and challenges of nanotechnology in many areas including the biotechnology, energy, environment, MEMS, optoelectronics, chemical, and nanoelectronics industries. The address will also cover ethical and social implications of nanotechnology on society.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Investigation of Hydrogen Production using Chemical Looping Reforming

Professor Tariq Shamim

Professor Shamim is a Professor of Mechanical Engineering at the Masdar Institute of Science and Technology, Abu Dhabi, UAE. He earned his doctorate in mechanical engineering and a master's in aerospace engineering from the University of Michigan – Ann Arbor. He also held visiting faculty appointments at the Massachusetts Institute of Technology, National University of Singapore, American University of Sharjah, N.E.D. University of Engineering & Technology, Oak. Ridge National Laboratory and Ford Motor Company.

Dr. Shamim specializes in the broad area of sustainability with special focus on clean energy technologies. His research and consulting work has been supported by several grants from the NSF, US Department of Defense, US Department of Energy, automotive, aerospace, and oil companies, and the government of Abu Dhabi. He is a fellow of the American Society of Mechanical Engineers (ASME).

Chemical looping reforming (CLR) is a relatively new method to produce hydrogen and is also used to convert solid, liquid or gaseous fuels to energy. There are various advantages of this method such as inherent carbon dioxide (CO_2) capture, minimal NOx emissions and the hydrogen production. In this process, there is no direct contact between the fuel and oxidizer. This method utilizes oxygen from an oxygen carrier which may be a transition metal. The idea is to split the combustion process into three separate sub-processes by employing three separate reactors: air reactor where the oxygen carrier is oxidized by air, fuel reactor where natural gas is oxidized to produce a stream of CO_2 and H_2O and steam reactor where the steam is reduced to produce hydrogen. This talk describes our current research program on the investigation of H_2 production using CLR. The talk will discuss the results of our recent study in which a thermodynamic model with iron oxides as oxygen carrier has been developed by employing conservation of mass and energy for all the components of the CLR system. The developed model was employed to investigate the effect of various operating parameters such as mass flow rates of air, fuel, steam and oxygen carrier (OC) and fraction of inert material on hydrogen and CO_2 production and key reactor temperatures. The results show that the H_2 production increases with the increase in air, fuel and steam flow rates up to a certain limit and stays constant for higher flow rates. The CO_2 production follows a similar trend. On the other hand, the increase in oxide flow rate and fraction of inert material increase the H_2 production up to a particular value, followed by a decreasing effect on the H_2 production. Using a statistical analysis, the interdependence of various mass flow parameters and their combined effects on H_2 production will also be presented. By comparing with other H_2 production technologies, the talk will discuss the salient features and research issues of the CLR technology. Details and challenges of the CFD and systems level modeling approaches for CLR systems will also be discussed.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Modeling and Simulations
Professor Dean Vucinic

Professor Vucinic, is member of 2 departments: Mechanical Engineering and Electronics & Informatics at the Vrije Universiteit Brussel (VUB). His Ph.D. thesis became a book in 2010, ISBN 1-3500-8383-3-978. In early 90's he developed "CFView - Computational Field Visualization System", first-time-ever interactive visualization software adapted to numerical simulation solvers, completely based on the object-oriented technology, and fully implemented in C++. During more than 27 years at VUB, he successfully participated in more than 20 European projects under the European Frameworks, EUREKA/ITEA and Tempus educational programs, where more than 20 PhD-s based their visualization and data analysis applying CFView.

The heartbeat process is considered to be the fluid-structure interaction multi-physics phenomena, and the proposed solution is based on the application of the general-purpose Computational Fluid Dynamics (CFD) Flow Vision code, and the SIMULIA Living Heart Human Model (LHHM). LHHM is a dynamic, anatomically realistic human heart model with -4chambers and further extended with 2 mechanical valves, which triggering is coupled to the multi-physics forces, generated by the electrical and mechanical fields, governing the heartbeat. The synchronous actions of such multi-physics fields regulate the heart pump functions, like blood filling and ejection. Originally, LHHM comes with a 1D fluid network model capable to simulate the dynamic pressure/ volume changes of the intra- and extra-cardiac circulation. In this approach, a full 3D blood circulation is simulated with Flow Vision, with a very detailed spatial and temporal resolutions applied for modelling the cardiac hemodynamics and the time-varying boundary conditions imposed by the motion of the beating heart. The bidirectional coupling between the Flow Vision blood flow and the LHHM structure is achieved with the SIMULIA co-simulation engine. It is envisaged that such fluid-structure interaction multi-physics simulations tools are important to design new medical devices. Especially, when considering a specific patient 3D heart geometry, which has to be simultaneously applied to the electrical, structural, and fluid heart models. In the near future, this approach might possibly create new medical treatments for the cardiovascular diseases.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Modeling and Optimization of Practical Thermal Systems to Enhance Output and Reduce Environmental Effect

