

Opening Address

Welcome Message from Advisory Chair

On behalf of the President of King Mongkut's University of Technology North Bangkok (KMUTNB), I would like to welcome you to the 2019 Research, Invention, and Innovation Congress (RI2C 2019) at the Arnoma Grand Hotel Bangkok, Thailand during 11 – 13 December 2019. I would like to thank the local organizers, Science and Technology Research Institute and all Faculties of King Mongkut's University of Technology North Bangkok for their excellent jobs to make the remarkable success of RI2C 2019. Without your dedicated support and network, this congress would have never been this success.

I would like to also thank for the great supports from The Association of Southeast Asian Institutions of Higher Learning (ASAIHL) and Thai universities to give the honorable opportunity to KMUTNB to host this annual conference for this time. I also would like to express my deepest gratitude to our distinguished keynote speakers, Prof. Dr. Ashwani K. Gupta from University of Maryland, Assoc. Prof. Dr. Yu-Shen Cheng from National Yunlin University of Science and Technology, Assoc. Prof. Dr. Rapeephun Dangtungee from King Mongkut's University of Technology North Bangkok, Mrs. Kalyaporn Ungsamatkosha from Robert Bosch Automotive Technologies (Thailand) Co., Ltd. and all invited speakers for sharing their valuable knowledge with us. Last but not least, I would like to give a warm welcome to all authors and speakers to join our event today to share your research and innovation to the community.

Finally, I wish you all have fruitful meeting of outstanding science and technology, and also have a great opportunity to establish a joint research collaboration. Welcome again to the RI2C 2019!

Faithfully yours,

Professor Dr.-Ing.habil. Suchart Siengchin

President, King Mongkut's University of Technology North Bangkok

Welcome message from the Conference Chair

On behalf of the conference chair, it is our great pleasure to introduce 2019 Research, Invention, and Innovation Congress which will be held at the Arnoma Grand Hotel Bangkok, Thailand from 11 – 13 December 2019. This conference aims to provide a forum for researchers, academics, scientists, engineers, and industrialists to share their research works in three main categories, including i) Materials and Mechanics (MM), ii) Electricals and Electronics (EE) and iii) Sustainable Sciences (SS).

Over 360 full manuscripts of the research works are submitted to the academic committee of RI²C conference who are responsible for the management of review process. All articles are peer-reviewed by a minimum of two reviewers who are experts in the field to guarantee the quality of the research works. The conference program is organized to allocate all accepted research works about 200 manuscripts in six parallel oral sessions to provide sufficient time to be presented. Based upon the above categories, those manuscripts will be published in Key Engineering Materials, IEEE Explore and E3S Web of Conference.

In the conference, we are honored to have an opportunity to attend the lectures from our distinguished keynote speakers, Prof. Dr. Ashwani K. Gupta from University of Maryland, Assoc. Prof. Dr. Yu-Shen Cheng from National Yunlin University of Science and Technology, Assoc. Prof. Dr. Rapeephun Dangtungee from King Mongkut's University of Technology North Bangkok, Mrs. Kalyaporn Ungsamatkosha from Robert Bosch Automotive Technologies (Thailand) Co., Ltd., and invited speakers, Prof. Dr. Babak Nahid-Mobarakeh from University of Lorraine, Prof. Dr. Prayoot Akkaraekthalin from King Mongkut's University of Technology North Bangkok, Prof. Dr. Oh Seok Kwon from Korea Research Institute of Bioscience and Biotechnology, South Korea, Prof. Dr.-Ing. Joachim Kaschta from Institute of Polymer Materials, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany and their colleagues for sharing their valuable knowledge with us.

All in all, we would like to express our thanks to all participants for their contributions to the Conference once more. And we are also appreciated for the hard work of the committee in organizing the conference. We highly believe that this conference will be an engrossing and captivating discussion for every participant.

Sincerely yours,

Professor Dr. Somrerak Chandra-ambhorn
King Mongkut's University of Technology North Bangkok

List of Conference Chairs

Conference Chair: 2019 Research, Invention, and Innovation Congress (RI2C2019)

1. Advisory Chair

Suchart Siengchin, King Mongkut's University of Technology North Bangkok (KMUTNB), Thailand

2. General Conference Chair

Somrerk Chandra-ambhorn, KMUTNB, Thailand

Phatiphat Thounthong, KMUTNB, Thailand

3. General Secretary

Titipong Lertwiriaprapa, KMUTNB, Thailand

4. International Program Organization Chair

Ashwani Gupta, University of Maryland, United States

Yu-Shen Cheng, National Yunlin University of Science and Technology, Taiwan

Nutapong Somjit, University of Leeds, United Kingdom

5. RI2C2019 Academic Chair

Ashwani Gupta, University of Maryland, United States

Babak Nahid-Mobarakeh, University of Lorraine, France

Christopher O'Brien, University of Nottingham, United Kingdom

Yulong Ding, University of Birmingham, United Kingdom

Nutapong Somjit, University of Leeds, United Kingdom

Yu-Shen Cheng, National Yunlin University of Science and Technology, Taiwan

Bernard Davat, University of Lorraine, France

Malinee Sriariyanun, KMUTNB, Thailand

Kittipong Rattanaporn, Kasetsart University, Thailand

Hsi-Tseng Chou, National Taiwan University, Taiwan

Lothar Kroll, Technical University of Chemnitz, Germany

Shaily Mahendra, University of California, Los Angeles, USA

6. Innovative Sustainable Science (iSS) Editors

Managing Editor: Malinee Sriariyanun, KMUTNB, Thailand

Editorial board members:

Yu-Shen Cheng, National Yunlin University of Science and Technology, Taiwan

Kittipong Rattanaporn, Kasetsart University, Thailand

Patchanee Yasurin, Assumption University, Thailand

Wawat Rodiahwati, Sumbawa University of Technology, Indonesia