

# 11<sup>th</sup> INTERNATIONAL MECHANICAL ENGINEERING CONFERENCE

14<sup>th</sup> & 15<sup>th</sup> January, 2022



**Sustainable Smart Advancements in  
Mechanical Engineering**

being held on the occasion of NED Centennial Year (1921-2021)



**Jointly Organized by**



The Institution of Engineers Pakistan  
Karachi Centre



NED University of Engineering  
& Technology - Karachi



DHA Suffa University  
Karachi



NED International Alumni  
Network (NEDIAN) Association - Pakistan

**In Collaboration With**



Federation of Engineering  
Institutions of South &  
Central Asia (FEISCA)  
Colombo - Sri Lanka



Federation of Engineering  
Institutions of Islamic  
Countries (FEIC)  
Riyadh - KSA



Mehran University of  
Engineering and  
Technology - Jamshoro



Balochistan University of  
Engineering & Technology  
Khuzdar



Balochistan University of  
Information Technology Engineering  
& Management Sciences - Quetta



Dawood University of  
Engineering & Technology  
Karachi



Hamdard University  
Karachi



Qaid-e-Awam  
University of Engineering  
Science & Technology  
Nawabshah



Pakistan Navy  
Engineering College - NUST,  
Karachi



Shaheed Zulfiqar Ali Bhutto  
Institute of  
Science & Technology  
Karachi



Pakistan HVACR  
Society



The American Society  
of Heating, Refrigerating and  
Air-Conditioning Engineers



Petroleum Institute  
of Pakistan



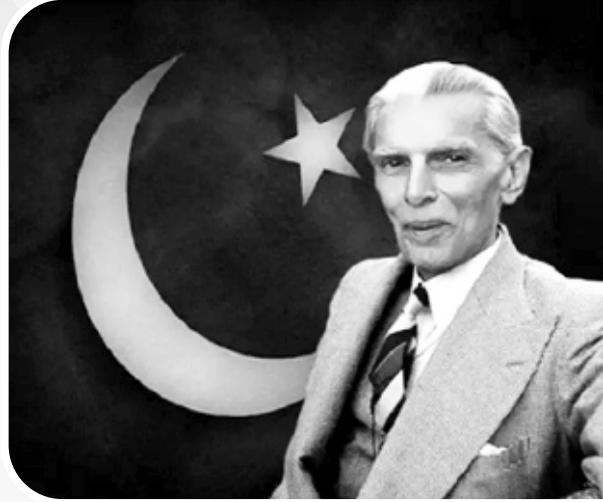
Pakistan Society of  
Plumbing Professionals

## MESSAGE

### FATHER OF THE NATION

Quaid-e-Azam Muhammad Ali Jinnah

Message on the occasion of  
Foundation Stone Laying Ceremony of the  
Institute of Engineers Pakistan, Headquarters  
at Dacca on 30th May, 1948



“

If Pakistan is to take its proper place among the progressive nations of the world, it will have to take up a good deal of leeway in the realm of scientific and technical education which is so necessary for the proper development of the country and the utilization of its resources.

The establishment of institution like the Institute of Engineers will greatly stimulate technical research and help in disseminating available information.

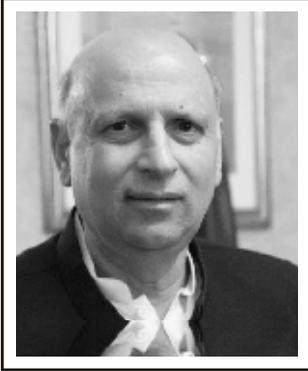
The Institute of Engineers will not only benefit the engineers themselves by improving their technical knowledge but also bring lasting benefits to public services which they are called upon to perform.

I wish the Institute every success ”





## Governor, Punjab



**Mohammad Sarwar**

Governor, Punjab

“ I am glad to know that the Institution of Engineers Pakistan Karachi Centre, NED University of Engineering and Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) Association are jointly organizing the 11th International Mechanical Engineering Conference (IMEC-2022) scheduled to be held on Friday 14th & Saturday 15th January, 2022 in collaboration with many other institutions.

Ever since its inception, the Institution has been endeavoring to keep pace with the ever expanding knowledge in the field of engineering and its dissemination amongst the engineers fraternity throughout the length and breadth of the Country. Over a period of time, the Institution has been, instrumental in the promotion and advancement of science and practice of engineering and the acquisition and exchange of technical-- knowledge in the field of engineering.

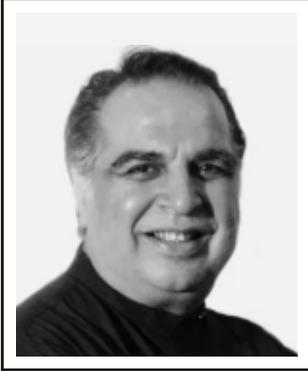
I am confident that the 11th International Mechanical Engineering Conference Chemed as "Sustainable Smart Advancement in Mechanical Engineering will have far reaching impact in the field of science and engineering. I strongly believe that every advancement in technology today, will give lead to a better tomorrow. Being attended by engineers from all the provinces of Pakistan as well as foreign countries, it will provide an excellent opportunity to the participants to benefit from shared experiences and to find solutions to our current problems.

I wish the Institution of Engineers Pakistan, NED University of Engineering and Technology participants of the Conference all the success.





## Governor Sindh



**Imran Ismail**

Governor Sindh

“ It is a matter of great pleasure that 11th International Mechanical Engineering Conference (IMEC-2022), jointly organized by Institution of Engineers Pakistan (IEP), NED University of Engineering and Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) Association is taking place on 14-15 January, 2022. The theme of the Conference "Sustainable Smart Advancements in Mechanical Engineering" is itself speaking about the significance of the event in learning about modern and emerging trends in the field.

This is truly exceptional and heartening that Institution of Engineers Pakistan holds the honour of having a message of the Quaid-e-Azam Mohammad Ali Jinnah, given on the occasion of IEP's first inaugural meeting in 1948. I am confident that IEP would successfully uphold this great legacy to ensure efficiency and advancement in the field of engineering in Pakistan.

The radius of mechanical engineering is incredibly wider, it covers everything that comes in our mind from industrial equipment to vehicles, robotics and lot more alike. The world is full of opportunities, and I urge IEP, NED and everyone who is contributing in the event to prepare our students in line with the global requirements. Our passed out student must be innovative and ready to face today's challenges in the world.

I once again admire everyone who is contributing in the event, and wish them accomplishment of their all set goals ahead.

”



## Governor, Balochistan



**Syed Zahoor Ali Agha**

Governor, Balochistan

“ It gives me immense pleasure to felicitate the members of the Institution of Engineers Pakistan Karachi Centre, NED University of Engineering and Technology, DHA Suffa University and NED international Alumni Network (NEDIAN) Association are jointly organizing the 11th International Mechanical Engineering Conference (IMEC-2022) scheduled to be held on Friday 14th and Saturday 15th January, 2022 at Karachi in collaboration with Federation of Engineering Institutions of Islamic Countries (FEIIC), MUET-Jamshoro, BUST Khuzdar, BUITEMS Quetta, DUET Karachi, Hamdard University, QUEST Nawabsha PNEC-NUST-Karachi, SZABIST Karachi, HVACR Society, ASHRAE Pakistan Chapter, Petroleum Institute of Pakistan, Pakistan Society of Plumbing Professionals.

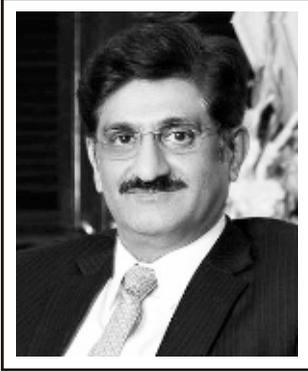
It can be said with confidence that 11th International Mechanical Engineering Conference on the theme "Sustainable Smart Advancement in Mechanical Engineer" will have far reaching impact in the field of science and engineering. It is fact that the advancement in technology today, will pave a way to the better successor. Being attended by engineers from all the provinces of Pakistan as well as foreign countries, it will provide an excellent opportunity to the participants to benefit from shared experiences and to find solutions to our current national problems.

I would like to emphasize that our engineers, despite lack of adequate facilities have done marvelous jobs. The role played by the Institution of Engineers Pakistan and NED University of Engineering & Technology is commendable.

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## Chief Minister Sindh



**Engr. Syed Murad Ali Shah, FIE(Pak)**

Chief Minister Sindh

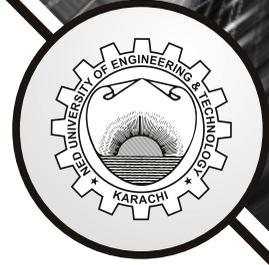
“ I am delighted to felicitate the members of The Institution of Engineers Pakistan Karachi Centre, NED University of Engineering and Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) Association are jointly organizing the 11th International Mechanical Engineering Conference (IMEC-2022) scheduled to be held on Friday 14th & Saturday 15th January, 2022 at Karachi in collaboration with Federation of Engineering Institutions of South and Central Asia (FEISCA), Federation of Engineering Institutions of Islamic Countries (FEIIC), MUET- Jamshoro, BUET-Khuzdar, BUIITEMS-Quetta, DUET-Karachi, Hamdard University, QUEST-Nawabshah, PNEC-NUST, Karachi, SZABIST- Karachi, Pakistan HVACR, Society, ASHRAE Pakistan Chapter, Petroleum Institute of Pakistan, Pakistan Society of Plumbing Professional. The Institution, which came into existence in 1948 with the blessings of the Father of Nation, Quaid-e-Azam Muhammad Ali Jinnah has contributed immensely towards the development of skills and knowledge in preparing engineers for our nation building goals.

I am confident that the 11th International Mechanical Engineering Conference themed as "Sustainable Smart Advancement in Mechanical Engineering" will have far reaching impact in the field of science and engineering. I strongly believe that every advancement in technology today, will give way to a better successor. Being attended by engineers from all the provinces of Pakistan as well as foreign countries, it will provide an excellent opportunity to the participants to benefit from shared experiences and to find solutions to our current national problems.

I would like to emphasize that our engineers, despite lack of adequate facilities have done marvelously well. The role played by the Institution of Engineers Pakistan is commendable.

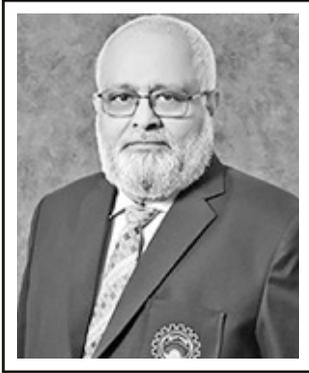
I wish all the success.

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## Vice-Chancellor

NED University of Engineering & Technology, Karachi



**Engr. Prof. Dr. Sarosh H. Lodi**

Vice Chancellor,  
NED University of Engineering and Technology, Karachi

“ It is heartening to know that the Institution of Engineers, Pakistan, Karachi Centre in collaboration with NED University of Engineering & Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) along with other partner universities is organizing 11th International Mechanical Engineering Conference which is in continuation of previously arranged conferences in earlier years. This Year's Conference with its theme being “Sustainable Smart Advancement in Mechanical Engineering” will certainly pave the way for highlighting the current research and the future avenue for being explored.

Modern tools including Artificial Intelligence, Virtual Reality, and Augmented Reality are being employed in all engineering disciplines including Mechanical Engineering. These tools are very vital and without employing these tools there is no survival of Mechanical Engineering. Autonomous vehicles are being manufactured which are all equipped with these modern tools. Hence, it is high time that interdisciplinary research is carried out in our universities so as to coop with the development in the west.

As very learned guest speakers from renowned institutions from abroad and within Country would be sharing their work, this will help the young researchers to get engaged in these areas and will be able to contribute with their maximum capacity limits.

