

# CONFERENCE PROCEEDINGS



**ChemEICon  
2024**

“**Chemical & Process Engineering for a  
Sustainable Future:**  
*Transformative Pathways for Circular Economy*”

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**1st International Research Conference of  
Department of Chemical and Process Engineering,  
University of Moratuwa**

on **27th June 2024**  
at **CEWAS, Rathmalana, Sri Lanka**

# ChemEIcon 2024

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ChemEICon 2024

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WELCOME  
MESSAGE  
BY THE  
CONFERENCE CHAIR  
Prof. P. G. Ratnasiri

*I am privileged to write a message for the conference proceeding published under the first international research conference (ChemEICon 2024) organized by the Department of Chemical and Process Engineering (DCPE), University of Moratuwa. Main theme for the research conference is "Chemical and Process Engineering for a Sustainable Future: Transformative Pathways for Circular Economy". Chemical and process engineering discipline itself is embedded with knowledge and skills needed to implement sustainable initiatives and circular economy. With excellence in academic programme offered and research outcomes of DCPE, it was able to increase its local and global recognition and visibility via increased number of research publications and high-quality graduates produced. DCPE has recently enhanced its interactions with local industry with the objective of orienting its undergraduates with more practically oriented projects and industrial training programmes. In line with these developments, department has set goals and is striving to engage in research programmes with tangible outcomes. With the experience gained from three undergraduate research symposium already conducted, DCPE has organized its first international research conference giving opportunity for local and international researchers, academics and professionals engaged in Chemical and Process Engineering discipline.*

*Chemical and Process Engineering is the discipline which imparts knowledge and skills needed to implement sustainable initiatives in industry. To engage in business activities in the international arena, industry should comply with its sustainability indicators such as energy, water and carbon foot prints. The industrial forum which is held concurrent with this research conference is the main platform to share sustainability initiatives taken and new technology developments. Leading local process industries will participate in this event and they will enlighten audience with their state of art technical developments and innovations. Research topics presented at this symposium are broadly classified into three parallel sessions i.e. **Renewable Energies, Resource Recovery and Upcycling, Environmental Biotechnology and Waste Treatment and Process Technology and Innovation**. I take this opportunity to thank all academic staff members, panelists, especially those who served as reviewers, and our junior academic staff members, instructors and undergraduate students for their dedication and commitment. This is a team effort and without the support of the head of the department and research supervisors, this would not have been a reality. Without the generous support and sponsorships received from local industry, it would have been very difficult to meet our financial targets. We highly appreciate the trust they kept in DCPE academic staff and students.*




MESSAGE BY THE  
VICE CHANCELLOR,  
UNIVERSITY OF MORATUWA  
Prof. N. D. Gunawardena

“  
*The University is delighted to observe the continued dedication to research by the Department of Chemical and Process Engineering (DCPE), evident through the inaugural International Research Conference on Chemical and Process Engineering - ChemEIcon 2024. The underlying theme of ChemEIcon 2024, "Chemical and Process Engineering for a Sustainable Future: Transformative Pathways for Circular Economy", remains the cornerstone, setting the stage for local and international researchers to unveil their potential in addressing industry-related challenges and research problems with their creative and novel ideas. ChemEIcon 2024 provides a unique platform for the aspiring engineers of the DCPE, poised to embrace the formidable challenges of the industrial landscape, to convene and engage in scientific discourse with experts in the field.*

*This event reaffirms the pledge of the Department of Chemical and Process Engineering to generate nationally significant, world-class research endeavours aimed at contributing to the continued progress of this engineering discipline in our nation. Such an international research conference aligns with the broader goals set by the University of Moratuwa in its pursuit of building a state-of-the-art research environment aimed at contributing towards national development.*

*I would like to acknowledge the invaluable guidance provided by academic supervisors in steering these research projects, while also extending my congratulations on the successful execution of this international research conference on behalf of the University.*

”



MESSAGE  
BY THE DEAN OF  
FACULTY OF ENGINEERING,  
UNIVERSITY OF MORATUWA  
Prof. K. T. M. U. Hemapala

“  
*It is with great pleasure that I convey this message on the occasion of the ‘ChemElcon 2024 - International Conference on Chemical and Process Engineering’ organized by the Department of Chemical and Process Engineering, University of Moratuwa with the objective of providing a platform for academics, researchers, and industrial experts to share their knowledge, expertise and advancement in the field of chemical and process engineering in local and global context. It is the first international conference to be organized by the Department of Chemical and Process Engineering (DCPE), University of Moratuwa. Further, it is a delight to see the industry forum and career fair 2024 in parallel to the international conference which enhance the key theme of the main event.*

