



# IC4M 2022

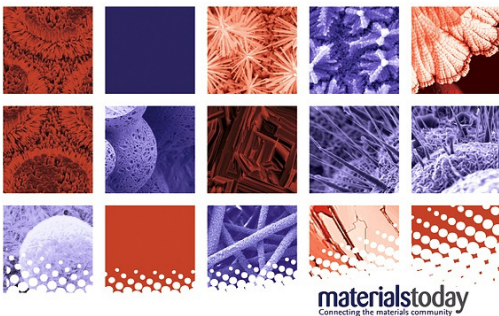
# INTERNATIONAL CONFERENCE

on

## Advances in Materials, Mechanics, Mechatronics and Manufacturing

**APRIL 9-10, 2022 / INDIA**

materialstoday:  
PROCEEDINGS

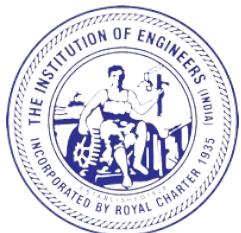


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Gwalior Local Chapter



Gwalior Local Chapter

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## CONFERENCE E-SOUVENIR





# About Conference

**April 9-10, 2022 / India**

**An International Peer-reviewed Academic Conference on Advances in Materials, Mechanics, Mechatronics and Manufacturing (IC4M 2022) is scheduled to be held online during April 9-10, 2022 in Madhya Pradesh, India. The conference seeks to provide a platform to discuss and exchange high quality academic research ideas between researchers, engineers, academicians, industrial professionals and practitioners of Mechanical Engineering from all over the globe. Several world-renowned experts from the thematic areas have also confirmed to share their years of knowledge and wisdom during the plenary lecture sessions with the participants.**

**The organizing committee invites faculty members, research scholars, PG scholars, industry personnel and practitioners from around the globe to showcase their original research articles, review articles and feature articles and take advantage from the sessions, panel discussions and networking opportunities offered by IC4M 2022.**



## Message from Vice-Chairman



**Prof. M. P. Poonia**  
Vice-Chairman  
AICTE, New Delhi, INDIA

It gives me immense pleasure to know that the organizers **Yajurvedam** and **M/s Gayatri Auto Industries** have partnered with prominent Associations in organizing **2nd International Conference on Advances in Materials, Mechanics, Mechatronics, Mechatronics and Manufacturing (IC4M2022)** during April 9-10, 2022.

I am sure that the international conference will be enriching and will have great participation with valuable outcomes for the researchers, faculty and participants. This conference would certainly inspire innovative ideas, paving a path for new inventions and new technologies amongst the participants.

**I congratulate the organizers and wishing them a great success for the International Conference.**

  
(Prof. M.P. Poonia)  
5/4/22



# DEV SANSKRITI VISHWAVIDYALAYA



## Message from Pro Vice-Chancellor



**Dr. Chinmay Pandya**

(MBBS, PGDipl, MRCPsyche – London)  
Pro Vice Chancellor, Dev Sanskriti  
Vishwavidyalaya, Gayatrikunj, Haridwar

*Dear Hosts, Participants & Collaborators*

I am glad to note that Yajurvedam: An Association for Educational Empowerment and Social Welfare and M/s Gayatri Auto Industries are organizing the second edition of **International Conference on Advances in Materials, Mechanics, Mechatronics and Manufacturing (IC4M 2022) during April 09-10, 2022.**

We are also aware that this prestigious conference is being hosted by joint collaboration with Materials Today-Elsevier (Publication Partner), Birmingham City University (UK), Canadian Centre (Canada), Mahrajpora Industrial Association, Gwalior; Indian Institute of Welding, Indian Institution of Industrial Engineering, Additive Manufacturing Society of India, Institution of Engineers(Gwalior Chapter), and Computer Society of India (Gwalior Chapter).