This Conference will surely also provide a platform for the participants for having interaction with each other. As a result collaboration will be initiated among the individuals as well as institutions.

Finally, I would like to congratulate all the members of Organizing Committee whose untiring efforts have made it possible to organize this 11th IMEC and hope that all participants will be fully benefitted by this Conference.



## Vice Chancellor

DHA SUFFA University



**Prof. Dr. Muhammad Afzal Haque**

Vice Chancellor, DHA SUFFA University

“ It is a matter of great pleasure to note that The Institution of Engineers Pakistan, NEDUET, DHA Suffa University and NED International Alumni Network (NEDIAN) Association are jointly organizing the 11th International Mechanical Engineering Conference (IMEC-2022) from January 14-15, 2022 at IEP Karachi in association with Federation of Engineering Institutions of South and Central Asia (FEISA), Federation of Engineering Institutions of Islamic Countries (FEIIC), Mehran University of Engineering & Technology Jamshoro, PNEC-NUST, Balochistan University of Engineering & Technology, SZABIST and several other prominent institutions.

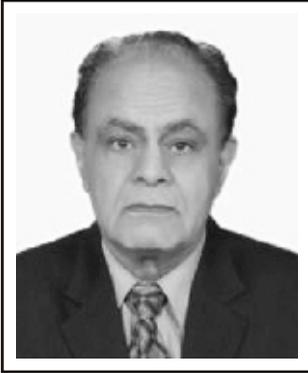
In line with the past traditions of organizing the thematic Conferences this year's theme is "Sustainable Smart Advancements in Mechanical Engineering", which relates to contemporary advancements and challenges in Mechanical Engineering. It is satisfying to know that a diversified group of luminaries from academia and industry is expected to attend this Conference, which will provide a common platform for stakeholders to dilate upon various challenges and advancements in all areas of Mechanical Engineering.

The world today is witnessing phenomenal advances and innovations in various fields of Engineering & Sciences. There is an increase in the demand and large energy requirements, Mechanical Engineers can be at the forefront of developing new technology for environmental remediation, farming, housing, transportation, safety & security, The Conference will hopefully dilate at length on modern fields like Industry 4.0, Artificial Intelligence, Machine Learning, Internet of Things, CAD/CAE, 3-D Printing, Additive Manufacturing besides embedding AI into Robotic designs to convert robots into near human machines, AI and Neural Technologies.

With a galaxy of experts, researchers, academicians and professionals attending the Conference, it is hoped, they will come out with solutions for the comfort of humanity with phenomenal advancements in sciences & technologies across the globe. I wish the Conference a tremendous success and congratulate its organizers for their commendable job in conducting series of such useful events.



**President,**  
The Institution of Engineers, Pakistan



**Engr. Dr. Javed Younas Uppal**

President,  
The Institution of Engineers, Pakistan

“ I am very pleased to convey this Message at the 11th International Mechanical Engineering Conference organized by the Karachi Center, Institution of Engineers Pakistan jointly with NED University of Engineering and Technology, DHA Suffa University, NED International Alumni Network Association, and in collaboration with Federation of Engineering Institutions of South and Central Asia (FEISCA), Federation of Engineering Institutions of Islamic Countries (FEIIC), Mehran University of Engineering and Technology Jamshero, Balochistan University of Engineering and Technology Khuzdar, Baluchistan University of Information Technology, Engineering and Management Sciences Quetta, Dawood University of Engineering and Technology Karachi, Hamdard University, Quaid-e Awam University of Engineering Sciences and Technology, Pakistan Navy Engineering College, NUST Karachi, Pakistan HVACR Society, ASHRAE Pakistan Chapter, Petroleum Institute of Pakistan, Pakistan Society of Plumbing Professionals, and Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology.

I commend the organizers of the Conference to have chosen the theme of the Sustainable Development that is well in compliance with the Sustainable Development Goals of the United Nations. The United Nations have now turned to it after 50 years of its inception. In the past, the governments in various countries not only failed their people, they also failed the United Nations as well and the latter has now decided to engage directly with the public through people-oriented people-centric organizations i.e. the civil society. If pursued with care, the effort offers opportunities for a peaceful progressive world, that have never been targeted before. The essence of the sustainable development is not to work for the vested interests of a few but to work for the entire people as a whole.

The digital world of today, has enabled a special power to the engineers and technologists to build better world. These are smart technologies. I commend the organizers of the Conference to have included the word 'smart' in the theme. Smart technologies are the home grounds of the IT engineers, electronic engineers and the OT mechanical mechatronic engineers.

The time has come for engineers to change their direction and that they now use the weapons of the smart technologies and to work wholeheartedly to eliminate evils from the society with their constructive roles.



## Chairman, IEP Karachi Centre



### Engr. Sohail Bashir, FIE, PE

Chairman, The Institution of Engineers Pakistan, Karachi Centre  
Member Governing Body, Pakistan Engineering Council  
Member, Executive Committee - FEIIC, FEISCA & ACECC

“ The Institution of Engineers Pakistan (IEP) is playing a vital role in the development of Pakistan since its inception within the frame work of its aims & objectives which revolves around the promotion of technology, advancement of the engineering practice, application of principles of science in engineering and dissemination of technical knowledge. Upholding its tradition continuously for the last many years, this year also the 11th International Mechanical Engineering Conference is being jointly hosted by IEP Karachi Centre, NED University of Engineering & Technology, Karachi, DHA Suffa University & NED International Alumni Network (NEDIAN) Association-Pakistan in collaboration with FEISCA- Colombo, Sri Lanka, FEIIC-Riyadh, Saudi Arabia, MUET-Jamshoro, BUET-Khuzdar, BUITEMS-Quetta, DUET-Karachi, Hamdard University-Karachi, QUEST- Nawabshah, PNEC- NUST- Karachi, SZABIST-Karachi, PHVACR Society. ASHRAE-Pakistan, PIP & PSPP. The theme of the conference is **“Sustainable Smart Advancements in Mechanical Engineering”**

On behalf of The Institution of Engineers Pakistan, Karachi Centre and the Members of the Organizing Committee of IMEC-2022, I would like to express my sincere appreciation for active participation of academia and industry in this Conference. Without their cooperation, support and active participatory role, this event would not have been possible for which I record my appreciation for all of them. Special thanks to the Conference Key Note Speakers of Inaugural session Dr. David White from Auckland University of Technology, New Zealand and Engr. Dr. Jeffrey Fernandez from JF Associates, Inc. Virginia, USA and keynote speaker of closing session Engr. Tariq A. Khan from House of Habib and Dr. A. Raheem Othman from PETRONAS University, Malaysia. Thanks to invited speakers from industry, authors and sponsors for strongly supporting the conference. I also take this opportunity to pay my sincere gratitude to the Chief Guest H.E Dr. June Kuncoro Hadiningrat, Consul General, The Republic of Indonesia and Guest of Honor of Inaugural Session & Chief Guest of Closing sessions Prof. Dr. M. Afzal Haque, Vice Chancellor, DHA Suffa University & Guest of Honour Engr. Asim Murtaza Khan, President NED International Alumni Network Association Pakistan for sparing their valuable time for this event. My sincere gratitude are to Engr. Prof. Dr. Sarosh Hashmat Lodi, Vice Chancellor, NEDUET, Engr. Prof. Dr. Muhammad Tufail, Pro-Vice Chancellor, NEDUET and Convener of 11th IMEC-2022 for their guidance & help in organizing IMEC-2022.

I would like to take this opportunity to place on record my sincere appreciation for Engr. Prof. Dr. Mubashir Ali Siddiqui, Chairman, Department of Mechanical Engineering, NEDUET & Co-Convener of IMEC-2022, Engr. Dr. Muhammad Uzair, Secretary, IMEC-2022, Engr. Ayaz Mirza, Vice-President (Mechanical & Allied), IEP, Engr. M. Aijazul Haque, Vice- Chairman (Mechanical), IEP, Karachi Centre, Engr. Ghulam Farooq Maniar, Engr. Abdul Rahim, Engr. Neelofar Hameed Khan, Engr. M.Sajid Abbas, Engr. M. Farooq Arbi and all Local Council Members of IEP, Karachi Centre for their hard work & strong support for IMEC-2022.



## President

NED International Alumni Network (NEDIAN) Association



### Engr. Asim Murtaza Khan

President

NED International Alumni Network (NEDIAN) Association  
& CEO, Petroleum Institute of Pakistan

“ It is a matter of great pride that The Institution of Engineers Pakistan, Karachi Centre, NED University of Engineering & Technology, DHA Suffa University and NED International Alumni Network Association are jointly holding 11th International Mechanical Engineering Conference on Friday 14th & Saturday 15th January, 2022 at NEDUET, Karachi in collaboration with National Engineering Universities.

It gives me great satisfaction that renowned experts from within the country and from abroad shall be presenting their valuable papers during the conference. This event will provide opportunity to young engineers to benefit from the knowledge of experienced engineers in their relevant fields.

The Institution of Engineers Pakistan, Karachi Centre is working hard for dissemination of knowledge by holding National/International Engineering Conferences, Technical Seminars, Workshops and Lectures for the benefit of Engineering profession and development of the Country.

IEP, Karachi Centre deserve appreciation for organizing the Conference in hybrid mode for the benefit of engineering community in this situation of COVID -19.

As President, NED International Alumni Network Association & CEO, Petroleum Institute of Pakistan I am confident the delegates, participants and corporate members attending the Conference, will be benefited by the presentations to be made by the experts from all over Pakistan and abroad, the participants will be able to improve their skills in their fields. It is hoped the participants attending this Conference will be able to apply their improved knowledge for better productivity in their practical life.

I pray for the success of the 11th International Mechanical Engineering Conference.”

## Vice Chancellor

BUIITEMS, Quetta



**Engr. Ahmed Farooq Bazai (S.I)**

Vice Chancellor

Balochistan University of IT, Engineering  
and Management Sciences (BUIITEMS)

“ I congratulate the Honorable Vice Chancellor of NED University and Chairman IEP Karachi Centre on organizing jointly the 11th International Mechanical Engineering Conference under the theme of "Sustainable Smart Advancements in Mechanical Engineering".

The conference aims to provide a platform for the exchange of thoughts on the latest development in the field of Mechanical Engineering for sustainable and smart industrial applications, among researchers and engineers in universities and industries, and to seek opportunities for collaboration among the participants.

There has been tremendous innovation in emerging technologies during recent years including, nanomaterials, superalloys, protective coatings, 3-D printing, smart cars, flying vehicles, hi-tech batteries, industrial and Nanorobots with innovative mobility, virtual reality, and many others. These and many other developments have unlocked new boundaries of research provoking advanced industrial revolution and also towards sustainability.

I anticipate that the conference is committed to meeting the expectations of all its stakeholders to realize its vision to emerge as a centre of excellence in various fields both at national and international levels. ”



## Vice-Chancellor, BUET ,Khuzdar



**Prof. Dr. Ehsanullah Khan Kakar**

Vice-Chancellor  
Balochistan UET ,Khuzdar

“ I am delighted to have the opportunity to share a few thoughts at the time of 11th International Mechanical Engineering Conference (IMEC-2022). It is a great initiative taken by Institution of Engineers Pakistan (IEP) and NED University of Engineering and Technology Karachi along with other reputed partners including Balochistan University of Engineering and Technology Khuzdar. The 11th edition of the conference itself is an indicator of the quality and credibility of the Conference Internationally.

The theme of the Conference “Sustainable Smart Advancements in Mechanical Engineering“is the need of the hour as technological advancements have made a huge impact on Mechanical Engineering globally. The tracks included in the conference relates to the sustainable smart advancements occurring in the field of Mechanical Engineering ranging from power generation policies, product optimization, 3-D printing and especially Artificial Intelligence and Nano technology as they are also significantly important in terms of achieving Sustainable Development Goals (SDGs) for a brighter future of Pakistan.

