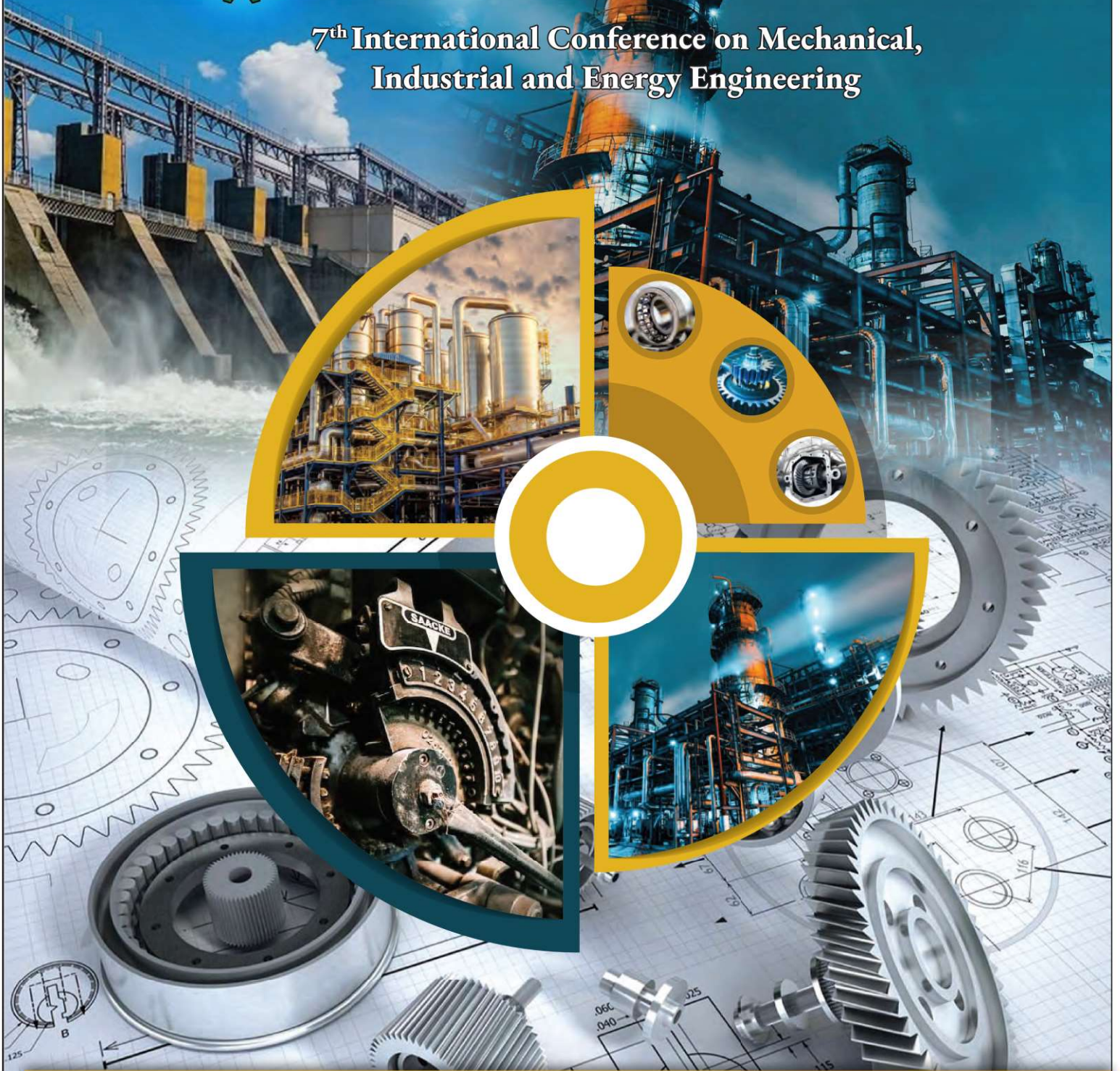




ICMIEE 2022

7th International Conference on Mechanical,
Industrial and Energy Engineering



Organized by

Faculty of Mechanical Engineering

Khulna University of Engineering & Technology (KUET)