*Organizers of ChemElcon 2024 have aligned the conference theme with current trends and demands in the field of Chemical and Process Engineering. The conference aims to disseminate the latest advancements and innovations in sustainable economic growth, circular economy principles, utilizing untapped local raw materials for value addition, and addressing the current economic crisis. By emphasizing sustainable practices within chemical and process engineering, the conference will cover topics such as bio-renewable and green energies, resource recovery and upcycling, polymer processing and technology, environmental biotechnology, process control, modeling and simulation, food processing and biochemical engineering, process safety and risk assessment, and process technology and innovation.*

*It is my pleasure and honour to convey my warm wishes to the participants and organizers of this momentous event. With the help of your contribution and participation, it will be an unforgettable and valuable experience.*

”



MESSAGE BY THE HEAD OF  
DEPARTMENT OF CHEMICAL  
AND PROCESS ENGINEERING,  
UNIVERSITY OF MORATUWA  
Prof. (Mrs.) S. M. Egodage

“ I am honored to welcome you to ChemEIcon-2024, the inaugural International Research Conference on Chemical and Process Engineering, organized by the Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka. This conference marks a significant milestone in our ongoing efforts to promote research, innovation, and collaboration within our field of specialization. Chemical and Process Engineering (CPE) is a keystone of sustainable industrial development, and our CPE graduates play a vital role in advancing industries worldwide. ChemEIcon-2024 embodies our commitment to addressing the critical challenges facing our society, including sustainable economic growth, the promotion of circular economy principles, and the utilization of local raw materials for value addition. By focusing on these themes, we aim to contribute meaningful solutions to the current economic crisis and beyond. ChemEIcon-2024 provides a vibrant platform for academics, researchers, and industry experts to come together, share knowledge, and explore the latest advancements in chemical engineering science and technology.

I extend my heartfelt gratitude to all participants from the industry, including our esteemed resource persons, for their invaluable contributions. I am particularly proud of the presenters, whose exceptional research and insights are at the heart of this event. Additionally, I would like to acknowledge the tremendous efforts of our entire DCPE staff and our undergraduates. Their hard work, dedication, and thorough planning have been instrumental in making ChemEIcon-2024 a resounding success. Thank you for joining us at this remarkable event. Together, we are paving the way for a future where Chemical and Process Engineering continues to innovate and lead the charge toward a sustainable and prosperous world.

”

# ChemEICon 2024 COMMITTEES

## Central Committee

- **Prof. P. G. Ratnasiri**  
Conference Chair
- **Dr. Hiran Chathuranga**  
Conference Assistant Secretary
- **Dr. Tharushi Keerthisinghe**  
Conference Secretary
- **Dr. Dilhara Sethunga**  
Financial Chair

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- **Prof. Jagath Premachandra**  
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- **Prof. Sanja Gunawardena**  
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- **Prof. Manisha Gunasekera**  
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- **Prof. Seungdae Oh**  
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- **Prof. Zaki Yamani bin Zakaria**  
UTM, Malaysia
- **Prof. Wichitpan Rongwong**  
WU, Thailand
- **Dr. Chuah Chong Yang**  
UTP, Malaysia
- **Snr. Prof. Padma Amarasinghe**  
UoM, Sri Lanka
- **Prof. Shantha Amarasinghe**  
UoM, Sri Lanka
- **Prof. Mahinsasa Narayana**  
UoM, Sri Lanka
- **Prof. Shantha Egodage**  
UoM, Sri Lanka

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- **Mrs. Udari Perera**  
Committee Member
- **Mr. Ishaq Ahamed**  
Committee Member
- **Dr. Thilini Ariyadasa**  
Committee Member
- **Dr. Mahinsasa Rathnayake**  
Committee Member
- **Dr. Hiran Chathuranga**  
Committee Member
- **Ms. Kavishka Gunaratne**  
Committee Member