I firmly believe that this conference will open a new era of research globally in the field of Mechanical Engineering with sharing of knowledge and brainstorming for innovation.

I warmly congratulate the organizers of the conference for holding such a high-quality International Conference and assure them that Balochistan UET Khuzdar will continue to collaborate in such future endeavors as well.

## Secretary General, IEP



**Engr. Amir Zamir Ahmed Khan**

Secretary General  
The Institution of Engineers, Pakistan



It is a matter of great pleasure that the Institution of Engineers Pakistan Karachi Centre, NED University of Engineering & Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) Association are jointly organizing the 11th International Mechanical Engineering Conference (11th IMEC-2022) in collaboration with Federation of Engineering Institutions of South & Central Asia (FEISCA), Federation of Engineering Institutions of Islamic Countries (FEIIC), Mehran University of Engineering & Technology, Jamshoro (MUET), Baluchistan University of Engineering & Technology, Khuzdar (BUET), Balochistan University of Information Technology, Engineering and Management Sciences, Quetta (BUIEMS), Dawood University of Engineering and Technology, Karachi, Hamdard University, Quaid-e-Awam University of Engineering, Sciences & Technology, Pakistan (QUEST), Navy Engineering College-NUST, Karachi, Pakistan HVACR, Society ASHRAE Pakistan Chapter, Petroleum Institute of Pakistan, Pakistan Society of Plumbing Professional and Shaheed Zulfiqar Ali Bhutto Institute of Science & Technology scheduled to be held on **Friday 14th & Saturday 15th January, 2022** at **NED University Karachi**.

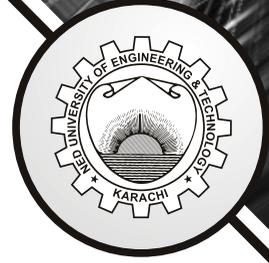
The Institution is the premier body of qualified engineers in Pakistan and has made significant contributions for the development of the country. The role being played by the Institution in spreading modern skills and technology is highly commendable. Recent advancements in Science and Technology have placed enormous energy at the disposal of man which must be harnessed for the welfare of humanity. Pakistan possesses vast natural resources and it is the duty of our engineers to utilize these resources for the welfare of the society, economic growth and environmental promotion for eradication of disease, ignorance, poverty and hunger.

I highly appreciate organizers for selection of very important theme of conference **“Sustainable Smart Advancement in Mechanical Engineering”** The Institution of Engineers, Pakistan being as National Member of World Federation of Engineering Organizations (WFEO) will have to follow the Sustainable Development Goals set up by United Nations. I am sure that in this conference practice of Mechanical Engineering will be discussed in the light of advancements in technology and competitive demands for efficient systems. The role of proper Mechanical Engineering practice will strengthen the economic sustainability and innovative technology for the development of country.

I am fully confident that 11th International Mechanical Engineering Conference being attended by engineers from all over Pakistan will provide an excellent opportunity to the participants particularly Young Engineers to benefit from the experiences of one another in the light of the Theme of the Conference.

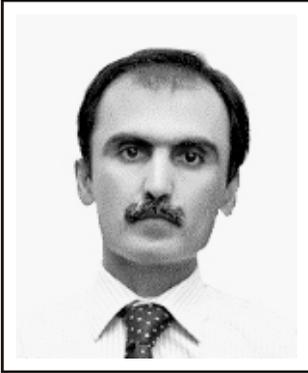
I wish the Institution of Engineers Pakistan Karachi Centre and Participants of the Conference all the success.





## Pro Vice-Chancellor

NED University of Engineering & Technology, Karachi



### Engr. Prof. Dr. Muhammad Tufail, FIE (Pak)

Pro Vice-Chancellor

NED University of Engineering & Technology, Karachi  
& Convener 11th IMEC-22

“ It is indeed a pleasure to see the efforts of the NED University of Engineering and Technology, and Institution of Engineers Pakistan (IEP) to provide the opportunities to the researchers from all over world to disseminate their research work in the field of Mechanical Engineering. International Mechanical Engineering Conference (IMEC) organized by NED University of Engineering and Technology and Institution of Engineers, Pakistan, Karachi Centre has established itself as a trade mark for providing the state of art research in the field of Mechanical Engineering.

Line every year, this year again, NED University of Engineering and Technology and Institution of Engineers, Pakistan, Karachi Centre in collaborationn with DHA Suffa university, Karachi and other partner universities will be arranging the 11th International Mechanical Engineering Conference under the theme of “Sustainable Smart advancements in Mechanical Engineering”. The theme will hopefully cover all Mechanical Engineering aspects and make the participants aware about advancement in the field.

I hope that the participants apart from getting knowledge about new research will also have interaction with other participating institutions which will lead towards establishing collaboration between the institutions within Country and abroad.

Finally, I would like to congratulate the Organizing Committee of 11th IMEC for their commendable efforts for organizing this event and hope that this event will be a successful one with all participants fully benefited from the event.

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## Vice-President

(Mechanical and Allied), IEP, Pakistan



### Engr. Ayaz Mirza, FIE, PE

Vice-President, (Mechanical and Allied)  
The Institution of Engineers Pakistan



I feel honored to welcome you all in 11th International Mechanical Engineering Conference (IMEC-2022) Jointly organized by The Institution of Engineers Pakistan, Karachi Centre, NED University of Engineering and Technology, DHA Suffa University and NED International Alumni Network (NEDIAN) Association in collaboration with Federation of Engineering Institutions of South and Central Asia (FEISCA), Federation of Engineering Institutions of Islamic Countries (FEIIC) and many other Engineering Universities of Pakistan, scheduled to be held on Friday 14th & Saturday 15th January, 2022 (Physical & Online through Zoom).

In spite of the fact that current global pandemic has created enormous challenges and tremendous impacts on life of each one of us, organizing IMEC-2022 was a big challenge but after the successful experience of IMEC -2021 which went on line, IMEC-2022 has also been pivoted from on-site event to online virtual/physically event. This conference has a fantastic line up of keynote sessions, webinars sessions by eminent speakers, paper presentation sessions to present the latest outcomes related to advancements in Mechanical Technologies.

Mechanical engineers play key roles in a wide range of industries including automotive, aerospace, biotechnology, computers, electronics, microelectromechanical systems, energy conversion, robotics and automation, and manufacturing.

The evolution of technologies related to climate change as represented by patent data shows that we are yet to witness the intensity of activities associated with a new innovation wave of sustainable technologies. What individual countries are aiming to achieve through innovation will not be enough to deal with the scale of the existing problems. Targeted global efforts are required for the new innovation wave to pick up and a global green system of innovation is needed. I hope this Conference will lead to resolve all the engineering issues and will be able to set new agenda for the overall success of the engineers and the engineering community

This includes solving today's problems and creating future solutions in health care, energy, transportation, world hunger, space exploration, climate change, and more.

This congress will provide you an opportunity to set your vision as well as lay down your plans for your organization as it takes on the challenges and opportunities of our time. May this exercise strengthen the bonds of camaraderie, deepen professional ties, and increase collaboration for the advancement of your field, for our shared aspirations of equitable progress in our nation.

As Vice-President (Mechanical and Allied) I am grateful to all our foreign delegates, participants, learned speakers of 11th Mechanical Engineering Conference (IMEC-2022).

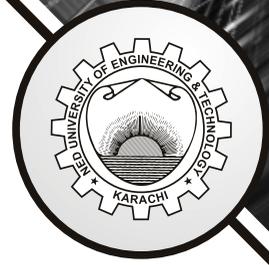
On behalf of the Central Council, The Institution of Engineers Pakistan, and my own behalf, I congratulate the Organizing Committee for their efforts particularly I would like to thank Engr. Prof. Dr. Sarosh Hashmat Lodi, Vice-Chancellor, NED University of Engineering and Technology for his support for providing the venue of this conference, I also thank Engr. Prof. Dr. M. Tufail, Pro Vice Chancellor, NED University of Engineering and Technology, convener of IMEC 2022 for his support and cooperation with the Institution of Engineers Pakistan, Karachi Centre.

I congratulate to Engr. Sohail Bashir, Chairman, IEP Karachi Centre and Engr. Farooq Arbi, Secretary, IEP, Karachi Centre, in accepting the challenge in organizing this conference during the present COVID-19 epidemics scenario.

I also congratulate members of all the committees, specially Engr, Aijaz Ul Haq , Chairman Mechanical and Chief Organizer of IMEC 2022, Prof. Dr. Mubashir Ali Siddiqui, Dr. Maaz Akhter, Dr. Muhammad Uzair Secretary IMEC 2022, Engr. Farooq Maniar and Engr. Abdul Rahim for their concerted efforts to make this Conference a success.

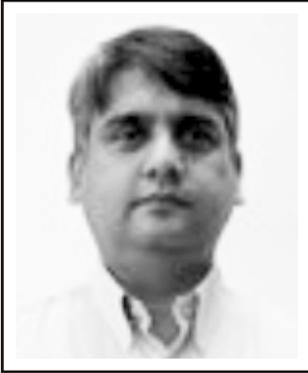
Looking forward to see you in the Conference





## Dean

Faculty of Mechanical & Manufacturing Engineering , NEDUET



### Prof. Dr. Syed Amir Iqbal

Dean Faculty of Mechanical  
& Manufacturing Engineering , NEDUET

“ It's great to see NED University and the Institution of Engineers Pakistan (IEP) collaborate with the Federation of Engineering Institutions of Islamic Countries (FEIIC), the Federation of Engineering Institutions of South and Central Asia (FEISCA), and other collaborating institutions to produce the 11th International Mechanical Engineering Conference on "Smart Sustainable Advancements in Mechanical Engineering.”

It is critical to succeed in present technologies while keeping an eye on future trends on the one hand, as this leads to technical advancement on the other.

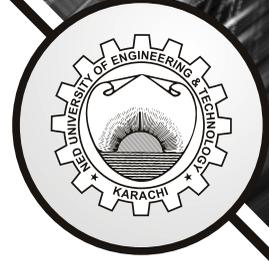
I am hopeful that the papers presented in conference tracks on nano technology, artificial intelligence, power generation, and other topics will benefit society.

Finally, I'd want to express my gratitude to the members of the IEP and NED committees, volunteers, and authors for their contributions to make this event successful.

”

## Co-Convener

11th-IMEC-2022



**Engr. Prof. Dr. Mubashir Ali Siddiqui, FIE(Pak)**

Chairman, Department of Mechanical Engineering, NEDUET  
& Co-Convener, 11th -IMEC-2022

“ It is indeed heartening to see that International Mechanical Engineering Conferences (IMEC) are being arranged regularly on an yearly basis, leading us to the 11th IMEC.

The Conference Theme is indeed the need of the day, as the world is moving very rapidly towards sustainable solutions and smart advancements in the field of Mechanical Engineering. Automation and data exchange have become compulsory in this particular field. Internet of Things (IoT) and cloud computing are being incorporated in almost all processes at a very brisk pace.

Various techniques including Smart Automation, Artificial Intelligence, and Interconnectivity are being applied in energy sector including renewables, along with manufacturing and service sectors.

I hope that academia and industry will get benefitted from this valuable conference, and pray for the success of the same.

”

## Secretary

The Institution of Engineers Pakistan, Karachi Centre



**Engr. M. Farooq Arbi, FIE, PE**

Secretary,

The Institution of Engineers Pakistan, Karachi Centre



We take great pleasure and pride in hosting the 11th International Mechanical Engineering Conference on the theme “Sustainable Smart Advancements in Mechanical Engineering” being jointly organized with NED University of Engineering and Technology, DHA SUFFA University and NED International Alumni Network (NEDIAN) Association scheduled to be held on Friday 14th & Saturday 15th March, 2022 at Video Conferencing Hall, Department of Civil Engineering, NED University of Engineering and Technology.