**May the blessings of Vedmurti Taponisht Param Pujya Gurudev & Param Vandaniya Mataji make this event successful.**

**Dr. Chinmay Pandya**



## Message from Dr. V K Jain



**Dr. Vijay Kumar Jain**

Professor (Retd.)  
Indian Institute of Technology Kanpur, INDIA

I am happy to note that **IC4M 2022 (International Conference on Advances in Materials, Mechanics, Mechatronics and Manufacturing (4M))** is being organized by Yajurvedam: (An Association for Educational Empowerment and Social Welfare (<https://yajurvedam.in/>)) and M/s Gayatri Auto Industries in association with other organizations, during April 09-10, 2022. This conference includes the subjects namely, Materials, Mechanics, Mechatronics and Manufacturing which are highly interdependent. It will be an opportunity for the participants to discuss their research activities on such interdependent subjects at one common platform, may be hybrid platform (On-line and off-line, both). I could see that there is a likelihood of good gathering of faculty members, research scholars, PG scholars, industry personnel and practitioners from around the globe. I am sure the exchange of ideas on these 4 M research activities will be very useful to the audience and participants. After going through the list of

the papers to be presented, I could conclude that the discussion should be quite interesting because it includes both the experimental work as well theoretical / scientific work in different research papers. I am sure that it should provide a proper platform to the researchers to have insight of research activities going on in 4M and the related subjects. I would like to advise that to achieve the ambitious goals, you should be honest, sincere, hardworking and should have junoon (passion) towards your goal.

**I wish all the success for the conference in the form of good research outcome.**

**Dr. Vijay Kumar Jain**



## Message from President, Additive Manufacturing Society of India



**Dr. L. Jyothish Kumar**

President  
Additive Manufacturing Society of India

It is my pleasure and privilege to be the part of Second International Conference on **Advances in Materials, Mechanics, Mechatronics and Manufacturing (IC4M 2022)** during April 09-10, 2022 in association with **Materials Today- Elsevier** (Publication Partner), **Birmingham City University (UK)**, **Canadian Centre (Canada)**, **Mahrajpura Industrial Association, Gwalior**; **Additive Manufacturing Society of India**, **Institution of Engineers (Gwalior Chapter)**, and **Computer Society of India (Gwalior Chapter)**.

Additive Manufacturing have made it possible to reconsider the supply chains fragmented during the pandemic year, helping local production to respond to the medical sector emergencies such as face shields, swabs, respirators and many more. The fact is that AM market has been globally affected economically where in most of the global AM equipment manufacturers, material manufacturers and software suppliers have experienced a decreased sales.

However survey reveals that there has been a increased production of AM parts and R&D activities during this pandemic. I hope that IC4M Conference will be a significant event for academicians to network with industry, R&D organisations.

**I wish all the best to the organisers of IC4M and all the participants.**

A handwritten signature in black ink, appearing to read 'Jyothish Kumar', written in a cursive style.

**Dr. L. Jyothish Kumar**





## Message from Conference Chair



### **Dr. Ravi K Dwivedi**

Professor, Maulana Azad National Institute  
of Technology  
Madhya Pradesh, India

On behalf of the organizing committee, it is with great pleasure to welcome you to the **International Conference on Materials, Mechanics, Mechatronics and Manufacturing (IC4M 2022)**. IC4M has become the preeminent international forum on embracing all aspects from Fatigue and Fracture Mechanics, Modeling and Simulation, Reliability Analysis, Artificial Intelligence, Machine Learning, Medical Robotics, Mechatronics Design Control System, Advanced Construction Materials, Biomaterials, Composite Materials, Additive Lean & Green Manufacturing, CAD, CAE and CAM and many more.

This time, the conference offers four keynote speakers by distinguished persons in their own fields.

We are proud to have Prof. Farrokh Mistree, and Prof. Janet K Allen, Professor, University of Oklahoma in Norman, Oklahoma, Prof. D. Scott Sink, Senior Advisor, Poirier Group in Toronto, Canada, and Prof. (Dr.) V. K. Jain, Professor (Retired), Indian Institute of Technology Kanpur, INDIA, as our keynote speakers.

The conference proceedings provide views into the current advances in the field of four ‘M’s’ i.e. Materials, Mechanics, Mechatronics and Manufacturing and how they are interlinked with the current scenario and the conference helps to build a relation and transfer of research ideas. We look forward to the presentations of our participants.