Professor Yogesh Jaluria

Professor Yogesh Jaluria is Board of Governors Professor and Distinguished Professor at Rutgers, the State University of New Jersey. His research work is in the field of thermal science and engineering, covering areas like convection, fires, materials processing, thermal management of electronics, energy, and optimization of thermal systems. He is the author/co-author of eight books and editor/ coeditor of thirteen conference proceedings, eight books, and seven special issues of archival journals. He has contributed over 500 technical articles, including over 200 in archival journals. He received the prestigious 2007 Kern Award from AIChE, the 2003 Robert Henry Thurston Lecture Award from ASME, and the 2002 Max Jakob Memorial Award, the highest international recognition in heat transfer, from ASME and the AIChE. He is currently the President of the American Society of Thermal and Fluids Engineers.

The growing concerns with the environment, energy consumption, productivity and product quality have made it crucial to optimize practical thermal systems to achieve improved performance with reduced environmental impact. This paper discusses the modeling, simulation, design and optimization of thermal systems in order to address these concerns. Systems from several important application areas, such as materials processing, thermal management of electronics, heat rejection and energy are considered. Typically, thermal systems and processes are quite complex and an accurate modeling involves meeting several challenges that are commonly encountered, such as variable material properties, uncertainties, combined transport mechanisms, complex domains, complicated boundary conditions, and multi-scale phenomena. The results from the model, along with available experimental data, are then used for prediction, design and optimization. Besides reduction in energy and material consumption and in the effect on the environment, it is important to enhance the output and improve the quality of the product obtained. This paper outlines the important aspects that must be considered and the approaches that may be adopted to overcome the challenges to obtain an accurate model and an optimal design. In most cases, several objectives are of interest and multi-objective design optimization is necessary. Results for a few practical systems, such as those for power plant heat rejection and thermal management of data centers, are presented in order to illustrate the basic approach. Additional concerns and approaches are outlined for other important processes.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Water Desalination by Humidification-Dehumidification Process Powered by Solar Energy

Professor M. K. Abu Arabi

Professor Abu Arabi received his B.Sc. (1983) and Ph.D. (1988) in Chemical Engineering from Oklahoma State University, USA and M.Sc. in Chemical Engineering (1985) from New Mexico State University, USA. He then joined Jordan University of Science and Technology (JUST) in July 1990. In September 1998, he joined Sultan Qaboos University then in July 1999, he joined the Middle East Desalination Research Center (MEDRC) as a project manager. He returned to JUST on September 2005. He held several administrative positions at JUST; assistant Dean of Engineering, chairman of the Chemical Engineering Department, and Dean of Engineering.

Desalination has become one of the resources of water supply in many regions worldwide. Almost all these regions that lack fresh water supply are blessed with high solar radiation and have the space needed for solar technologies implementation. Success in implementing solar technologies in desalination depends on the progress made or to be made to convert solar energy into electrical and/or thermal energies economically. This is because desalination processes need these types of energies. Among the processes that can be powered by solar energy is the humidification-dehumidification (HDH) process. This process has shown promising potential mainly for small capacity production plants. It has several advantages such as the use of separate components for the thermal processes (evaporation and condensation), allowing each component to be independently designed and allowing more flexibility in the design of the thermodynamic cycle. In this presentation, several processes that follow the HDH principles and were investigated will be reported. As solar still represent the basic case of HDH powered by solar energy, several separate modifications have been made on solar still to make it more productive. These modifications included solar concentrators to heat the entering air along with external condenser, using additional solar collector to heat the water in the still, using falling film on inclined plate, and using additional solar collector to heat the water in the still, using falling film on inclined plate, and using rotating surface inside a solar enclosure.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Designer Solvents; New Findings and Challenges

Dr. Farouq S. Mjalli

Dr. Mjalli received his doctorate (PhD) in 2003 from the Chemical Engineering Department, University of Aston, Birmingham UK. He joined the Sultan Qaboos University (SQU) Department of Petroleum & Chemical Engineering in 2010 as an associate professor. Prior to that, Dr. Mjalli held several academic positions at Qatar University and the University of Malaya. His main field of research includes investigating alternative energy sources, fuel treatment technologies, as well as the synthesis, characterization and use of green solvents in different industrial aspects. Dr. Mjalli has published more than 150 highly ranked journal articles and technical papers and participated in many international and regional conferences. He is the recipient of the SQU best researcher award for the academic year 2013 and the international award of Best Professor in Petroleum and Oil & Gas Engineering for 2014.