This time we have collaborated with Federation of Engineering Institutions of South and Central Asia (FEISCA), Federation of Engineering Institutions of Islamic Countries (FEIIC), Mehran University of Engineering & Technology, Jamshoro, Balochistan University of Engineering and Technology, Khuzdar, Balochistan University of Information Technology, Engineering & Management Sciences, Quetta, Dawood University of Engineering and Technology, Hamdard University, Quaid-e-Awam University of Engineering, Sciences and Technology, Pakistan Navy Engineering College-NUST, Karachi, Pakistan HVACR Society, ASHRAE Pakistan Chapter, Petroleum Institute of Pakistan, Pakistan Society of Plumbing Professionals, and Shaheed Zulfiqar Ali Bhutto Institute of Science & Technology.

Mechanical Engineers develop state-of-the-art technologies and exhilarating solutions for everyone. In this regard, this conference is envisaged to be a congregation of academicians, researchers, practitioners, engineers, educators, administrators and students. The deliberations, discussions and sharing of thoughts and ideas shall enable the participants to take up new challenges and initiatives in their chosen area of research.

I must appreciate the exceptional conviction of the organizing committee to select such a subject theme for the conference that has far reaching impact not only on the lives of people in the Science and Engineering field, but also masses in general. Advancement in technologies in modern times has almost become as obvious and as regular perhaps as the natural phenomenon of the circle of day and night. It is my belief that the Conference will be a grand success and will pave the way for similar conferences in the future and not to mention, it will contribute in generating improved awareness about the latest technological advancements amongst us!

I believe this Conference will provide us the benchmark for continued improvement in overall development of the Institution of Engineers Pakistan and NED University of Engineering and Technology, DHA SUFFA University. I appreciate the efforts of the Organizing Committee, Engr. Sohail Bashir, Chairman, IEP Karachi Centre, Engr. Prof. Dr. Sarosh Hashmat Lodhi, Vice-Chancellor, NEDUET, Prof. Dr. M.Tufail, Pro Vice-Chancellor, NEDUET, Engr. Prof. Dr. Amir Iqbal, Dean, Department of Mechanical Engineering, NEDUET, Engr. Prof. Dr. Mubashir Ali Siddiqui, Chairman, Department of Mechanical Engineering, NEDUET Engr. Dr. Muhammad Uzair, Members of the Central and Local Council of IEP Karachi Centre, who have done an excellent job in compiling 11th International Mechanical Engineering Conference activities and disseminating them through this Conference.

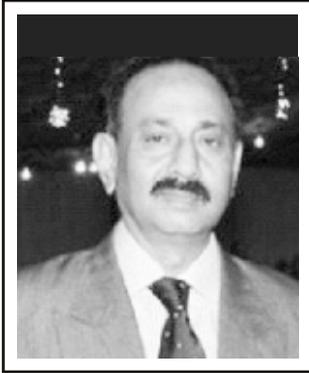
As Secretary, IEP Karachi Centre I am confident the delegates, participants and corporate members attending the Conference, will be benefited by the presentations to be made by the experts from all over Pakistan and abroad (physically and online), the participants will be able to improve their skills in their fields. It is hoped the participants attending this Conference will be able to apply their improved knowledge for better productivity in their practical life.





## Vice-Chairman (Mechanical)

The Institution of Engineers Pakistan Karachi Centre



**Engr. Muhammad Aijaz ul Haque**

Vice-Chairman

(Mechanical) IEP Karachi Centre

“ The Institution of Engineers Pakistan is playing a vital role in the Development of Engineering Profession since its inception within the parameter of its approved aims and objectives, for the promotion and advancement of the practice and application of principles of Engineering, spread across Pakistan. As per its traditions, IEP, Karachi Centre, NEDUET, DHA Suffa University and NED International Alumni Network (NEDIAN) Association is Jointly organizing the 11th International Mechanical Engineering Conference this year in collaboration with NEDUET.

The conference shall focus on latest Technological Development in the field of Mechanical Engineering not only to disseminate knowledge but will also broaden the vision of the participants, which led them to explore the new frontiers.

As Vice-Chairman (Mechanical) of the Institution of Engineers Pakistan, Karachi Centre and member of the 11th IMEC-2022 Organizing Committee, I would like to express my sincere appreciation for all participants, through contributions to the conference and through their extremely hard work to make this event happen. Special thanks also go to the keynote speakers, invited speakers and authors.

I wish the organizers of this conference every success



## Secretary General

NED International Alumni Network (NEDIAN) Association



### Engr. Muhammad Abbas Sajid

General Secretary

Pakistan Society of Plumbing Professionals

Secretary General

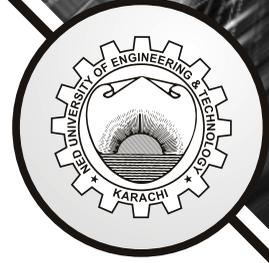
NED International Alumni Network (NEDIAN) Association

“ I am delighted to have the opportunity to share a few thoughts at the time of 11th International Mechanical Engineering Conference (IMEC-2022). It is a great initiative taken by Institution of Engineers Pakistan (IEP) Karachi Centre and NED University of Engineering and Technology Karachi, DHA Suffa University and NED International Alumni Network (NEDIAN) Association along with other reputed partners including Pakistan Society of Plumbing Professionals. The 11th edition of the conference itself is an indicator of the quality and credibility of the Conference Internationally.

The theme of the Conference “Sustainable Smart Advancement in Mechanical Engineering “ is very relevant in modern times as technological advancements have made a huge impact on Mechanical Engineering globally. The tracks included in the conference reflect the Smart Advancements occurring in the field of Mechanical Engineering.

I firmly believe that this conference will open a new era of research with a focus on Sustainable Smart Advancements resulting in technological transformation in the field of Mechanical Engineering.

I warmly congratulate the organizers of the conference for holding such a high quality International Conference and assure them that Pakistan Society of Plumbing Professionals will continue to collaborate in such future endeavours as well.

**Secretary, 11th -IMEC-2022****Engr. Dr. Muhammad Uzair**

Secretary  
11th -IMEC-2022

“ Being Secretary of the 11th International Mechanical Engineering Conference (IMEC-22), I am very thankful to the efforts of organizing committee.

NED University of Engineering and Technology and The Institution of Engineers Pakistan (IEP) has always played a commendable part in promoting Engineering and Technology in Pakistan.

The International Mechanical Engineering Conference (IMEC) has established itself as a worldwide reference for the dissemination of high-quality research in all aspects of Mechanical Engineering.

Over the past Ten successful events IMEC has provided a platform for researchers to address the advancements in the field of Mechanical Engineering.

Finally, I wish all the attendees a highly stimulating, informative, and enjoyable conference.

”



## The Institution of Engineers Pakistan

The main goal of the Institution of Engineers, Pakistan is to Build Better World as appearing in its logo.

The aims and objectives of the Institution are:

- a. To Promote and advance the science, practice, and business of engineering in all its branches throughout Pakistan.
- b. To Promote efficiency in the engineering practice and profession.
- c. To Regulate the professional activities and assist in maintaining high standard in the general conduct of its members.
- d. To Lay down professional code of ethics and to make it mandatory for its members in their professional conduct.
- e. To Help in the acquisition and exchange of technical knowledge.
- f. To Promote the professional interest and social welfare of its members.
- g. To Encourage original research in engineering and conservation and economic utilization of the country's materials resources.
- h. To Foster coordination with similar institutions in other countries and Engineering Universities, Institutions and Colleges in Pakistan and in other countries for mutual benefits in furthering the objects of Institution.
- i) To diffuse among its members information on all matters affecting engineering and to encourage, assist and extend knowledge and information connected therewith by establishment and promotion of lectures, discussions or correspondence, by the holding of conferences, by the publication of papers, periodicals and journals, proceedings, reports, books, circulars and maps or other literary undertaking, by encouraging research work or by the formation of library or libraries and collection of models, designs, drawings, and other articles of interest in connection with engineering or otherwise howsoever.
- j) To promote the study of engineering with a view to disseminating the information obtained for facilitating the scientific and economic development of engineering in Pakistan.
- k) To establish, acquire, carry on, control or advise with regard to colleges or other educational establishments where students and apprentices may obtain a sound education and training in engineering on such terms as may be settled by the Institution.
- l) To encourage, regulate and elevate the technical and general knowledge of persons engaged in or about to engage in engineering or in any employment manual or otherwise in connection therewith and with a view thereto function as an Educational Institution and to provide for holding of coaching wherever possible and to test by examination or otherwise the competence of such persons and to institute and establish professor-ships, student-ships, scholar-ships, rewards and other benefactions and to grant certificates of competency whether under any Act of the Government of Pakistan or Local Government under the Bye-Laws of the Institution regulating the conduct and qualification of engineer or otherwise howsoever.
- m) To operate with various Government agencies and industrial and commercial enterprises connected with engineering and advising them in matters concerning the profession and practice of engineering and promotion of technical education.
- n) To encourage inventions and investigate and make known their nature and merits.
- o) To arrange and promote the adoption of equitable forms of engineering contracts and other legal documents, to encourage settlement of disputes by arbitration and to act as and nominate arbitrators and to act as and nominate arbitrators and umpires on such terms as may be expedient.
- p) To promote just and honorable dealing and to suppress mal-practice in engineering
- q) To do all such other acts and things as are incidental or conducive to the above objects or any of them.

The Institution ever since its inception has been taking concerted efforts to upgrade the knowledge and technical know-how of its member engineers by undertaking various technical activities. IEP has, on number of occasions, conducted numerous studies on various technical problems, and has submitted its recommendations to the government.

## LIST OF ORGANIZATIONS, INSTITUTIONS HAVING AGREEMENT OF CO-OPERATION / AFFILIATIONS WITH IEP

1. World Federation of Engineering Organizations (WFEO)
2. Federation of Engineering Institutions of Islamic Countries (FEIIC)  
(comprising all Engineering Institution of Islamic Countries).
3. Federation of Engineering Institutions of South and Central Asia (FEISCA),  
(all Engineering Institutions of SAARC Countries are its Members.)
4. Asian Civil Engineering Coordinating Council (ACECC)
5. Common-Wealth Engineers Council (CEC)  
(which works under the aegis of United Nations Organization).
6. International Federation of Automatic Control (IFAC)
7. Consortium of Affiliates of International Programme (CAIP)
8. American Association for Advancement of Sciences (AAAS), USA.
9. International Association for Bridges & Structural Engineering (IABSE), USA.
10. Russian Engineering Academy, Russia
11. American Society for Civil Engineers, USA.
12. Canadian Society for Civil Engineering, Canada.
13. Royal Aeronautical Society, U.K.
14. Institution of Structural Engineers, UK.
15. Institution of Civil Engineers, UK.
16. Institution of Electrical Engineers UK.
17. Institution of Mechanical Engineers UK.
18. China Civil Engineering Society, China
19. China Mechanical Engineering Society, China.
20. China Highways & Transportation Engineering Society, China.
21. Chinese Society of Electrical Engineers, China.
22. China Institution of Electronics, China.
23. Cyprus Professional Engineers Association, Cyprus.
24. Institution of Engineers, Bangladesh.
25. Institution of Electrical Engineers of Japan
26. Institution of Engineers Sri Lanka.
27. Nepal Engineers' Association, Nepal.
28. Institution of Engineers Malaysia.
29. Institution of Engineers Indonesia.
30. Engineering Academy of Tajikistan.
31. Engineering Academy of Uzbekistan.
32. Engineering Academy of Kazakhstan.
33. Institute of Seismology and Seismological Construction, Tajikistan.
34. Republican Association of Young Engineers and Specialist, Kazakhstan.
35. Institution of Engineers Afghanistan.
36. Council of Aeronautical Science, USA.
37. Engineering Academy of Kirgistan.
38. Institution of Engineers, Australia.
39. Union of Chambers of Engineers & Architects, Turkey.
40. Korean Society of Civil Engineers, Korea.
41. Japan Society of Civil Engineers, Japan
42. Institution of Electrical and Electronics Engineers, USA.
43. Institute of Marine Engineering, Science & Technology, UK.
44. Bahrain Society of Engineers, Bahrain.