**To all participants, I hope we can gain knowledge and benefits from the conference while making new contacts with other participants.**

**Dr. Ravi K Dwivedi**



## Message from Conference Co-Chair



**Dr. Premanand S Chauhan**

Director  
Sushila Devi Bansal College, Indore, IN

It is a matter of great pleasure that we are organizing an **International Conference on Advances in Materials, Mechanics, Mechatronics & Manufacturing on April 09 & 10, 2022.**

In the progress towards excellence in the field of materials, mechanics, mechatronics and manufacturing technology, new innovations and developments need to be shared and disseminated for ensuring continuous advancement and knowledge creation. Therefore it is my hope that the conference will provide a platform for exchange of noble ideas among researchers, academicians and industrial practitioners all over the country and abroad.

This conference bears all the hallmarks of success. This is due to the great team work from international and national advisory committee members and organizing team members who I owe a deep depth of gratitude.

I am grateful to the associates of IC4M 2022 Birmingham City University UK, Canadian Centre for Inter Academic

Research and Communication, Canada Additive Manufacturing Society of India, Maharajpura Industrial Association, Computer Society of India (Gwalior Local Chapter) and the Institution of Engineers (Gwalior Local Chapter) for their generous support in organizing this conference.

I pay my sincere regards to Elsevier Publishing for bringing out the proceedings.

My thanks to members of the technical committee and reviewing committee for helping in the review of papers. Thanks to the promotional committee whose help is deeply appreciated.

Thanks to the printing committee for bringing out the fantastic souvenir which shares the highlights from IC4M 2022, gives sketches of keynote speakers, and photographs of all major volunteers.

Last but not the least are the authors whom I thank sincerely for contributing good papers and for attending this conference.

I sincerely hope that all the participants will actively deliberate in the conference and come out with recommendations for emerging trends in Materials, Mechanics Mechatronics & Manufacturing.

**I extend my very best wishes for the success of the conference.**

**Dr. Premanand S Chauhan**





## Message from Coordinator



**Dr. Avadesh K Sharma**

Associate Professor  
Rajkiya Engineering College, Mainpuri, India

On the behalf of organizing committee of "**International Conference on Advances in Materials, Mechanics Mechatronics and Manufacturing (IC4M-2022)**", I extend a warm welcome to all the delegates from academia, research institutes and industries.

The main aim of this conference is to provide an international academy forum for all the researchers, practitioners, professionals, faculty members and students in related field to share their knowledge and results from their experimental, analytical and computational work.

The Conference would consist of key note lectures from the various eminent speakers of international repute. Also, there are paper presentation by the participants from the country and abroad. The papers cover a wide range of topics such as analysis and synthesis of mechanism, Finite Element Method, CFD, Computer assisted Manufacturing and Design, Composite Materials, Engineering Mechanics, Mechanical Vibration, Mechatronics, Robotics and Simulation.

I express my gratitude towards reviewers from the many institute and research organisations for helping in the peer review of research papers.

It has been a great privilege for me to serve as a coordinator of IC4M-2022 and it's my hope that you will find the conference stimulating, fulfilling and enjoyable. I convey my sincere thanks to all of you for your support and wish you a pleasant experience in this knowledgeable conference.

**Last but not least, the authors, for continuing to contribute and believe in the excellence of IC4M 2022.**

**Dr. Avadesh K Sharma**



## Message from Organizing Secretary



**Dr. Anupma Agarwal**

Assistant Professor  
Symbiosis University of Applied Sciences,  
Indore

I am greatly honored to serve as the Organizing Secretary of the **IC4M2022** an **International Conference on Advances in Materials, Mechanics, Mechatronics and Manufacturing**. It gives me utmost pleasure to welcome you all on this virtual platform of IC4M2022.

This conference with the theme of Advances in Materials, Mechanics, Mechatronics and Manufacturing is the right platform to bring various stakeholders under one roof to discuss, exchange and explore the idea of technological advancement in the field of these four M's to make the life of people easier and more comfortable. Through this conference we put all our effort to drive the best practices of multi domain research on upfront. The plenary sessions by the eminent experts of their fields will surely stimulate the researchers to work on the most recent developments of technology.

I pay my gratitude to each and every one of you who has directly and indirectly associated with IC4M2022, provided their valuable services with full of dedication, presented

their research ideas enthusiastically and making it a mega event of its kind. The enthusiasm shown by all the people associated in the organization of the conference is truly remarkable.

I look forward to working with our research community including authors, reviewers, editors, and publication staff to take the conference to the new horizon of success!