📅 22 – 24 December 2022

📍 Khulna, Bangladesh

**7th International Conference on Mechanical, Industrial and Energy
Engineering (ICMIEE 2022)
22-24 December 2022, Khulna, BANGLADESH**

Introduction and Objective

Mechanical and allied engineering have made significant contributions to technological advancement. Rapid development in technology can be achieved through continuous research. The Faculty of Mechanical Engineering of Khulna University of Engineering & Technology (KUET), Bangladesh successfully organized the 7th International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE2022), continuing its biennial tradition, on 22–24 December 2022 in Khulna, the industrial city of Bangladesh. The main objective of ICMIEE 2022 was to create an effective platform for researchers and technical experts to share their recent ideas, innovations, and problem-solving techniques in the broad fields of Mechanical and allied Engineering. The conference served as a valuable opportunity for both researchers and industrial communities to meet, discuss, and exchange their research outcomes in the fields of Mechanical, Industrial, Energy, Leather, Textile, Mechatronics, and Chemical Engineering.

Scope

Mechanical Engineering

- o Aerodynamics
- o CFD
- o Composite and Smart Materials
- o Energy conversion, Storage & Management
- o Thermo-fluid
- o Fatigue and Fracture
- o Fuels and Combustion
- o Maintenance Engineering
- o MEMS and Nanotechnology
- o Noise and Vibration
- o Refrigeration and Air-conditioning
- o Tribology

Industrial Engineering and Management

- o CAD/CAM/CIM
- o Operations and Supply Chain Management
- o Optimization and Ergonomics

Energy Science and Engineering

- o Building Energy Conservation
- o Energy Efficiency Management
- o Renewable Energy

Mechatronics Engineering

- o Automation and Robotics
- o Hydraulic and Pneumatic control

Textile Engineering

- o Composite and Functional Textile
- o Dyeing, Finishing and Printing
- o Sustainable Fashion Design

Leather Engineering

- o Leather and Footwear Engineering
- o Leather Products

Chemical Engineering

- o Advances in Chemical Engineering
- o Process safety and control
- o Waste-to-Energy

Related Engineering

Message from Chairman of Organizing Committee

It is a great privilege and an honor for me, as the Conference Chair, to welcome you all to the 7th International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE2022) organized by Faculty of Mechanical Engineering, KUET, Bangladesh. This conference will provide a unique opportunity for researchers and industrial communities to discuss and share research outcomes and challenges in practice.

I acknowledge all the members of International and Local Advisory Committees for their wise advice and brilliant suggestions on organizing the conference. All recognition should go to the members of the organizing committee and sub-committees who have all worked extremely hard on the details of important aspects of the conference programs. I am indebted to the honorable Vice-Chancellor of KUET and Chief Patron of the conference Prof. Dr. Mihir Ranjan Halder for his continuous supports and guidance throughout the arrangement of the conference. I would like to thank all the keynote speakers for their valuable time and for sharing their research experiences to the participants of the conference. A special thanks to the sponsoring organizations for their generous support.

We have adapted double-blind peer-review process for the conference to ensure the quality and standard of the accepted papers. A note of appreciation to the reviewers for their thorough and timely reviewing of the papers. Special thanks to the Technical Committee for setting the standard for the technical aspect of the conference.

I take this opportunity to thank all the authors for choosing this conference to present their latest research results and all the participants to attend ICMIEE 2022.

Md. Golam Kader

Chairman, Organizing Committee of ICMIEE 2022

Professor, Department of Mechanical Engineering,

Khulna University of Engineering & Technology, Khulna 9203, Bangladesh

Message from Chairman of Technical Committee

It is my great pleasure that the 7th International Conference on Mechanical Industrial and Energy Engineering (ICMIEE 2022) will be held on 22-24 December 2022 at Khulna University of Engineering & Technology campus organized by Faculty of Mechanical Engineering.

This is the 7th dignified conference is going to be held in this university by the Faculty of Mechanical Engineering. Faculty of Mechanical Engineering consists of seven departments, namely Mechanical Engineering, Industrial Engineering and Management, Energy Science and Engineering, Leather Engineering, Textile Engineering, Chemical Engineering and Mechatronics Engineering. In addition, Institute of Environment and Power Technology (IEPT) has started its activities since 2016.