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# The Institution of Engineers Pakistan

**Inaugural Session  
at Video Conferencing Hall,  
Department of Civil Engineering, NEDUET, Karachi  
(Friday, 14th January, 2022)**

03:00 pm	Guests Arrival
03:25 pm	Guests to be seated
03:30 pm	Recitation from the Holy Quran
03:35 pm	National Anthem
03:40 pm	<b>Conference briefing by</b> Prof. Dr. Syed Amir Iqbal, Dean, Mechanical and Manufacturing Engineering NEDUET & Co-Convenor, 11 <sup>th</sup> IMEC-2022
03:45 pm	<b>Welcome Address by</b> Engr. Prof. Dr. Muhammad Tufail, Pro-Vice Chancellor, NEDUET & Convenor, 11 <sup>th</sup> IMEC-2022
03:50 pm	<b>Address by</b> Engr. Sohail Bashir Chairman, IEP Karachi Centre
03:55 pm	<b>Key Note Address by</b> Dr. David White, Associate Professor, Auckland University of Technology New Zealand
04:05 pm	<b>Technical Presentation on “Home Office Ergonomic”</b> Jeffrey Fernandez, PhD, PE, CPE Managing Principal, JF Associates, Inc., Fairfax, Virginia, USA
04: 20pm	<b>Address by</b> Engr. Prof. Dr. Sarosh Hashmat Lodi, FIE, PE Vice-Chancellor, NEDUET
04:30 pm	<b>Address by Guest of Honor</b>
04: 40 pm	<b>Address by Chief Guest</b> <b>H.E Dr. June Kuncoro Hadiningrat</b> Consul General, The Republic of Indonesia
04: 50 pm	Presentation of Conference Mementos
05:10 pm	<b>Vote of Thanks by</b> Engr. Farooq Arbi, FIE, PE Secretary, IEP, Karachi Centre
05:20 pm	<b>Asr Prayer</b>
05:30 pm	<b>Refreshments</b>

**Programme**  
**Technical Sessions (Saturday, 15<sup>th</sup> January, 2022)**

<p>Technical Session 1-A Video Conferencing Hall Department of Civil Engineering NEDUET, Karachi Time: 9:30 am- 11:10 am</p>	Paper 1	Paper 2	Paper 3	Paper 4
<p><b>Topic: Computational Fluid Dynamic</b> <b>Session Chairs:</b> Engr. Dr. Muhammad Dawood Idress (DUET) Engr. Dr. Muhammad Shakaib (NEDUET) Engr. Abdul Rahim (IEP)</p>	<p>“The effect of inlet swirl on thermal performance of curved vortex tube”  By Shehzaib Yousuf Khan, Usman Allauddin</p>	<p>“Design and modelling of lower prosthetic limb for additive manufacturing”  By Muhammad Osama, Usman Allauddin</p>	<p>“Why do we need improved wind speed forecasting models for small sample datasets?”  By Muhammad Uzair Yousuf</p>	<p>“Simulation of three-dimensional laminar and turbulent flows over a cylinder undergoing vortex induced vibration”  By Syed Ahmad Raza Yosua Heru Irawan and Ming-Jyh Chern</p>
<p>Technical Session 1-B Audio Visual Hall Department of Mechanical Engineering NEDUET, Karachi Time: 9:30 am- 11:10 am</p>	Paper 1	Paper 2	Paper 3	Paper 4
<p><b>Topic: Heat Transfer</b> <b>Session Chairs:</b> Engr. Prof. Dr. Murtaza Mehdi (NEDUET) Engr. Jilani Yousuf (IEP/ Industry) Engr. Abdul Wahab Tajwani (IEP/Industry)</p>	<p>“Thermodynamic analysis of single effect and double effect vapor absorption refrigeration system”  By Abdul Rehman and Syed Muhammad Ali Mazhar</p>	<p>“Assessment plan of Indoor and Outdoor Relationship of Nitrous Oxides, Sulfur Dioxide, and Particulate Matters Concentration Level in Four Shanghai Public Schools”  By Mirza Hammad Baig, Kashif Azher, Katherine Hasan and Francine Lima</p>	<p>“Design and Fabrication of Catalytic Converter with New Material”  By Muhammad Wajahat Rasool Arain, Asad A. Zaidi, Muhammad Asif, Muhammad Uzair</p>	<p>“Experimental study to analyze the effect of critical parameters on the performance of integrated solid desiccant using cross flow m-cycle”  By Ghulam Qadar Chaudhary, Allah Ditta, Muzaffar Ali, Muhammad Uzair, Naveed Akram, Amar Gulnawaz</p>
<b>Tea Break (11:10am – 11:30am)</b>				
<p>Technical Session 2-A Video Conferencing Hall Department of Civil Engineering, NEDUET, Karachi Time; 11:30 am- 1:10 pm</p>	Paper 1	Paper 2	Paper 3	Paper 4
<p><b>Topic: Materials Engineering</b> <b>Session Chairs:</b> Engr. Dr. Ehtesham ul Haque (NEDUET) Engr. S.A.H. Naqvi (IEP/ Industry) Engr. Ghulam Farooq Maniar (IEP)</p>	<p>“Ready to Use Virtual All-Atom Polarized Model of Gold Compatible with FORCITE Module”  By Tariq Jamil and Shaukat Ali</p>	<p>“Ideal resource management model (IRMM) for atlas battery limited”  By Syed Sohail Ibtihaj Bukhari, Maaz Akhtar, Muhammad Muzamil</p>	<p>“Development of new creep material model for use through computational modelling”  By Mohsin Sattar, A.R. Othman and S. Kamaruddin, Maaz Akhtar</p>	<p>“Single image frame algorithm for particle streak velocimetry”  By Mumtaz Hussain Qureshi and Wei-Hsin Tien</p>

<p>Technical Session 2-B  <b>Audio Visual Hall, Department of Mechanical Engineering, NEDUET</b>  <b>Time: 11:30 am- 1:10 pm</b></p>	Paper 1	Paper 2	Paper 3	Paper 4
<p><b>Topic: Solar Energy</b>  <b>Session Chairs:</b>                  Engr. Dr. Tariq Jamil (NEDUET)                  Engr. Taufiq Bilwani (Industry)                  Engr. Pervez Sadiq (IEP)</p>	<p><b>“Sizing of a novel off-grid mobile solar PV system”</b></p> <p>By                  Ahsan Ahmed,                  Musab Salim Khan, Faaiz Alavi,                  Hassan Rasool and Hassan Ali</p>	<p><b>“Increasing photovoltaic performance through temperature regulation by Soy wax as phase change material”</b></p> <p>By                  Muhammad Farhan, Asad A. Naqvi and Muhammad Uzair</p>	<p><b>“Design and Fabrication of Small-Scale Solar Panel Lamination Machine”</b></p> <p>By                  Usman Allauddin, Mirza Hammad Baig, S.H. Siddiqui I, M.M. Aman, M.W. Baqar, T.A. Hussain, M.A. Mohsin</p>	<p><b>“Future of gas turbines in power sector”</b></p> <p>By                  Engr. M. Aijaz Umer                  Voce-President, Central Technical Service (Conventional and CCGT Technology), ACWA Power International, Riyadh, Saudi Arabia</p>
<p><b>Lunch &amp; Zohar Prayer 1:10-2:00 pm</b></p>				
<p>Technical Session 3-A  <b>Video Conferencing Hall</b>  <b>Department of Civil Engineering</b>  <b>NEDUET, Karachi</b>  <b>Time: 02:00pm - 03:40 pm</b></p>	Presentation 1	Presentation 2	Presentation 3	
<p><b>Topic: ASHRAE Pakistan</b>  <b>Session Chairs:</b>                  Engr. Dr. Maaz Akhtar                  Engr. M. Abbas Sajid (Industry)                  Engr. Neelofar Hameed Khan (IEP)</p>	<p><b>“Energy Efficient Practices for HVAC System Designs for High Performance Buildings”</b></p> <p>By                  Fahim I. Siddiqui</p>	<p><b>“An overview of Pakistan’s Building Energy Code and the Role of ASHRAE”</b></p> <p>By                  Farhan A. Mehboob</p>	<p><b>“Bangladesh changing its indoor environment with ASHRAE Standards”</b></p> <p>By                  Ananta Ahmad</p>	
<p>Technical Session 3-B  <b>Audio Visual Hall</b>  <b>Department of Mechanical Engineering, NEDUET, Karachi</b>  <b>Time: 02:00pm - 03:40 pm</b></p>	Paper 1	Paper 2	Paper 3	Paper 4
<p><b>Topic: Automotive</b>  <b>Session Chairs:</b>                  Engr. Dr. Usman Allauddin (NEDUET)                  Engr. Engr. Tariq A. Khan (Industry)                  Engr. Ayaz Mirza (IEP)</p>	<p><b>“Impact of Waste Cooking Oil Blend on Exhaust Gas Temperature in Compression Ignition Engine”</b></p> <p>By                  Faheem Ahmed Solongi, Liaquat Ali Memon, Tamoor Abbas Larik and Ali Murtaza Ansari</p>	<p><b>“Study the effects of utilizing of waste thermoplastics in the construction of roads”</b></p> <p>By                  Ifrah Asif, Asad A. Naqvi, Mubashir Ali Siddiqui I and Hammad Ahmed</p>	<p><b>“3d structural analysis of an electric vehicle chassis using computer simulations”</b></p> <p>By                  Hasan Raza, Murtuza Mehdi, Usman Allauddin I and Nauman Malik</p>	<p><b>“Selection of Fluid for Organic Rankine Cycle”</b></p> <p>By                  Asad A. Naqvi, Shaheer Ali, Hassan Shahid, Hasan Masroor, Anas Khan</p>

Technical Session 1-A  
 Video Conferencing Hall  
 Department of Civil Engineering  
 NEDUET, Karachi  
 Time: 9:30 am- 11:10 am

Session1-A (Video Conferencing Hall , Department of Civil Engineering

Computational Fluid Dynamics

### THE EFFECT OF INLET SWIRL ON THERMAL PERFORMANCE OF CURVED VORTEX TUBE

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Curved Vortex Tubes (CVT) with different configurations of inlet swirl nozzles are numerically investigated for optimizing the thermal performance including heating, cooling, and energy separation. The CFD simulations are performed using ANSYS Fluent and validated using the published experimental data. The standard turbulence model along with governing equations are used to model the vortical flow inside the tube. The thermal performance is compared by increasing the number of inlet nozzles, and then multiple diameters are used to analyze the effect of temperature separation. It is found that the inlet nozzle specifications have favourable results on the thermal performance of the vortex tube. Furthermore, the reason for degradation in thermal performance is found to be the pressure loss at nozzle exhaust and turbulent mixing inside the tube. The thermal performance is characterized by temperature differences and isentropic efficiency.