# ChemEIcon 2024 COMMITTEES

## Sponsorships and International Relations Committee

- **Dr. Mahinsasa Rathnayake**  
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- **Dr. Thushara Subasinghe**  
International Relations Chair
- **Mr. Lakshan Dissanayake**  
Committee Member
- **Mr. Ishaq Ahamed**  
Committee Member
- **Ms. Punethri Hewage**  
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- **Ms. Ruwani Madhuhansi**  
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- **Dr. Hiran Chathuranga**  
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- **Mr. Manuja Dayanath**  
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- **Ms. Kavishka Gunaratne**  
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## Finance Committee

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Committee Chair
- **Mrs. Udari Perera**  
Committee Member
- **Mr. Nishadha Gamage**  
Committee Member



# CONFERENCE AGENDA

## **Inauguration Event** (Location: Circular Hall I (Jasmine))

08:00 - 08:45	Arrival of Guests and Registration
08:45 - 08:50	Lighting of the Oil Lamp
08:50 - 08:55	National Anthem
08:55 - 09:00	Welcome Speech by the Chairperson of ChemEIcon 2024
09:00 - 09:05	Speech by Vice Chancellor, University of Moratuwa
09:05 - 09:10	Speech by Dean, Faculty of Engineering, University of Moratuwa
09:10 - 09:15	Speech by Dean, Faculty of Graduate Studies, University of Moratuwa
09:15 - 09:20	Speech by Head of Department, Department of Chemical and Process Engineering, University of Moratuwa
09:20 - 09:25	Event Introduction Video
09:25 - 09:45	Keynote Speech - Prof. Maheshi Danthurebandara
09:45 - 10:05	Keynote Speech - Prof. William Chen
10:05 - 10:15	Speech by Mr. Rushanth Chandrabose - Platinum Sponsor and Technical Partner of Industry Forum
10:15 - 10:25	Felicitation of Guests
10:25 - 10:35	Vote of Thanks
10:30 - 10:55	Refreshments and Networking

## **Technical Session - Environmental Biotechnology and Waste Treatment** (Location: Computer Lab I (Topaz))

11:00 - 11:05	Introduction to the Session and Panel
11:05 - 11:25	Plenary Speech - Prof. B. C. Liyanage Athapattu
11:25 - 11:40	Methylene Blue Removal Using Chitosan Encapsulated <i>Strychnos Potatorum</i> (Igini) Seeds Activated Carbon: Isotherm and Kinetic Study



# CONFERENCE AGENDA

11:40 - 11:55	Investigating Starch Degradation Efficiency and Key Attributes of Soil Bacteria from Makandura (NWP) Area
11:55 - 12:10	Technical and Economic Evaluation of Organic Waste Management Method in the Western Province: A Comparative Analysis of Anaerobic Digestion, Sanitary Landfill, and Composting
12:10 - 12:25	Textile Dye Removal from a Modified Adsorbent Material Made of Ceramic Waste and Gliricidia Sepium Biochar
12:25 - 12:40	Optimization of 5-HMF Production from Rice Straw Using an Acid Catalyze in a Biphasic System
12:40 - 12:55	A Systematic Literature Review on Applications of Bioinspired MXenes Structures
12:55 - 13 :00	Promotional Video
13:25 - 14:25	Lunch and Networking
14:25 - 15:00	Awards Ceremony and Conclusion ( <i>Location: Circular Hall I</i> )

## **Technical Session - Process Technology and Innovation** (*Location: Class Room B (Ruby)*)

11:00 - 11:05	Introduction to the Session and Panel
11:05 - 11:25	Plenary Speech - Prof. Manisha Gunasekera
11:25 - 11:55	Synthesis and Characterization of Nitrogen-Doped Carbon Quantum Dot (NCQD)/ Titanium Dioxide (TiO <sub>2</sub> ) Hybrid Nano Material for Enhanced Photocatalytic Applications
11:55 - 12:10	Preparation and characterization of pharmaceutical nanococrystals
12:10 - 12:25	Inhibition of Iron Corrosion using Schiff base Cu(II) Complex in Saline and Acidic Medium
12:25 - 12:40	Study of Aluminum Inhibition Using Self-Assembled layer of Schiff Base Ligand



# CONFERENCE AGENDA

12:40 - 12:55	Artificial Neural Network based Adaptive Model Predictive Control of Batch Distillation Column
12:55 - 13:10	Heat Transfer Analysis During Chili Drying in a Packed Bed Dryer
13:10 - 13:15	Promotional Video
13:25 - 14:25	Lunch and Networking
14:25 - 15:00	Awards Ceremony and Conclusion ( <i>Location: Circular Hall I</i> )