Different branches of Mechanical Engineering contribute greatly in the advancement of technologies, wide research field is covered by all the departments for sustainable development. So, ICMIEE 2022 can contribute in this thrusting dimension creating an effective platform for young and experienced researchers and professional experts sharing their recent ideas and innovations. Moreover, from such conference both the researcher and industrial communities will be benefited mutually from the research outcomes. I am glad to know that the conference has significant number of contributors and delegates from different parts of the world.

Around two hundred one abstracts have been submitted and that papers are reviewed primarily and authors are requested to submit full paper within deadline. But we have received one hundred and thirty-two papers from the different authors. After two blind peer reviewing we have finally accepted one hundred and seven papers for the conference proceedings and to do this, seventy-four reviewers worked hard and made this conference successful. Also, thanks to the keynote speakers for their contribution to this conference.

I must appreciate the decision of the technical committee of ICMIEE 2022 to get the papers reviewed by renowned experts in the relevant fields maintaining high scientific standard which definitely improve the quality of the papers as well as the scientific standard of the conference. It is also my pleasure to congratulate the authors, sponsors, supporters, participants and all other members for their initiatives, contribution and support to make the event a remarkable. Special thanks are indispensable to University Grants Commissions, Bangladesh for supporting this event. Finally, I would like to congratulate all the members of organizing committee for their hard works to arrange such an excellent event and hope that it will continue with regular interval as before.

Dr. Khandkar Aftab Hossain

Chairman, Technical Committee of ICMIEE 2022

and

Professor, Department of Mechanical Engineering,

Khulna University of Engineering & Technology, Khulna 9203, Bangladesh

Message from Secretary of Organizing Committee

I would like to share sincere greetings to the honorable guests, participants and researchers to participate to the biannual international conference, 7th International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE 2022), which is organized by the Faculty of Mechanical Engineering, Khulna University of Engineering & Technology. The conference proudly showcases versatile fields of Mechanical and its allied engineering since its first occurrence in 2010. I am delighted to organize its seven occurrences at our green campus providing opportunities to gather renowned scientists and other stake holders during 22-24 December, 2022. Faculty of Mechanical Engineering at our university comprises seven interconnected departments and the conference gives an opportunity to work with harmony.

The conference has received overwhelming response from many eminent researchers, academicians, professional engineers from home and abroad. We have received a good number of papers from the prospective participants from local and foreign universities/institutes. The conference program spans 22-24 December, 2022 and activities will occur mostly on-site. Four keynote speeches by the distinguished researchers in the respective field from four different countries will grace the event. There will be 16 parallel technical sessions in different tracks based on various fields of mechanical and allied engineering.

On behalf of the organizing committee, I would like to thank all keynote speakers, authors, participants, reviewers, sponsors and other members of the stakeholder of the event for their generous support in their individual roles which helped us to accomplished the tasks with quality and duly. I would also like to thank UGC, Bangladesh, Vice-Chancellor and Pro-Vice Chancellor of KUET for their generous support. I sincerely wishing you a delightful and stimulating next three days and hope you will enjoy the event.

Dr. Zahir Uddin Ahmed

Secretary, Organizing Committee of ICMIEE 2022

and

Professor, Department of Mechanical Engineering,

Khulna University of Engineering & Technology, Khulna 9203, Bangladesh

Message from Secretary of Technical Committee

As a Secretary of the Technical Committee, I am pleased and greatly honored to welcome you all to the 7th International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE 2022) organized by the Faculty of Mechanical Engineering, Khulna University of Engineering & Technology (KUET). This conference mainly covered versatile fields of Mechanical Engineering; Industrial Engineering and Management; Energy Science and Engineering; Textile Engineering; Leather Engineering; Chemical Engineering; Mechatronics Engineering and related engineering since 2010. This conference will be held on 22-24 December, 2022 at KUET.

The conference received a great response from researchers, academicians, and professional engineers from home and abroad. We received around 201 extended abstracts, out of this the number of full papers submitted was 132. We follow double blind peer review process for our conference to ensure the quality of the paper. The reviewers are mainly university teachers and professionals from around the world. After detailed review and revision process, finally we selected 106 papers for oral presentation and inclusion in the proceeding of the 7th International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE 2022).