**Keywords:** Cooling; Refrigeration; Swirling flow; Temperature Separation; Turbulence; Vortex tubes.

Session1-A (Video Conferencing Hall , Department of Civil Engineering

Computational Fluid Dynamics

### DESIGN AND MODELLING OF LOWER PROSTHETIC LIMB FOR ADDITIVE MANUFACTURING

Muhammad Osama1\*, Usman Allauddin2

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This paper presents an approach for designing a prosthetic limb utilizing SolidWorks. The method of stereolithography made a difference make the prosthetic limb due to the flexibility within the provided parameters. The designed leg weighs 4kg approx. The whole weight acts on the sole of the leg. The sole once more experienced a SolidWorks simulation with the application of a 1200N stack. The preferred fabric -TPU - was selected after considering all the components. The manuscript continues with a financial analysis to induce a cost estimate for the manufacturing of each portion of the limb, which may be a crucial factor.

**Keywords:** Additive Manufacturing, Prosthetic limb, Stereolithography.

Technical Session 1-A  
 Video Conferencing Hall  
 Department of Civil Engineering  
 NEDUET, Karachi  
 Time: 9:30 am- 11:10 am

Session 1-A (Video Conferencing Hall , Department of Civil Engineering

Computational Fluid Dynamics

### WHY DO WE NEED IMPROVED WIND SPEED FORECASTING MODELS FOR SMALL SAMPLE DATASETS?

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The stochastic nature of wind speed raised multiple challenges to the power systems and is one of the principal challenges to declare wind energy a reliable source. Wind speed forecasting is one solution to overcome this problem. For this reason, forecasting models have been gaining more attention for the last two decades. However, a handful of studies are available that considered the prediction of wind for small sample datasets. In this study, the data-driven models are analyzed for multiple case studies. Initially, the problems of traditional models are highlighted. Next, improvements are suggested for the conventional models. Lastly, the accuracies are compared to ensure the robustness of the model. The proposed models would be helpful in precisely assessing the wind speeds.

Session 1-A (Video Conferencing Hall , Department of Civil Engineering

Computational Fluid Dynamics

### SIMULATION OF THREE-DIMENSIONAL LAMINAR AND TURBULENT FLOWS OVER A CYLINDER UNDERGOING VORTEX INDUCED VIBRATION

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Fluid-structure interactions involving elastically mounted bodies often generate vortices in the downstream flow, which could cause vortex-induced vibration (VIV). Such VIV often has an adverse effect on engineering structures but in recent years, several attempts have been made to harness it for energy generation. An in-house finite volume code was developed in C++ using the direct-forcing immersed boundary method (DFIB) to study laminar and turbulent flows over an elastically mounted circular cylinder. The cylinder undergoing VIV was allowed a single-degree-of-freedom (1-DOF) in the direction transverse to the flow. Numerical investigations were conducted to validate the results using published studies. The results highlighted the need to conduct multiple grid independence studies in the lock-in (synchronization) region for VIV simulations in laminar and turbulent flows. The effect of various initial conditions on VIV response in turbulent flows was also studied and a hysteresis phenomenon was observed. Furthermore, the use of multiple averaging methods was found necessary for a detailed comparison of vibration amplitudes in the turbulent flow regime. Keywords: Vortex-induced vibration, direct-forcing immersed boundary method, elastically mounted cylinder, hysteresis

Technical Session 1-B  
 Audio Visual Hall  
 Department of Mechanical Engineering  
 NEDUET, Karachi  
 Time: 9:30 am- 11:10 am

**Session-1-B (Audio Visual Hall, Department of Mechanical Engineering)**

**Heat Transfer**

**THERMODYNAMIC ANALYSIS OF SINGLE EFFECT AND DOUBLE EFFECT  
 VAPOR ABSORPTION REFRIGERATION SYSTEM**

Abdul Rehman and Syed Muhammad Ali Mazhar  
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The depletion of conventional sources of energy are enhancing at a faster rate and the increasing population is unable to meet the requirements of the energy in terms of technology and economy. The worldwide governments are now looking for the renewable resources of energy and ensuring the utilization of these resources which includes wind, solar and storage batteries. In the same context, this study is based on the utilization of solar energy to operate the cooling system based on Single Effect and Double Effect Vapor Absorption System (VAS) along with a detailed energy analysis of the working cycle. In the thermodynamic analysis of vapor absorption systems, the maximum COP of single effect is achieved when the generator temperature is 80.80°C which was 0.701 while the evaporative cooling load varies from the minimum value of 2.555 kW up to 10.29 kW and the maximum COP of double effect is achieved when the generator temperature is 120 °C which was 1.382 while the evaporative cooling load varies from the minimum value of 259 kW up to 421.9 kW.

**Keywords:** Vapor Absorption System; Renewable; Energy; Solar; COP

**Session-1-B (Audio Visual Hall, Department of Mechanical Engineering)**

**Heat Transfer**

**ASSESSMENT PLAN OF INDOOR AND OUTDOOR RELATIONSHIP OF NITROUS OXIDES, SULFUR DIOXIDE,  
 AND PARTICULATE MATTERS CONCENTRATION LEVEL IN FOUR SHANGHAI PUBLIC SCHOOLS**

Mirza Hammad Baig<sup>1\*</sup>, Kashif Azher<sup>1</sup>, Katherine Hasan<sup>2</sup> and Francine Lima  
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In this measurement plan, a detailed proposal to evaluate the indoor pollution levels in four public schools located in Shanghai, China is presented. The selected measurement strategy of indoor pollutants is the Continuous Monitoring Measurement method. Public schools are selected as the measurement site mainly due to minimum additional indoor pollutants generated through anthropogenic activities, e.g. cooking and smoking, and considering the exposure imposed on population within schooling age groups. The measurement plan will factor in local meteorological conditions, such as humidity and temperature, according to specifications presented in VDI 3787. Topographical factors are not relevant since the city is virtually flat and without deep valleys or high mountains. With the obtained data, influences on indoor pollution resulting from outdoor sources will be assessed, by analyzing both the measured indoor data and the collected outdoor data from the pre-selected measurement stations, located at a maximum distance of 2 km from the measurement sites. Additional factors such as layout design, construction materials of the school buildings, time-specific activities, special weather events, and their contribution for the indoor air pollutant levels will be considered.

**Keywords:** Pollution, Continuous Monitoring Measurement, indoor pollutants

Technical Session 1-B  
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 Time: 9:30 am- 11:10 am

**Session-1-B (Audio Visual Hall, Department of Mechanical Engineering)**

**Heat Transfer**

**DESIGN AND FABRICATION OF CATALYTIC CONVERTER WITH NEW MATERIAL**

Muhammad Wajahat Rasool Arain 1, Asad A. Zaidi<sup>2</sup>, Muhammad Asif<sup>1</sup>, Muhammad Uzair<sup>3,\*</sup>

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Catalytic Converters convert toxic pollutants such as CO, Nitrogen oxides and unburnt hydrocarbons into less harmful pollutants by catalytic activity. This field has seen a vast research for increasing the conversion efficiency of pollutants by using different cheap metals. Now a days catalyst used in Catalytic Converter are noble metals, Platinum, Palladium and Rhodium which are very expensive due to which low cost cars are not installed with catalytic converter especially in third world countries. In this research paper work has been carried out to check catalytic activity of catalyst made from base earth metals Cerium Sulphate Tetra hydrate, Manganese Sulphate Mono hydrate and Copper Sulphate Penta hydrate which are not expensive and less affected by the poison. Test sample catalysts were prepared through co-precipitation method having different molar concentration and tested the conversion efficiency by applying the catalyst on ceramic plates by using Flue Gas Analyzer. On basis of results, final catalyst was prepared and applied on monolithic ceramic plate and tested which gave increase in conversion rate of pollutants as compared to already installed Catalytic Converter and also cost effective as well. Keywords: Catalytic converter, Noble metals and Base metals, Co-precipitation, Monolithic Structure, Flue Gas Analyzer

**Session-1-B (Audio Visual Hall, Department of Mechanical Engineering)**

**Heat Transfer**

**EXPERIMENTAL STUDY TO ANALYSE THE EFFECT OF CRITICAL PARAMETERS  
 ON THE PERFORMANCE OF INTEGRATED SOLID DESICCANT USING CROSS FLOW M-CYCLE**

Ghulam Qadar Chaudhary, Allah Ditta a, Dr. Muzaffar Alib, Dr. Muhammad Uzair b, Naveed Akram a Amar Gulnawaz

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Large power consumption and environmental issues of conventional air conditioning systems has emphasized the importance of alternative system which could meet the requirements. In this work, a solar assisted desiccant system integrated with cross flow Maisotsenko cycle has been studied experimentally. Experimental setup is comprised of solar water heating system, auxiliary heater, desiccant and enthalpy wheel and cross flow M-cycle. Performance of system has been evaluated based on outlet temperature and humidity, COP and cooling capacity. Operating parameters (inlet temperature and humidity, regeneration temperature) are selected to check influence on system performance. Results shows that system is sensitive towards inlet conditions and regeneration temperature. Maximum MRR and dehumidification effectiveness of dehumidifier is 1.58 g/s and 47% respectively. Maximum COP and cooling capacity is 1.29 and 2.55 kW respectively.

Technical Session 2-A  
 Video Conferencing Hall  
 Department of Civil Engineering,  
 NEDUET, Karachi  
 Time; 11:30 am- 1:10 pm

**Session-2-A (Video Conferencing Hall, Department of Civil Engineering)**

**Materials**

**READY TO USE VIRTUAL ALL-ATOM POLARIZED MODEL OF GOLD COMPATIBLE WITH FORCITE MODULE**

Tariq Jamil and Shaukat Ali

Department of Mechanical Engineering, NED University of Engineering & Technology, Karachi

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Accurate force field parameters of virtual models of materials are essential for meaningful Molecular Dynamics (MD) solutions. Metals are important constituents of many systems. The electronic cloud present in the metal and its behaviour particularly the surface and interfacial effect cannot be mimicked using single point charge – single point mass models used in the classical MD simulations. Recently developed polarized models have smartly addressed the issue without massively adding the need for computing resources. In this work, we have developed the force field file containing proven all-atoms polarized models of gold compatible with the Forcite module of BIOVIA Material Studio software. INTERFACE force field commonly known as IFF has introduced the model however it was limited for DISCOVER – an older module for simulation present in the software. We have repeated the rigorous testing and validation protocol as defined in the INTERFACE force field. Resulted lattice parameters, mechanical properties, and surface properties are in close agreement with the reported simulation data and experiments. The newly developed force field file can be deployed for any related simulations and can be used as a sample for adding parameters for other metals.

**Session-2-A (Video Conferencing Hall, Department of Civil Engineering)**

**Materials**

**IDEAL RESOURCE MANGEMENT MODEL (IRMM) FOR ATLAS BATTERY LIMITED**

Syed Sohail Ibtihaj Bukhari, Maaz Akhtar, Muhammad Muzamil,

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World of technology is getting advance day by day and to excel in competitive environment around the world, companies need to use optimized resources and innovative new ways for optimal use of resources. Ideal Resource Management Model (IRMM) is a new innovative approach to use and balance the resources in M/s Atlas Battery Limited. A detailed study is carried out with the help of six sigma DMAIC approach. It was found that a certain percentage of production of Formation Department is defective. Company also lacks in resources which are calculated by IRMM to effectively balance the resources to meet daily production demand. By implementing the findings and recommendations of this study, ABL can overcome loss of Millions of Rupees per annum.

KEYWORDS: Tunnel Dry Oven (TDO), Inert Gas Oven (IGO), Pasted Panel, Define Measure Analyze Improve and Control (DMAIC), Ideal Resource Management Model (IRMM).