Solvents are used in diverse industrial and commercial applications. The selection of these solvents is based on certain basic criteria including their solvation capability, handling and economic properties as well as their potential impact on the environment. The ever-increasing concern on environmental issues is paving the way towards replacing the conventional solvents with more benign alternatives. Few diverse routes have been suggested and some of which have been implemented for the preparation and design of efficient green solvents that can be safely and economically replace the currently used ones. One of these viable routes is through the use of ionic fluids such as ionic liquids and their analogues. In this talk, a brief overview of the solvent selection issue will be introduced from its inception. A special focus will be given to the use of ionic liquids and specifically the deep eutectic solvents. The speaker will present the SQU's green solvents research group and briefly provide highlights of some case studies and recent research efforts conducted by the group in areas involving ionic solvents for diverse separation and thermal applications. In addition, the use of these applications will be critically evaluated and challenges involved in their utilization will be emphasized and properly addressed.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

A Novel Thermochemical Model for Nanomaterials

Professor M.R. Islam

Professor Islam is known as the most published engineer in the world. He is credited to have coined terms, such as 'green petroleum' and 'sustainable petroleum development' at a time when "sustainable petroleum" was considered to be an oxymoron. In recognition of his research and teaching excellence, he has received a number of international awards, including Einstein Gold Medal of Honor, and Crown and Eagle Gold Medal for both of which Dr. Islam is the first recipient in Canada.

He is the President of Emertec Research and Development Ltd. and an adjunct Professor of Petroleum Engineering at Dalhousie University, where he was Canada's first Killam Chair in petroleum engineering during 2000 to 2005. He has written nearly 800 publications, including dozens of books and keynote speeches. He is the executive editor of Journal of Nature Science and Sustainable Technology.

Information age marks revolutionary changes in all aspects, but most notably in the domain of nanotechnology. The technological revolution involves nanomaterials, engineered or otherwise, that have great mechanical stability, high thermal conductivity, large current carrying ability, and tremendous flexibility in terms of compatibility with other materials. Because all mathematical models of nanomaterials use the same theories (ranging from sub-atomic to macro- through molecular scale), conflicting predictions of macroscopic properties of nanomaterials emerge. These contradictions have been dealt with dogmatic alterations of the governing equations, often with problematic scientific explanation. However, in this paper such contradictions are erased by starting with theories that do not invoke spurious assumptions. Spurious assumptions are removed at a fundamental level, thereby making atomic structure models consistent with macroscopic models. An immediate outcome of this approach is the elimination of two different governing equations for mass and energy balance. Consequently, there is no longer a requirement to characterize forces as gravitational, electromagnetic, and nuclear. Also rendered redundant are the concepts of molecular forces, lattice energy and its relations to properties of solid, dipole-dipole forces, London dispersion forces, van der Waal's forces, bonds, and others. By using a consistent model throughout, the need to have these notions as well as quantum mechanical narration through perturbation theory, super molecular modeling and other are avoided. The resulting model describes properties of both conventional metals and others, including semiconductors.

10th International Conference on Thermal Engineering: Theory and Applications
26 – 28th February, 2017

Conference Chairs

Rashid Al-Maamari M .Z. Saghir

ICTEA Steering Committee

R. Agarwal, USA
M. Momany, UAE
M. Kashef, UAE
M. Lappa, UK
M. Lachemi, Canada
D. Siginer, USA
M.Z. Saghir, Canada

International Scientific Committee

R. Abdeljabar, Tunisia
H. Abu Khalifeh, UAE
E. Alnajjar, UAE
S.A.B. Al Omari, UAE
A. Amirfazli, Canada
H. Arafat, UAE
C. Augustine, MA
J. Azaiez, Canada
R. Bennacer, France
H. Beji, France
M. Boutaous, France
M. Chacha, UAE
C. Ching, Canada
J. Cao, Canada
M. Darwish, Lebanon
M. El Ganaoui, France
B. Farahbakhsh, USA
J. Friedman, Canada
F. Genco, UAE
A. Hadawey, UK
M. Hamed, Canada
M. Hamdan, UAE
M. Hasnaoui, Morocco
B. Said Houari, UAE
T.J. Jaber, UAE
F. Kulacki, USA
A. Labed, Algeria
Z. Lizhi, China
T. Mare, France
A.A. Mohamad, Canada
H. Muhamad, UAE
D. Naylor, Canada
I. Pop, Romania
M. Rebay, France
H. Sammouda, Tunisia
M.Z. Saghir, Canada
D. Siginer, USA
T. Shamim, UAE
H. Sheibani, UAE
M. Shemirani, UAE
S. Srinivasan, Canada
R. Touma, Lebanon
D. Vucinic, Belgium
H. Wang, China
T. Yousefi, Iran
D. Zeidan, Jordan

Local Organizing Committee

Rashid Al-Maamari
Hasan Abdellatif Hasan
Ahmed Kharboshi
Talal Al-Wahaibi
Ghulam Murshid