**Hope you all will continue to support us in future programs and this splice of faith will be stronger every time.**

**Dr. Anupma Agarwal**



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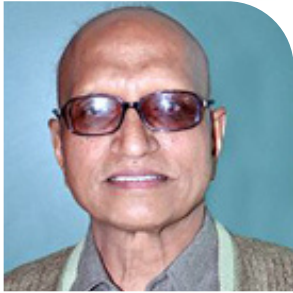
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Maulana Azad National Institute  
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Mainpuri  
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Swinburne University of  
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Sr. Faculty  
Swinburne University of  
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### **Mr. Vineet Raj Singh Kushwah**

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IPS College of Technology &  
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**Website Management  
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### **Ms. Neha Sharma**

Associate Professor  
IPS College of Technology &  
Mangement, Gwalior  
**Host**



### **Ms. Garima Singh**

VIT Bhopal  
**Host**



### **Mr. Prem Prakash Pandit**

Assistant Professor  
IPS College of Technology &  
Mangement, Gwalior  
**Member**



### **Mr. Gaurav Jain**

Assistant Professor  
SD Bansal College, Indore,  
INDIA  
**Member**



**Keynote Speaker**



**Dr. Vijay Kumar Jain**  
Professor (Retd)  
Indian Institute of Technology Kanpur,  
India



**Dr. Farrokh Mistree**  
Professor  
The University of Oklahoma, Norman,  
USA



**D. Scott Sink**  
Professor  
Western Michigan University, USA



**Dr. Janet Allen**  
Professor  
The University of Oklahoma, Norman,  
USA



## Session Chairs

- **Dr. Akshay Dwivedi**, Professor Indian Institute of Technology, Roorkee, IN
- **Dr. Santosh Rane**, Dean, Sardar Patel COE, Mumbai, IN
- **Dr. Santosh Jaju**, Professor and Dean (R&D) at G. H. Rasoni College of Engineering, Nagpur, IN
- **Dr. Alpana Agarwal**, Professor & Head, Thapar Institute of Engineering and Technology, Patiala, Punjab, IN
- **Dr. Devendra Singh**, Professor & Head, AKG Engineering College, Ghaziabad, IN
- **Dr. Rajesh K Porwal**, Professor, Shri Ramswaroop Memorial University, Barabanki, IN
- **Dr. Ashish Dash**, Professor, Orissa University, IN
- **Dr. Manoj Gaur**, Professor, Madhav Institute of Technology & Science, Gwalior, IN
- **Dr. Elammaran Jayamani**, Sr. Faculty, Swinburne University of Technology, Malaysia
- **Dr. S.K. Panigrahi**, Associate Professor, VSSUT, Burla, IN
- **Dr. Avadesh K Sharma**, Associate Professor, Rajkiya Engineering College, Mainpuri, IN
- **Dr. Ishwar Prasad Sahu**, Associate Professor, IGNT University, Amarkantak
- **Dr. Ravindra Pathak**, Associate Professor, Medicaps University, Indore, IN
- **Dr. Vijay Gadakh**, Associate Professor, Amrutvahani COE, Sangamner, IN
- **Dr. Ravi Mandava**, Asst. Professor, Maulana Azad National Institute of Technology, Bhopal, IN
- **Dr. Jyoti Vimal**, Asst Professor, Madhav Institute of Technology & Science, Gwalior, IN
- **Dr. Yaswant Modi**, Asst Professor (SG), Jaypee University of Engineering & Technology, Raghogarh, Guna (M.P.)



**BEST PAPER /  
PRESENTATION AWARD**

**BEST PAPER AWARD**

<b>Name of Presenter</b>	<b>Paper Id</b>
• <b>Sudip Santra</b>	<b>186</b>
• <b>Chandra Prakash Singh</b>	<b>162</b>
• <b>Elaraman Jayamani</b>	<b>233</b>
• <b>Kavita Rani</b>	<b>206</b>

**BEST PRESENTATION AWARD**

<b>Name of Presenter</b>	<b>Paper Id</b>
• <b>S. Kunar</b>	<b>113</b>
• <b>Hirpa G Lemu</b>	<b>124</b>
• <b>Pei Fun Lee</b>	<b>135</b>
• <b>Shibu Clement\Mr. Naveen</b>	<b>204</b>