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 Department of Civil Engineering,  
 NEDUET, Karachi  
 Time; 11:30 am- 1:10 pm

Session-2-A (Video Conferencing Hall, Department of Civil Engineering)

Materials

### DEVELOPMENT OF NEW CREEP MATERIAL MODEL FOR USE THROUGH COMPUTATIONAL MODELLING

Mohsin Sattar, A.R. Othman and S. Kamaruddin  
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With the increase of the operational parameters, structural components in power plant are suffering from elevated temperatures and pressures, which are high enough for creep to occur. This may lead to failure and fracture in components. Over the past several decades, considerable efforts have been made to gain a fundamental understanding of the creep mechanism. Much attention has been paid to life prediction to ensure safety and reliability in plants. Based on the Norton- Bailey and Kachanov-Rabotnov constitutive models, a modified model was proposed to be able to describe the whole three stages of creep. Numerical calculations with the modified constitutive model were performed to simulate the damage development of uniaxial specimens. The emphasis was laid on the effect of specimen dimensions and stress on the damage development. The results show a good agreement of the novel model that complete creep curve can be obtained for any material and the stress have remarkable effect on the creep behaviour and damage development.

**Keywords:** Creep deformation, curve fitting, Kachanov Rabotnov model, damage evolution, Norton Bailey mode

Session-2-A (Video Conferencing Hall, Department of Civil Engineering)

Materials

### SINGLE IMAGE FRAME ALGORITHM FOR PARTICLE STREAK VELOCIMETRY

Mumtaz Hussain Qureshi<sup>1,\*</sup> and Wei-Hsin Tien<sup>2</sup>  
<sup>1</sup> Department of Mechanical Engineering, NED University of Engineering & Technology, Karachi, Pakistan  
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A novel streak-resolving algorithm is proposed for Particle Streak Velocimetry (PSV) to resolve velocity fields using a single image frame with multiple particle streaks. A model streak function, which is based on the temporal integral of the particle image intensity moving along the trajectory during the exposure time period, is approximated by a multi-variable least-square fit procedure to reconstruct the streak information and the corresponding particle trajectory. The accelerating parallel flow and the rotational flow of Hill's vortex, are used to generate synthetic streaks for the simulation tests. The results show the new criteria to resolve the streak which is very useful to solve the real world problems in the field of fluid dynamics.

**Keywords:** Particle Image Velocimetry; Particle Tracking Velocimetry; Particle Streak Velocimetry

Technical Session 2-B  
 Audio Visual Hall, Department of  
 Mechanical Engineering, NEDUET  
 Time: 11:30 am- 1:10 pm

Session-2-B (Conference Hall Mech. Engg. Department)

Solar Energy

### SIZING OF A NOVEL OFF-GRID MOBILE SOLAR PV SYSTEM

Ahsan Ahmed<sup>1,\*</sup>, Musab Salim Khan<sup>1</sup>, Faaiz Alavi<sup>1</sup>, Hassan Rasool<sup>1</sup> and Hassan Ali<sup>1</sup>

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Sustainable, smart, and advanced renewable energy technologies are needed to tackle global warming and electrical energy demands. The solar photovoltaic systems are one the proven renewable energy converting tool to satisfy electrical requirement for residential, commercial, and industrial applications. This system can be made more useful if it is made movable. This study focuses on the PV sizing of such a system. In this research work, some of the end user appliances are selected. The electrical load of these appliances was computed. The approach of mathematical modeling is used to size off-grid mobile PV systems. The results of this attempt showed that for 850 W appliances with a daily electrical requirement of 3,267.5 Wh, a PV array of 6 modules of 170 W is required. Considering the system voltage of 12V, a 60 A charge controller, three 150 Ah batteries and a 1,020 W capacity inverter are needed. Overall this system can produce 2,018.87 KWh annually.

**Keywords:** Photovoltaic, off-grid, portable, mobile, Karachi, Pakistan

Session-2-B (Conference Hall Mech. Engg. Department)

Solar Energy

### INCREASING PHOTOVOLTAIC PERFORMANCE THROUGH TEMPERATURE REGULATION BY SOY WAX AS PHASE CHANGE MATERIAL

Muhammad Farhan<sup>1</sup>, Asad A. Naqvi<sup>1\*</sup>, Muhammad Uzair<sup>1</sup>

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Photovoltaic System is an efficient renewable technology and is widely used for the generation of electricity. Photovoltaic systems convert sunlight directly into electricity. The efficiency of solar photovoltaic (PV) panels is affected by their operating temperature. Having high irradiance produces high electrical output but also heats the panel and thus reduces the panel's efficiency. This study investigates the effect of cooling solar panel of 30 Watts PV by using 4 kg of soy wax as a phase change material (PCM). The wax is applied to the back plate of a solar PV panel. The experiment is done at model colony Karachi, Pakistan. The cooling by PCM reduced the panel temperature up to 18°C, and increases the power output up to 10.34% as compared to the simple panel without any PCM applied. The conversion of PV module into Hybrid PV/T module is an economic solution to improve the electrical efficiency of the PV module.

**Keywords:** Photovoltaic, Phase Change Material, Power improvement, Temperature regulation, Efficiency

Technical Session 2-B  
 Audio Visual Hall, Department of  
 Mechanical Engineering, NEDUET  
 Time: 11:30 am- 1:10 pm

Session-2-B (Conference Hall Mech. Engg. Department)

Solar Energy

**DESIGN AND FABRICATION OF SMALL-SCALE SOLAR PANEL LAMINATION MACHINE**

Usman Allauddin<sup>1\*</sup>, Mirza Hammad Baig<sup>1</sup>, S.H. Siddiqui<sup>1</sup>, M.M. Aman<sup>2</sup>, M.W. Baqar<sup>1</sup>, T.A. Hussain<sup>1</sup>, M.A. Mohsin<sup>1</sup>  
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A small-scale lamination machine is designed and fabricated for indigenous production of solar panels in Pakistan. It involves melting of a polymer Ethylene Vinyl Acetate (EVA) material and forming a protective layer on both sides of solar wafers. Firstly, an optimum shape and geometry parameters of the vacuum chamber were found with a Finite Element Analysis by considering the real vacuum and heating conditions. The cuboidal geometry of the vacuum chamber with ribs added on the outer surface was found to be the optimum one. A pressing system was designed to apply pressure on different layers of materials in PV panel to ensure proper contact and avoid entrapment of air during melting and cross-linking of EVA. An optimum combination of pressure, heating temperature, heating time and curing time was used during the lamination to get high quality PV solar panels. The cost solar panel per watt was found to be relatively low as compared to the products available in local market. The cost of laminating machine is the area of importance in the study which is quite low since it was manufactured locally. The Solar Panel Industries in Pakistan have imported Laminating Machines. So, the localized manufacturing would ultimately reduce the cost of the machine. **Keywords:** PV panel laminating machine; Finite Element Analysis; Vacuum Chamber; PV solar panel; solar wafers; Lamination of Solar Cells; EVA Encapsulation

Session-2-B (Conference Hall Mech. Engg. Department)

Solar Energy

**FUTURE OF GAS TURBINES IN POWER SECTOR**

M. Aijaz Umer

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Carbon dioxide (CO<sub>2</sub>) is the main cause of Global warming by Power Sector. Decarbonization is the key to support 1.5°C target set under Paris Agreement. Fossil fuels need to be utilized sensibly which means Zero Coal and Zero Oil consumption in electricity generation. However natural gas should be utilized in highest efficient technology i.e. Combined Cycle Power Plant (CCPP). Combusting hydrogen (H<sub>2</sub>) in CCPP can help to reduce CO<sub>2</sub> emissions depending upon the percentage of the H<sub>2</sub> in the fuel mix. Fluctuating electricity due to intermittent renewable sources can be compensated by producing H<sub>2</sub> using surplus renewable power and utilizing it in Gas Turbines (GTs). Currently, energy balance of utilizing H<sub>2</sub> in GTs is negative nevertheless overall emissions are less. H<sub>2</sub> production cost < 1\$/kg can help it to economically compete fossil fuel power plants. GT's OEMs are on the race to manufacture combustion turbine to burn enriched hydrogen in their machines and increase the efficiency. **Keywords:** Gas Turbine; CCPP; Green Hydrogen; Electrolysis; Carbon Emission; Zero CO<sub>2</sub>; Decarbonization; Coal Power Plant;

Technical Session 3-A  
 Video Conferencing Hall  
 Department of Civil Engineering NEDUET, Karachi  
 Time: 02:00pm - 03:40 pm

ASHRAE

**"Energy Efficient Practices for HVAC System Designs for High Performance Buildings"**  
 By Fahim I Siddiqui

**"An overview of Pakistan's Building Energy Code and the Role of ASHRAE"**  
 By Farhan A. Mehboob

**"Bangladesh changing its indoor environment with ASHRAE Standards"**  
 By Ananta Ahmad

## Technical Session 3-B

## Audio Visual Hall

Department of Mechanical Engineering,  
NEDUET, Karachi

Time: 02:00pm - 03:40 pm

## Session-3-B (Audio Visual Hall- Department of Mechanical; Engineering

## Automotive

### IMPACT OF WASTE COOKING OIL BLEND ON EXHAUST GAS TEMPERATURE IN COMPRESSION IGNITION ENGINE

Faheem Ahemd Solongji1,\* Liaquat Ali Memon2 Tamoor Abbas Larik3 Ali Murtaza Ansari4

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Exhaust gas temperature is one of the key determinate that appraise the condition and behaviour of the ignition techniques. The purpose of this study is to examine the opportunity of utilizing diesel and waste cooking oil blend. Fuel blend containing 5%, waste cooking oil (WCO5) with diesel fuel (DF) was developed and the impact of this blend on exhaust gas temperature during long term endurance test under constant load circumstances were examined using single cylinder diesel engine. Two samples tests were carried out on engine test bed to analysis exhaust gas temperature on engine load, whereas the engine speed kept steady. The recorded results have shown that the exhaust gas temperature, Diesel fuel DF100 at 60, 100 and 160 hour the highest were recorded to be as 2750C, 2790C and 2880C, respectively. While, in case of DF95WCO5 on same engine operating hours were recorded as 2650C, 2590C and 2630C respectively with regarding the increase of 5% waste cooking oil in pure diesel.

**Keywords:** Diesel Engine; Waste Cooking oil Blend; Exhaust Gas temperature

## Session-3-B (Audio Visual Hall- Department of Mechanical; Engineering

## Automotive

### 3D STRUCTURAL ANALYSIS OF AN ELECTRIC VEHICLE CHASSIS USING COMPUTER SIMULATIONS

Hasan Raza1, Murtuza Mehdi1, Usman Allauddin1 and Nauman Malik2

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Conventional fossil fuel driven vehicles are adversely affecting the environment and contribute in carbon and noise emissions. Due to this reason the world is shifting towards the green and sustainable approach of living standards. An electric vehicle also known as an EV is an environment friendly option that can serve as one of the solution to this problem.

An EV can be driven using an electric motor as its power plant that runs on a battery pack. However, the battery pack itself can be sensitive towards excessive deflections during the journey. In order to design a rigid platform that can support the battery pack of an EV it is vital to investigate the various design options that can be utilized for this purpose.

In this study 3D computer simulations are performed to investigate the structural performance of different frame designs of battery pack which includes the load bearing ability and deflections. The results are compared and the best design is identified.