On behalf of the technical committee, I would like to thank all researchers for submission of their papers to this conference, reviewers for their tremendous effort to ensure the quality of the paper and delegates for their generous support to accomplish this conference. I believe that you will enjoy this conference at KUET.

Dr. Mohammad Ilias Inam

Secretary, Technical Committee, ICMIEE 2022

and

Professor, Department of Mechanical Engineering,

Khulna University of Engineering & Technology, Khulna 9203, Bangladesh

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Time	Program
09:30AM-10:35AM	Inaugural Ceremony Venue: KUET Auditorium
	9:35: Guests take seats 9:40: Recitation from the Holy Al-Quran 09:45: Welcome speech by Prof. Md. Golam Kader Chair, Organizing Committee 09:50: Speech by Prof. Dr. Khandkar Aftab Hossain Chair, Technical Committee 09:55 Speech by Prof. Dr. Mohammad Ilias Inam Secretary, Technical Committee 10:00 Speech by Special Guest Prof. Dr. Sobahan Mia Pro-Vice Chancellor, KUET 10:10: Speech by Chief Guest Prof. Dr. Ehsanul Haque Former Member, UGC, and Former Vice Chancellor, KUET 10:25: Speech by Chief Patron Prof. Dr. Mihir Ranjan Halder Vice-Chancellor, KUET, Bangladesh 10:35: Vote of thanks by Prof. Dr. Zahir Uddin Ahmed Secretary, Organizing Committee
10:35AM-11:00AM	Refreshment and Communication break
11:00 AM-12:00 PM	Keynote Lecture by Prof. Dr. Muhammad Mustafizur Rahman (Wichita State University, USA) Title: Thermal Management in Buildings Using Phase Change Materials Chair: Prof. Dr. Md. Kutub Uddin (KUET, Khulna) Venue : KUET Auditorium
12:00 PM-01:00 PM	Keynote Lecture by Prof. Dr. S. M. Sohel Murshed (University of Lisbon, PORTUGAL) Title: Nanofluids to Tackle Modern Thermal Management and Energy Challenges Chair: Prof. Dr. Md. Nawsher Ali (Northwestern University, Khulna) Venue: KUET Auditorium
1:00PM-2:00PM	Lunch Break
2:00PM-3:30PM	Parallel Technical Sessions A1: CFD I (Paper ID: 011, 030, 035, 042, 107,116, 130) Chair: Prof. Dr. Muhammad A R Sharif (University of Alabama, USA) Co-chair: Dr. Md. Abdullah Al-Faruk (KUET) Venue: ME 201 B1: Composite & Smart Materials I (Paper ID: 060, 105, 111, 134, 200, 208, 210) Chair: Prof. Dr. Md. Shahidul Islam (KUET) Co-Chair: Prof. Dr. Md. Abdul Hasib (KUET) Venue: ME 308 C1: Energy Engineering I (Paper ID: 015, 045, 051, 100, 128, 181) Chair: Prof. Dr. Mohammad Ariful Islam (KUET)



7th International Conference on Mechanical, Industrial and Energy Engineering

📍 **Khulna, Bangladesh** 📅 **22-24 December, 2022**



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Khulna University of Engineering & Technology (KUET)