**Technical Chair: Dr. R S Jadon**, Professor  
G B Pant University of Agriculture & Technology, Pant Nagar, IN

**Technical Committee Coordinator: Dr. Ashish Khaira**

**Online Platform Mangement, Co Chair: Dr. Keshav Rawat**, Associate Professor  
Central University, Haryana, IN

### Programme Schedule

#### Day 1 (April 09,2022)

Programme		Time/ Paper IDs
<b>Inaugural function &amp; Keynote Address-I</b>		
Speaker:	<b>Dr. V K Jain</b> , Professor (Retd) Indian Institute of Technology Kanpur, IN	10:00 a.m. - 11:30 a.m.
Topic:	<b>Manufacturing: Vision for future</b>	
Host:	<b>Ms. Neha Sharma</b> , Asst. Prof., IPSCTM, Gwl, IN <b>Ms. Garima Singh</b> , VIT Bhopal, IN	
<b>Technical Session-I</b>		
	Session Chairs 1. <b>Dr. Alpana Agarwal</b> , Professor & Head, Thapar Institute of Engineering and Technology, Patiala, Punjab, IN 2. <b>Dr. Vijay Gadakh</b> , Associate Professor, Amrutvahani COE, Sangamner, IN	11:45 a.m. - 1:00 p.m.
		113, 154, 161, 186, 192, 243
<b>Technical Session-II</b>		
	Session Chairs 1. <b>Dr. Elammaran Jayamani</b> , Sr. Faculty, Swinburne University of Technology, Malaysia 2. <b>Dr. Devendra Singh</b> , Professor & Head, AKG Engineering College, Ghaziabad, IN	11:45 a.m. - 1:00 p.m.
		112, 117, 124, 126, 130, 131, 238
<b>Technical Session-III</b>		
	Session Chairs 1. <b>Dr. Akshay Dwivedi</b> , Professor Indian Institute of Technology, Roorkee, IN 2. <b>Dr. Ishwar Prasad Sahu</b> , Associate Professor, IGNT University, Amarkantak	2:00 pm - 4:15 pm
		122, 129, 146, 116, 120, 138, 162, 203, 215, 222, 247

Technical Session-IV		
	Session Chair	2:00 pm - 4:15 pm
	1. <b>Dr. Santosh Jaju</b> , Professor and Dean (R&D) at G. H. Raison College of Engineering, Nagpur, IN 2. <b>Dr. Ravi Mandawa</b> , Asst. Professor, Maulana Azad National Institute of Technology, Bhopal, IN	172, 176, 177, 181, 183, 190, 191, 193, 198, 199, 200

Keynote Address-2		
Speaker:	<b>Prof. Farrokh Mistree &amp; Prof. Janet K Allen</b> Professor, University of Oklahoma in Norman, Oklahoma, USA	4:30 pm - 5:30 pm
Topic: Host:	<b>Design Engineering 4.0</b> <b>Ms. Neha Sharma</b> , Asst. Prof., IPSCTM, Gwl, IN <b>Ms. Garima Singh</b> , VIT Bhopal, IN	

Day 2 (April 10,2022)		
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Programme	Time/ Paper IDs
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Technical Session-V		
	Session Chairs	10:15 a.m. - 1:00 p.m.
	1. <b>Dr. Santosh Rane</b> , Dean, Sardar Patel COE, Mumbai, IN 2. <b>Dr. Jyoti Vimal</b> , Asst Professor, Madhav Institute of Technology & Science, Gwalior, IN	134, 135, 142, 143, 147, 156, 166, 168, 170, 218, 219

Technical Session-VI		
	Session Chairs	10:15 a.m. - 1:00 p.m.
	1. <b>Dr. Ravindra Pathak</b> , Associate Professor, Medicaps University, Indore, IN 2. <b>Dr. Yaswant Modi</b> , Associate Professor, Jaypee, Guna, IN	164, 171, 207, 208, 210, 217, 204, 214, 221, 227

Technical Session-VII		
	Session Chairs	2:00 pm - 4:15 pm
	1. <b>Dr. Rajesh K Porwal</b> , Professor, SRM University, Lucknow, IN 2. <b>Dr. S.K. Panigrahi</b> , Associate Professor, VSSUT, Burla, IN	107, 121, 145, 173, 174, 175, 182, 188, 189, 206, 233