## **Technical Session - Renewable Energies, Resource Recovery and Upcycling** (*Location: Computer Lab 2 (Jasper)*)

11:00 - 11:05	Introduction to the Session and Panel
11:05 - 11:25	Plenary Speech - Prof. Mahinsasa Narayana
11:25 - 11:40	Green Hydrogen Roadmap for Sri Lanka
11:40 - 11:55	Investigate the Ideal Mixing Ratio of Palm Oil Fiber to Decanter Cake for Optimal Briquette Production to Use as a Biofuel
11:55 - 12:10	Exploring the Electrical Properties of $\text{Li}_5\text{GaO}_4$ as a Potential Li Battery Electrolyte through Atomistic Simulation
12:10 - 12:25	Enhancing the Energy Density and Sustainability of Biomass Material Through Integrated Utilization of Bagasse with Spent Wash in Bioenergy Production
12:25 - 12:40	Formation of Gaseous Fuel via Catalytic Pyrolysis of Fuel Oil Blended Stock (FOBS)
12:40 - 12:55	AlkB1 as a Key Enzyme for Alkane Degradation in <i>Pseudomonas aeruginosa</i> PAO1 Strain
12:55 - 13:10	Comparative Study of Thermal Stability of Olive Oil and Sesame Oil Using FTIR Spectroscopy Coupled with UV-Sis Spectroscopy

# CONFERENCE AGENDA

13:10 - 13:15 Promotional Video

13:25 - 14:25 Lunch and Networking

14:25 - 15:00 Awards Ceremony and Conclusion (*Location: Circular Hall I*)

## Industrial Forum (*Location: Circular Hall I (Jasmine)*)

11:00 - 11:05 Welcome Speech by Chairperson of the Industrial Forum

11:05 - 11:10 Introduction of Technical Partners and Moderator

11:10 - 11:25 Presentation and Q&A - **“Transform to a Circular Economy Through Process Improvements”** by INSEE

11:25 - 11:40 Keynote Speech by Guest of Honor - Dr. Kishu Gomes

11:40 - 11:55 Presentation and Q&A - **“Revolutionizing Water Treatment: The Role of Membrane Technology in Sustainable Development”** by ISL

11:55 - 12:10 Keynote Speech by Mr. Janaka Gammanpila (CEO of Silvermill Group)

12:10 - 12:25 Presentation and Q&A - **“Zero Liquid Discharge System for Palm Oil Mill Effluent”** by AEN Palm Oil

12:25 - 12:40 Presentation - **“Approach for Sustenance of Key Performance Parameters”** by Forbes Marshall

12:40 - 12:45 Presentation - **“Sustainable Disposal Solution for Rubber-based Sludge Generation from Effluent Treatment Plants”** by ATG Gloves

12:45 - 13:00 Presentation and Q&A - **“A Greener Future with Aluminium”** by Alumex

13:00 - 13:20 Acknowledgement of Sponsors and Felicitation of Panelists

13:20 - 13:25 Vote of Thanks by President of Chemical Engineering Students' Society, University of Moratuwa

13:25 - 14:25 Lunch and Networking





# KEYNOTE SPEAKER

## **Prof. Maheshi Danthurebandara**

Department of Chemical and Process  
Engineering  
University of Peradeniya

Maheshi Danthurebandara graduated from the Faculty of Engineering, University of Peradeniya, with a specialization in Chemical and Process Engineering in 2005. She then joined the industry as a Chemical Engineer in a reputable private sector organization dedicated to wastewater treatment. After accumulating two years of industrial experience, in 2007, she received a competitive full scholarship from the Belgian Government for master's studies in Environmental Sanitation at Ghent University, Belgium. Subsequently, she was granted a scholarship for her PhD studies in Engineering Science from KU Leuven, Belgium. She successfully completed her PhD in 2015, with a specialization in the fields of Life Cycle Assessment (LCA) and Enhanced Landfill Mining research.