	Co-Chair: Dr. Md. Hasan Ali (KUET) Venue: ME 310
	D1: Leather Engineering I (Paper ID: 004, 005, 006, 189, 202, 205) Chair: Dr. Abdulla-Al-Mamun (ILET, Dhaka University) Co-Chair: Dr. Elias Uddin (KUET) Venue: TE 410
3:30PM-3:45PM	Tea and Communication break
3:45 PM-5:05 PM	Parallel Technical Sessions
	A2: CFD II (Paper ID: 044, 047, 054, 064, 155, 165, 166) Chair: Prof. Dr. Muhammad Mustafizur Rahman (Wichita State University, USA) Co-chair: Prof. Kazi Mustafijur Rahman (KUET) Venue: ME 201
	B2: Thermofluids I (Paper ID: 049, 053, 152, 187, 190, 213, 215) Chair: Prof. Dr. S M Sohel Murshed (University of Lisbon, Portugal) Co-Chair: Prof. Dr. Md. Ashraful Islam (KUET) Venue: ME 308
	C2: Industrial Automation & Robotics (Paper ID: 026, 046, 057, 058, 065, 084, 091) Chair: Prof. Dr. Helal An-Nahiyen (KUET) Co-Chair: Dr. Asief Javed (KUET) Venue: ME 310
	D2: Textile and Material Engineering I (Paper ID: 009, 097, 117, 120, 131, 132, 161, 191) Chair: Professor Dr. Lal Mohan Baral (Ahsanullah University of Science and Technology, Dhaka) Co-Chair: Dr. Ismail Hossain (KUET) Venue: TE 410

Date: December 23, 2022 (Friday)

9:30AM-10:30AM	Keynote Lecture by Prof. Dr. A K M Nurul Amin (Military Institute of Science and Technology, Bangladesh) Title: Causes of Chatter Formation in Metal Cutting and Innovative Chatter Control Strategies Chair: Prof. Dr. Nasim Ahmed (Northwestern University, Bangladesh) Venue: ME 201
10:30AM-11:30AM	Keynote Lecture by Prof. Dr. Firoz Alam (RMIT University, Australia) Title: Central-Southern Himalayan Region Hydropower Generation and Ecosystem Chair: Prof. Dr. Muhammad A R Sharif (University of Alabama, USA) Venue: ME 201
11:30AM-11:45AM	Tea and Communication break
11:45AM-01:00PM	Parallel Technical Sessions
	A3: CFD III (Paper ID: 068, 071, 072, 086, 096, 170, 186) Chair: Prof. Dr. Khandkar Aftab Hossain (KUET)



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	Co-Chair: Prof. Dr. Zahir Uddin Ahmed (KUET) Venue: ME 201 B3: Composite & Smart Materials II (Paper ID: 061, 135, 136, 160, 211, 212) Chair: Prof. Dr. Md. Shariful Islam (KUET) Co-Chair: Prof. Dr. Md. Sanaul Rabbi (CUET) Venue: ME 308 C3: Industrial and Production Engineering (Paper ID: 025, 055, 062, 088, 104, 153, 178) Chair: Prof. Dr. A. K. M. Nurul Amin (AUST) Co-Chair: Prof. Dr. Subrata Talapatra (KUET) Venue: ME 310 D3: Chemical Engineering (Paper ID: 003, 095, 103, 113, 138, 171, 176, 192, 206) Chair: Prof. Dr. Md. Abul Hashem (KUET) Co-Chair: Prof. Dr. Md. Arifuzzaman (KUET) Venue: TE 410
1:00PM-2:00PM	Lunch Break
2:00PM-3:15PM	Parallel Technical Sessions A4: Thermofluids II (Paper ID: 163, 164, 168, 179, 184) Chair: Prof. Dr. Md. Ilias Inam (KUET) Co-Chair: Dr. Dipayan Mondal (KUET) Venue: ME 201 B4: Energy Engineering II (Paper ID: 021, 076, 080, 207, 214) Chair: Prof. Dr. A N M Mizanur Rahman (KUET) Co-Chair: Dr. Md. Abdul Wakil (KUET) Venue: ME 308 C4: Leather Engineering II (Paper ID: 007, 016, 031, 037, 070, 078) Chair: Prof. Dr. Md. Abul Hashem (KUET) Co-Chair: Dr. Elias Uddin (KUET) Venue: ME 310 D4: Related Engineering (Paper ID: 019, 082, 087, 093, 099, 172, 203) Chair: Prof. Dr. Md. Abul Jalil (KUET) Co-Chair: Dr. Md. Rafiquzzaman (KUET) Venue: TE 410 E: Online Session (On Demand) Chair: Prof. Dr. Mohammad Sultan Mahmud (KUET)
3:15PM-3:45PM	Tea and Communication break
3:45PM-4:45PM	Closing Ceremony Venue: ME 201

Date: December 24, 2022 (Saturday)

9:30AM-04:30AM	Local Tour (On request)
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