Technical Session-VIII		
	Session Chair	2:00 pm - 4:15 pm
	1. <b>Dr. Ashish Dash</b> , Professor, Orissa University, IN	196, 202, 211, 212, 216, 224, 225, 232, 239, 244, 246

**Technical Session-IX**

	Session Chairs	2:00 pm - 4:15 pm
	1. <b>Dr. Manoj Gaur</b> , Professor, Madhav Institute of Technology & Science, Gwalior, IN 2. <b>Dr. Avadesh Sharma</b> , Associate Professor, Rajkiya Engineering College, Mainpuri, IN	144, 157, 223, 230, 240, 241, 242, 245

**Keynote Address-3**

Speaker:	<b>Prof. D. Scott Sink</b> Senior Advisor, Poirier Group in Toronto, Canada	4:30 pm - 5:30 pm
Topic:	<b>Achieving operational excellence: perspectives, points of view and strategies</b>	
Host:	<b>Ms. Neha Sharma</b> , Asst. Prof., IPSCTM, Gwl, IN <b>Ms. Garima Singh</b> , VIT Bhopal, IN	

**Valedictory Session**

5:30 pm Onwards



**INTERNATIONAL CONFERENCE**  
**Advances in Materials, Mechanics, Mechatronics and Manufacturing**  
**April 9-10, 2022/India**



**Program Schedule**  
**April 09, 2022**

**Day 1 (April 09, 2022)**

<b>10:15 am- 11:15 am</b>	<b>Keynote Address 1</b>
<b>Topic of the Keynote</b>	<b>Manufacturing: Vision for future</b>
<b>Keynote Speaker</b>	<b>Dr. Vijay Kumar Jain</b> <b>Professor (Retd)</b> Indian Institute of Technology Kanpur, India
<p><b>Biography of Speaker:</b> Prof. V.K..Jain did his B.Tech. from MACT Bhopal (Vikram University, Ujjain), and M. Tech. and Ph.D. from University of Roorkee (now, IIT Roorkee). He has about 44 years of teaching and research experience. He has served as a visiting professor at university of California at Berkeley (USA) and university of Nebraska at Lincoln (USA). He retired as a professor from Indian Institute of Technology Kanpur after serving for thirty three years. Dr. Jain has won three gold medals, two silver medals and one best paper award as recognition to his research work. He is editor-in-chief of three International journals and associate editor of Int J. Engineering manufacture and J. Machining Science and Technology. In recognition to the research work of Dr. Jain, he has been opted as a member of the editorial board of more than ten international journals. He has also worked as a guest-editor for more than ten special issues on TQM, CAPP, advanced machining processes, micromanufacturing, and micro fabrication. He has more than 300 publications to his credit. He has written and edited eight books. He has guided fifteen Ph.D. Students and around one hundred M. Tech. / M. E. Students. Dr. Jain has various research areas of interest, viz. Advanced machining techniques (ECM, EDM, AFM, MAF, MRAF, and others), machining of advanced engineering materials, shear strain acceleration phenomenon in metal cutting, computer aided manufacturing, and CAPP.</p>	

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**Day 1 (April 09, 2022)**

<b>04:30 pm- 05:30 pm</b>	<b>Keynote Address 2</b>
<b>Topic of the Keynote</b>	<b>Design Engineering 4.0</b>
<b>Keynote Speaker</b>	<b>Dr. Farrokh Mistree</b> <b>Professor</b> The University of Oklahoma, Norman, USA
<p><b>Biography of Speaker:</b> Farrokh’s passion is to have fun in providing an opportunity for highly motivated and talented people to learn how to define and achieve their dreams. Since his arrival in August 2009 at the University of Oklahoma, after seventeen years at Georgia Tech, Farrokh holds the L. A. Comp Chair in the School of Aerospace and Mechanical Engineering. Farrokh received his B. Tech (Hons) degree in Naval Architecture in 1967 from the Indian Institute of Technology, Kharagpur and his Ph.D. in Engineering from the University of California, Berkeley in 1974. He has co-authored two textbooks, four monographs and more than 450 technical papers dealing with the co-design of materials, products and associated manufacturing processes, the design of mechanical, thermal and structural systems; ships and aircraft; engineered networks. He has co-mentored 34 doctoral students and 65 master’s students; 18 of his mentees are pursuing highly successful careers in academia. In addition, he has mentored two students, one master’s and one doctoral, who founded several for-profit colleges in Odisha, India. Farrokh is a Fellow of ASME, an Associate Fellow of AIAA, a Life Member of The Honor Society of Phi Kappa Phi and a Member of ASEE, RINA and SNAME. He was named the ASME Ruth and Joel Spira Outstanding Engineering Design Educator in 2011. In September 2012 he was recognized as a Distinguished Alumnus of the Indian Institute of Technology, Kharagpur, India. In December 2012, he received the Life Time Achievement Award from the International Society for Agile Manufacturing, Lafayette, Louisiana. Farrokh co-directs the Systems Realization Laboratory @ OU (SRL@OU) with his wife Professor Janet K. Allen who holds the John and Mary Moore Chair in Industrial and Systems Engineering. The SRL@OU is a multicultural, multidisciplinary academic family focused on educating the next generation of professors. They provide an opportunity for every member to learn how to dream, rise to his/her full potential and contribute to the scholarship associated with the realization of complex engineered systems.</p>	