**Keywords:** Electric Vehicle, Chassis, Deflection, Stress, 3D Simulations, environment

## Technical Session 3-B

## Audio Visual Hall

Department of Mechanical Engineering,  
NEDUET, Karachi

Time: 02:00pm - 03:40 pm

Session-3-B (Audio Visual Hall- Department of Mechanical; Engineering

Automotive

### STUDY THE EFFECTS OF UTILIZING OF WASTE THERMOPLASTICS IN THE CONSTRUCTION OF ROADS

Ifrah Asif<sup>1</sup>, Asad A. Naqvi<sup>1\*</sup>, Mubashir Ali Siddiqui<sup>1</sup>, Hammad Ahmed<sup>2</sup>  
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 Department of Energy Engineering, Politecnico Milano, Milan, Italy  
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Due to unawareness, carelessness and poor waste management the world is getting polluted with the plastic waste. Waste plastic after segregation, cleaning and shredding are being utilized as a modifier in pavements. One of the main objectives of this research is plastic road production, which is both economically and environmentally beneficial. The heavy monsoons in Pakistan promote to road cracking and potholes, bituminous mix with modified plastic binder can eliminate these road failures. Plastic modified roads have strong stability and crack resistance which aid in resisting impact and cracking due to heavy monsoon showers and hot climatic conditions. Plastic roads are constructed in the world and results are available in the literature. To validate literature results samples are made using the available standard, Marshall Stability test, Ductility test, Softening & Penetration tests are performed, and the results of the tests are verified. The experimental results demonstrate the effects of using plastic as a binder modifier by replacing 8% of the bitumen. Plastic utilization in roads can make the prefabrication of roads possible, making the road lying process time and cost efficient. According to the test results, it is also concluded that PET-added bituminous mixture provide improved stability and prevents permanent deformation due to its relatively higher resistance against penetration and higher softening point in contrast to traditional binder. Furthermore, the economic analysis of the project showing 4% to 6% reduction in the cost as compare to conventional road owing low maintenance cost, compatible with adverse environment and reducing the environmental pollution.

Session-3-B (Audio Visual Hall- Department of Mechanical; Engineering

Automotive

### SELECTION OF FLUID FOR ORGANIC RANKINE CYCLE

Asad A. Naqvi, Shaheer Ali, Hassan Shahid, Hasan Masroor, Anas Khan  
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Organic Rankine Cycle are a growing clean energy solution to the current global energy crisis and climate change. Selection of the most suitable working fluid and cycle configuration is the foremost step necessary in designing an ORC for its specific application. In this paper we considered a group of commonly used working fluids for different applications. The selection of the working fluid can be based on many different criteria including the thermodynamic match with the heat source and sink, chemical stability, environmental concerns, safety, or cost and it is difficult to find a single best fluid for a given application. In this paper we chose Benzene as the most suitable working fluid for a small-scale low heat source temperature. Similarly component selections are done based on working conditions. A thermodynamic model has been developed using Engineering Equation Solver (EES) software to simulate the system under steady state conditions. Parametric analysis is conducted to examine the effects of some thermodynamic parameters on the system performance using different working fluids. When evaporator inlet temperature was varied from 120°C to 160°C keeping condensation temperature fixed at 25°C. The energy production and efficiencies of the system are then evaluated using EES. The work demonstrates the use of Benzene as the working fluid in ORC.

S. No.	Poster Title	Authors Name	University Name
1	Thermal Analysis of Welding Heat-source on Metallic Material	Mr. Arsalan Ahmed Khan	NEDUET
2	Experimental study of the new surface development additive for repairmen works	Mr. Muhammad Naveed Anwar	NEDUET
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5	Strategies to Minimize Energy usage of HVAC-AHU System	Ms. Ifrah Asif	NEDUET
6	Identification of Root Causes of Rework in the Manufacturing of G-1.6 Domestic Gas Meter	Ms. Ifrah Asif	NEDUET
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10	Design and Fabrication of unmanned aerial vehicle with precision landing	Mr. Aannand Lal	DHA SUFFA
11	Design and fabrication of Laser Cutting Machine	Mr. Taha Jawaid	DHA SUFFA
12	Small scale Injection Moulding Machine	Mr. Syed Ashar Hussain	DHA SUFFA

ProgrammeClosing Session

at Video Conferencing Hall, Department of Civil Engineering, NEDUET  
(Saturday, 15th January, 2022)

03:50 pm	Recitation from the Holy Quran
03:55 pm	<b>Conference Highlights by</b> Engr. Prof. Dr. Mubashir Ali Siddiqui Chairman, Mechanical Engineering Department, NEDUET & Co-Convener, IMEC-2022
4:00 pm	<b>Address by</b> Engr. Sohail Bashir Chairman, IEP, Karachi Centre
04:05 pm	<b>Keynote Address by</b> Engr. Tariq A. Khan Senior Director, CSRA, IMC & Group Director, Strategy Auto Engineering Group, House of Habib
04:15 pm	<b>Keynote Address by</b> Dr. A. Raheem Othman PETRONAS University, Malaysia
04:25 pm	<b>Address by</b> Engr. Prof. Dr. Sarosh Hashmat Lodi Vice-Chancellor, NEDUET
04:35 pm	<b>Address by Guest of Honor</b> Engr. Asim Murtaza Khan Former Managing Director, Pakistan Petroleum Limited & President, NED International Alumni Network (NEDIAN) Association
04:45 pm	<b>Address by Chief Guest</b> <b>Engr. Prof. Dr. Muhammad Afzal Haque</b> Vice-Chancellor DHA SUFFA University Karachi
05:05 pm	<b>Chairman's Medal for Best Paper and IEP Award for Best Poster</b>
05: 10 pm	<b>Conference Recommendations by</b> Engr. Dr. Muhammad Uzair Secretary, IMEC-2022
05:15 pm	<b>Vote of Thanks by</b> Engr. M. Aijazul Haque Vice-Chairman, (Mechanical & Allied) IEP, Karachi Centre & Chief Organizer, IMEC-2022
05: 20 pm	<b>Asr Prayer</b>
05:30 pm	<b>Refreshments</b>

## List of Papers Presented in 10th International Mechanical Engineering Conference held on 12th February, 2021 at IEP, Karachi

### **CYCLE TIME REDUCTION OF ASSEMBLY LINE USING VALUE STREAM MAPPING**

-Muhammad Danish Saleem, Dr. Nasir Uddin Shaikh  
Mechanical Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan

### **INVESTIGATION OF ENHANCED THERMAL-CONDUCTIVITY BY ADDING NANOPARTICLES IN LUBRICANT OIL**

Mohammad Ehteshamul Haque, A.B. Rosli, Mechanical Engineering Department NED University of Engineering & Technology, Karachi, Pakistan, Mechanical Engineering Department, Pahang University, Malaysia.

### **DEVELOPMENT OF A HIGH EFFICIENT RESIDENTIAL WATER COOLED AIR CONDITIONER**

-Muzammil Ejaz, Muhammad Oun, Kalim Ullah, Talha Alam, Mechanical Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan

### **TECHNO-ECONOMIC ANALYSIS OF A HYBRID PHOTOVOLTAIC-THERMAL (PV/T) AIR COLLECTOR**

-Asad A. Naqvi, Muhammad Kazim, Ahsan Ahmed, Mechanical Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan, Department of Mechanical Engineering, Texas A&M University, USA

### **NUMERICAL CHARACTERIZATION AND COMPARISON STUDY OF MICRO HYDROKINETIC TURBINES FOR RIVER APPLICATIONS,**

Muzammil Ejaz , Osama Rauf, Mehdi Rizvi, Jalil Ali, Danyal Yousuf, Mechanical Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan

### **EVALUATION OF NATURAL REFRIGERANTS FOR AN ORGANIC RANKINE CYCLE DRIVEN VAPOR COMPRESSION CYCLE**

-Muhammad Tauseef Nasir, Department of Mechanical Engineering, PUSAN National University, South Korea

### **MODELLING AND SIMULATION OF A COGENERATION PROCESS IN A DAIRY FARM**

-Mahnoor Syed , Zahra Mushtaq , Muhammad Sabir Javed , Osaid ul Hasan Syed , Zeeshan Anwar, PNEC NUST, Karachi, Pakistan 2Technical University of Munich, Germany

### **THERMAL MANAGEMENT OF LITHIUM ION BATTERIES FOR ELECTRIC VEHICLES**

-Waqas Ahmed, Abid Hussain, Department of Mechanical Engineering, University of Engineering & Technology Taxila, Pakistan.

### **DESIGN AND DEVELOPMENT OF PAINT SPRAYING ROBOTIC MECHANISM**

Muhammad Faizan Shah, Syed Saad Farooq, Zareena Kausar, Aqdas Nadeem1,

Muhammad Shaheer Wassi, Hasnain Ahmed, and Muhammad Sohaib, Department of Mechanical Engineering, Khwaja Fareed University of Engineering & IT Rahim Yar Khan, Pakistan. Department of Mechatronics Engineering, Air University, Islamabad, Pakistan.

### **EFFECT OF CORNERING CHARACTERISTICS OF A NON-PNEUMATIC TIRE ON HANDLING PERFORMANCE OF A VEHICLE**

-Mubashir Jaleel, Raja Amer Azim , Hasan Aftab Saeed, Syed Gul Hassan Naqvi, Department of Mechanical Engineering, College of E&ME, National University of Sciences and Technology, Pakistan, Faculty of Department of Mechanical Engineering, College of E&ME, National University of Sciences and Technology, Pakistan

### **ENERGY ANALYSIS OF ORC-VCC BASED COGENERATION SYSTEM POWERED BY LOW-GRADE HEAT SOURCES**

-Rajnish Kumar, Abdul Ghafoor Memon, Faqeer Muhammad, Abdullah Tariq, Mechanical Engineering Department, Mehran University of Engineering & Technology, Jamshoro, Pakistan

### **DESIGN OF A TWO-WHEELED MOBILE WELDING MANIPULATOR FOR SPHERICAL OBJECTS**

-Muhammad Faizan Shah, Zareena Kausar and, Aqdas Nadeem, Department of Mechanical Engineering, Khwaja Fareed University of Engineering & IT Rahim Yar Khan, Pakistan. Department of Mechatronics Engineering, Air University, Islamabad, Pakistan

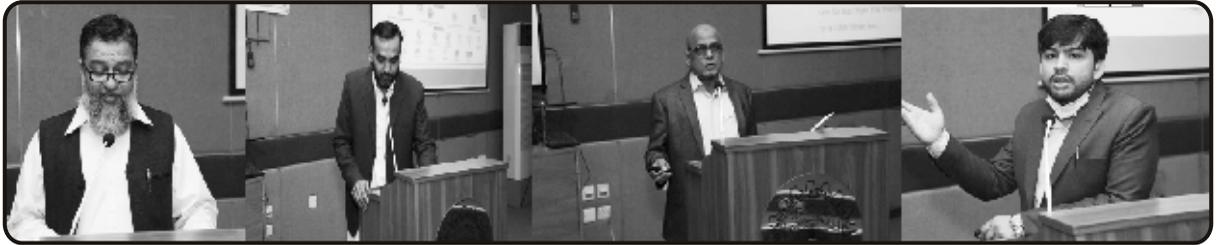
### **DURING LONG-TERM ANALYSIS PERFORMANCE AND CARBON DEPOSITION IN COMPRESSION IGNITION ENGINE USING BIODIESEL BLENDED FUELS AS ADDITIVE**

-Ali Murtaza Ansari, Liaquat Ali Memon, Faheem Ahmed Solangi, PhD research scholar, Department of Mechanical Engineering, Quaid-e-Awam University of Engineering Science & Technology Nawabshah, Sindh Pakistan, Professor, Department of Mechanical Engineering, Quaid-e-awam University of Engineering Science & Technology Professor, Department of Mechanical Engineering, Department of Mechanical Engineering, Quaid-e-awam University of Engineering Science & Technology Nawabshah, Sindh Pakistan

### **CONVECTIVE HEAT LOSSES IN A PARABOLIC DISH CAVITY RECEIVER**

- Muhammad Uzair, M. Zeeshan Anwer Hamza Siddiqui , S. Hamza Hasan, M. Shahbaz Hussain1 1Mechanical Engineering Department, NED University of Engineering & Technology, Karachi, Pakistan Technical University of Munich, Germany

Glimpses of 10th International Mechanical Engineering Conference held on 12th February, 2021



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