Following her doctoral studies, she assumed the role of a Senior Lecturer in the Department of Chemical and Process Engineering, Faculty of Engineering, University of Peradeniya, in 2015, and later earned a promotion to professorship in 2020. With a wealth of experience in life cycle assessment, product carbon footprint analysis, and waste valorization, she has authored numerous articles in international scientific journals. In addition to her academic roles, she also serves as a LCA practitioner and educator. Her work involves collaborating with local industries to popularize the LCA process and to implement waste valorization strategies, aligning with the principles of the circular economy concept. She has overseen various LCA projects, serving as chairperson, to assess the product carbon footprint of diverse industries such as textiles, breweries, dyes, electronics, roofing materials, and packaging. She possesses the capability to conduct intricate LCA studies, enabling her to compare environmental impacts and forecast potential environmental enhancements for specific products.



# KEYNOTE SPEAKER

## **Prof. William Chen**

The Michael Fam Chair Professor in Food Science and Technology, Nanyang Technological University Singapore

William Chen is the Michael Fam Endowed Professor and Director of Food Science and Technology Programme at Nanyang Technological University Singapore (NTU FST). He is also driving two of Singapore government funded food initiatives, first as Director of Singapore Agri-food Innovation Lab (SAIL), and also as Director of Singapore Future Ready Food Safety Hub (FRESH).

His food technology innovations, which have been extensively attracting global attention, are characterized by their simplicity and scalability and have resulted in active partnerships with food industry leading to development of consumer products.

His views on food tech innovations, food safety and food security have been covered regularly by major local and international media. He is also advisor/consultant to overseas universities, government agencies, food industry, and international organizations (ADB, FAO, and WHO among others).

# PLENARY SPEAKER

**Environmental Biotechnology and Waste Treatment**

## **Prof. B. C. Liyanage Athapattu**

Department of Civil Engineering  
The Open University of Sri Lanka



Professor Bandunee Athapattu is a Professor in Environmental Engineering in the Department of Civil Engineering of the Open University of Sri Lanka. She obtained her Bachelor of the Science Honors in Engineering from the University of Moratuwa in 1993. She earned her Masters in Engineering and the Doctoral Degree in Environmental Engineering from the Osaka University, Japan. She has been a Commonwealth fellow of the Imperial College London and JSPS Postdoctoral Fellow of the Okayama University, Japan and SIDA fellow of the University of Stockholm, Sweden.

She has published more than 60 papers in international indexed journals, out of which about 40 are indexed in the Science Citation Index, Science Citation Index Expanded, book chapters, and has presented more than 75 papers in academic symposia. She has received many Outstanding Research Awards including Presidential Awards for Research Excellence. Her fields of interests include water and wastewater technologies, ecological engineering, environmental modelling, pollution control and solid waste management.

She is a Chartered Civil Engineer and a Member of the Institute of Environmental Professionals in Sri Lanka. Currently she serves as the Director of the Environmental Studies and Sustainable Development of the Open University of Sri Lanka.

# PLENARY SPEAKER

**Process Technology and Innovation**

## **Prof. Manisha Gunasekara**

Department of Chemical and Process Engineering  
University of Moratuwa



Manisha Yasanthi Gunasekera is a Professor in the Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka. She obtained her BSc Engineering degree in Chemical Engineering and Master of Engineering in Environmental Engineering and Management from University of Moratuwa. She received her PhD degree from the Department of Chemical Engineering from Loughborough University UK. She is a Corporate Member of the Institution of Engineers IESL. Her research interests include process plant development focusing on environmental protection and loss prevention in the chemical industry.



# PLENARY SPEAKER

**Renewable Energies, Resource Recovery and Upcycling**

## **Prof. Mahinsasa Narayana**

Department of Chemical and Process Engineering  
University of Moratuwa



Prof. Mahinsasa Narayana holds a PhD from Northumbria University in Newcastle, UK, an MPhil (Eng.) research degree from the University of Moratuwa in Sri Lanka, and a BSc (Eng.) in Mechanical Engineering from the same institution. Both his PhD and MPhil research endeavours have been centred around the field of energy technology. His current primary research focuses on process modelling and optimization, as well as energy technology. In addition, he has conducted extensive research using computational fluid dynamics (CFD) to analyse various multi-phase processes involving bioresource energy, including drying, pyrolysis, and combustion. His work has provided valuable insights into improving energy efficiency and advancing sustainable energy solutions. Throughout his career, Prof. Narayana has gained valuable experience working on diverse engineering projects in both academic and industrial settings.