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Day 1 (April 09, 2022)

<b>04:30 pm- 05:30 pm</b>	<b>Keynote Address 2</b>
<b>Topic of the Keynote</b>	<b>Design Engineering 4.0</b>
<b>Keynote Speaker</b>	<b>Dr. Janet Allen</b> <b>Professor</b> The University of Oklahoma, Norman, USA
<p><b>Biography of Speaker:</b> Janet K. Allen has held the John and Mary Moore Chair and has been a Professor of Industrial and Systems Engineering since her arrival at the University of Oklahoma in August 2009 from Georgia Tech. She received her S.B. in Life Sciences from the Massachusetts Institute of Technology and her PhD in Biophysics from the University of California. She has co-authored one textbook, four monographs and more than 350 technical papers dealing with the co-design of materials, products and associated manufacturing processes, the design of mechanical, thermal and structural systems; ships and aircraft; and engineered networks such as supply chains. Janet K. Allen and her husband, Professor Farrokh Mistree, who holds the L.A. Comp Chair in Aerospace and Mechanical Engineering, co-Direct the Systems Realization Laboratory which is home to students from various disciplines. Our mission is to provide an opportunity for students to learn how to rise to their full potentials to become the next generation of professors.</p>	

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**Program Schedule**  
**April 10, 2022**

**Day 2 (April 10, 2022)**

<b>04:30 pm- 05:30 pm</b>	<b>Keynote Address 3</b>
<b>Topic of the Keynote</b>	<b>Achieving operational excellence: perspectives, points of view and strategies</b>
<b>Keynote Speaker</b>	<b>D. Scott Sink</b> <b>Professor</b> Western Michigan University, USA
<p><b>Biography of Speaker:</b> Scott is a native of Findlay, Ohio, and a graduate of The Ohio State University (1973, '76, '78). He spent three years with Eastman Kodak as a Service Systems Engineer in Rochester, N.Y., after receiving his BS in Industrial and Systems Engineering. Scott returned to Ohio State as a graduate research assistant funded by an NSF grant, studying white collar productivity measurement. Upon completion of his Ph.D. in Interdisciplinary Studies (based in ISE), he joined the faculty at Oklahoma State University from 1978-1984. In the fall of 1984, Scott joined the ISE faculty at Virginia Tech and led the Virginia Quality and Productivity Center from 1984-1997. Scott has written three books and more than 40 papers and articles, and has consulted extensively. Scott joined the private sector in 1997 and served as VP of Business Process Reengineering for Exchange Solutions (Boston/Toronto) and then from 2004-2007 as VP of Business Process Improvement for MDS, Intl. in Toronto. He designed and launched a very successful Operational Excellence (LeanSigma) Program for MDS (Global Life Science Company). In the fall of 2007, he decided to return to academia and his alma mater to develop and lead a LeanSigma Certification Program in the College of Engineering. The LeanSigma Certification Program has been exceedingly well received by ISE undergraduate candidates. The 53 projects to date have generated some \$4 million in direct benefits to local business and industry. (e.g. The Limited, Kroger, OSU Medical Center, PPG, Mid Ohio Foodbank, Diamond Innovations, Rosati Windows, Kahiki Foods, Smiths Medical, Donato's Pizza, and others).</p>	

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