## **Preface**

The 2016 5<sup>th</sup> International Conference on Engineering and Innovative Materials (ICEIM 2016) is a comprehensive conference which was focused on analysis of the latest technical status and recent trends in the research and applications of engineering materials and innovative materials. The conference also was aimed at motivating the next generation of researchers by promotion of their research results and solutions in area of engineering materials and innovative materials.

The program of the conference included invited speeches and oral presentations in sessions, including poster presentations. The invited talks were focused on the potential application of engineering materials and innovative materials in various fields of engineering and production.

The proceedings contain 50 papers which have been selected from the conference with a total submission of 98 papers. Each contributed paper was rigorously peer-reviewed by two reviewers who were drawn from a large pool of technical committee members as well as other international reviewers in the related fields.

On behalf of the organizing committee, we'd like to express our heartful gratitude to all the reviewers for their great professionalism and efforts. And thank all the participants and sponsors for their valuable contributions and support to ICEIM 2016.

Prof. Dr. Muhammad Yahaya Emeritus Professor in School of Applied Physics, UKM Malaysia September 6, 2016

# **Committee**

#### **Conference Co-Chairs**

Prof. Muhammad Yahaya, Emeritus Professor in School of Applied Physics, UKM Malaysia, Malaysia

## **Conference Program Chairs**

Prof. D. S. Robinson Smart, Karunya University, India

Prof. Hui-Mi Hsu, National Ilan University, Taiwan

### **Conference Technical Committee**

Prof. I. Sopyan, International Islamic University Malaysia, Malaysia

Prof. Azrul Azlan Hamzah, Universiti Kebangsaan Malaysia, Malaysia

Abul K. Azad, Universiti Brunei Darussalam, Brunei

Prof. Mohd Azlan Mohd Ishak, Universiti Teknologi MARA, Malaysia

Dr. N. Fatchurrohman, Universiti Malaysia Pahang, Malaysia

Ir. Dr. Faiz Mohd Turan, Universiti Malaysia Pahang, Malaysia

Dr. Ramadhansyah P. J., Universiti Teknologi Malaysia, Malaysia

Prof. Saifuddin M. Nomanbhaym, Universiti Tenaga Nasional, Malaysia

Prof. K. Shirvani, Iranian Research Organization for Science and Technology, Iran

Dr. Hilton Ahmad, Universiti Tun Hussein Onn Malaysia, Malaysia

Prof. Preecha Khantikomol, Rajamangala University of Technology Isan, Thailand

Dr. Mohd Hasmizam Razali, Universiti Malaysia Terengganu, Malaysia

Dr. Khairul Anuar Mat Amin, Universiti Malaysia Terengganu, Malaysia

Prof. Chanchai Thongpin, Silpakorn University, Thailand

Prof. Farshad Akbaripanah, Malayer Universty of Iran, Iran

Prof. Ponnusamy Pandithevan, Indian Institute of Information Technology, Design and Manufacturing Kancheepuram, Chennai, India

Prof. Dr. Natinee Lopattananon, Prince of Songkla University, Thailand

Prof. Bundit Krittacom, Rajamangala University of Technology Isan, Thailand

Prof. Dr. Hariati Taib, Universiti Tun Hussein Onn Malaysia, Malaysia

Prof. Dr. Sufizar Binti Ahmad, Universiti Tun Hussein Onn Malaysia, Malaysia

Prof. Dato' Ir Dr. Othman A. Karim, Universiti Kebangsaan Malaysia, Malaysia

Dr. Norpadzlihatun Manap, Universiti Tun Hussein Onn Malaysia, Malaysia

Dr. Mohd Idris Shah b. Ismail, Universiti Putra Malaysia, Malaysia

Dr. Ahmad Kamal Ahmad, Al-Nahrain University, Baghdad, Iraq

Dr. Saiful Izwan Abd Razak, Universiti Teknologi Malaysia, Malaysia

Assist. Prof. Manoj Sahni, Pandit Deendaval Petroleum University, Gandhinagar, Gujarat, India

Dr. Audrey Huong, University Tun Hussein Onn Malaysia, Malaysia

Assist. Prof. Chakrit Suvanjumrat, Department of Mechanical Engineering, Faculty of Engineering, Mahidol University, Thailand

Assist. Prof. Nasib Singh, Eternal University, India

Assoc. Prof. Karan Singh, Eternal University, India

Dr. Muralithran Govindan Kutty, University of Malaya, Malaysia

Chui Kim Ng, Tunku Abdul Rahman University College, Malaysia

Chui Kim Ng, Tunku Abdul Rahman University College, Malaysia

Dr. Tan Winie, Universiti Teknologi MARA, Selangor, Malaysia