

# IDEAL – 2025

*IISc Dialogues on Education and Learning, 15<sup>th</sup> March 2025*

**Venue:** S V Narasaiah Auditorium, Department of IAP (Hybrid mode allowing for online participation by overseas participants)

**Timings:** 09:30 – 18:00

**Host Department:** Instrumentation and Applied Physics

**Conference Chair and Co-Chair:** Prof. Baladitya Suri (IAP) and Prof. Jayanth G R (IAP)

**Advisory Board:** Prof. Kaushal Verma (*Dean, Division of Physical and Mathematical Sciences*), Prof. Ananthasuresh G K (*Dean, Division of Mechanical Sciences*), Prof. Sanjiv Sambandan (*Chair, IAP*) and the *Faculty of IAP*, Prof. Ramsharan Rangarajan (*ME*), Prof. Koushik Viswanathan (*ME*), Prof. Pavan Nukala (*CeNSE*), Prof. Maria Thaker (*CES*), Prof. Kavita Isvaran (*CES*), Prof. Vishweshha Guttal (*CES*).

## **Program:**

**9:45 – 10:00** – *Welcome and Inauguration*

**10:00 – 11:30** – *Inaugural Talk by Prof. Shreepad Karmalkar (Director, IIT Bhubaneswar)*

**11:30 – 12:00** – *High Tea*

**12:00 – 12:45** – *Prof. Kumaran Viswanathan (Chair – Senate Curriculum Committee, IISc)*

**12:45 – 13:30** – *Prof. Sudhir D. Agashe (COEP Technological University, Pune)*

**14:30 – 15:00** *Inauguration of Dept. of IAP M.Tech. teaching lab*

**15:00 – 15:45** – *Dr. Divya Navamani and Dr. Lavanya A. (SRM University, Chennai)*

**15:45 – 16:30** – *Shri Vallish Herur (Prayoga, Bengaluru)*

**16:30 – 17:15** – *Prof. M. S. Hegde (Former Convener, IISc - TDC Chellakere)*

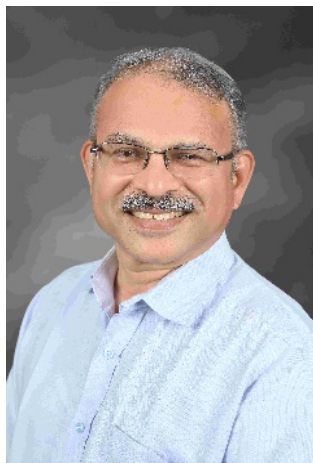
**17:15 – 17:30** – *Vote of thanks and closing*

**17:30 – 18:00** – *High Tea*

## **Speaker Bios, Titles and Abstracts:**

**10:00 – 11:30 – Inaugural Talk by Prof. Shreepad Karmalkar (Director, IIT Bhubaneswar)**

### **About the Speaker:**



*Prof. Shreepad Karmalkar is Director, IIT Bhubaneswar. He has expertise in Semiconductor Devices and Education. He obtained B.Tech (1983) and accelerated PhD (1989) Degrees in Electrical Engineering from IIT Madras. Prior to joining IIT Bhubaneswar, he was at IIT Madras as a faculty of Electrical Engineering for about three decades, and Head of the Teaching-Learning Centre for two years. He has received the 2006 Vikram Sarabhai Award for research, 2007 IBM Faculty Award for research and teaching, 2021 VLSI Society of India Best Faculty Award for "contributions in the area of teaching, popularizing and creating some of the best minds in Microelectronics in the last*

*30 years," and the president's nomination to the IIT Council for "contributions in education, science or technology". He was an Editor of IEEE Transactions on Education. He is a strong espouser of holistic education, and a multilingual – can read, write and speak – Bengali, Hindi, Marathi, and can converse in – Telugu, Tamil and to an extent, Sanskrit.*

### **Title of the talk: TEACHING PORTFOLIO – EVIDENCE OF TEACHING EFFECTIVENESS**

**Abstract:** *At the end of this session, a participant will be able to explain all a teacher should do to enhance learning among students. A "Teaching Portfolio" documents all key aspects of a teaching activity just as a "Research Paper" does for a research activity. Aspects described in a "Teaching Portfolio" include: course title; syllabus; learning outcomes; text / reference books; class size and composition; assessment format; attendance policy; overall student performance and grading policy; critical thinking level questions in examinations and assignments, and performance on these; questions asked by students; activities and fraction of class time spent on these; students feedback; identifying and dealing with students needing special attention; performance of students in a follow-on course; performance of students in real life; anything else. Such a document sets goals, provides a clear plan, encourages regular action and offers feedback for self-reflection, all of which promote continuous improvement; it also showcases accomplishments of a teacher. It is this portfolio and not the students' rating alone that constitutes reliable evidence of teaching effectiveness.*

**12:00 – 12:45 – Prof. Kumaran Viswanathan (Chair – Senate Curriculum Committee, IISc)**

### **About the Speaker:**



*Prof. Kumaran Viswanathan received his Bachelors in Chemical Engineering from IITM in 1987, followed by a doctorate from Cornell University in 1992. After a stint as a post-doctoral research engineer at the University of California, Santa Barbara, he joined the Indian Institute of Science as an assistant professor in 1993. Prof. Kumaran received the Young Scientist Medal of the Indian National Science Academy in 1996. The Indian National Academy of Engineering awarded him the Young Engineer Award in 1997. He received the Amar Dye-Chem Award of the Indian Institute of Chemical Engineers in 1999. The Council of Scientific and Industrial Research awarded him the Shanti Swarup Bhatnagar Prize in 2000. The Infosys Science Foundation awarded him the Infosys Prize in 2016 for his research on complex fluids and complex flows. The Asian Scientist magazine included him in the Asian Scientists 100 list in 2016. He is an elected fellow of the Indian Academy of Sciences, Indian National Science Academy and the Indian National Academy of Engineering. Prof. Kumaran Viswanathan is also widely regarded for his teaching and has been helming the SCC (Senate Curriculum Committee) of IISc for the last couple years.*

**Title of the talk:** University 4.0

**Abstract:** *At the present stage of national development, there are increasing requirements for significantly enhancing student numbers in technical education, converting new research advancements into courses that can be efficiently disseminated and digested, and matching student capabilities with employment opportunities. Simultaneously, there is an ever greater need for students to understand practical applicability, get a good overall perspective, peer to peer learning and old-fashioned guidance and mentoring. All of these can not be achieved by numbering up the current models, it is necessary to rethink the current university system. Current technological advances that enable better value addition and learning experience, and the new system enabled by the synthesis of these advances, will be discussed. This will be followed by a proposal for the role of institutes of national importance in the newly developing university system.*

**12:45 – 13:30 – Prof. Sudhir D. Agashe (COEP Technological University, Pune)**

*About the Speaker:*



*field.*

*Prof. S. D. Agashe is a highly qualified and experienced academician, with a post-graduate degree in Instrumentation & Control Engineering and a Ph.D. in the area of process automation. Prof. Agashe has a wealth of experience both in academia and industry. With 28 years of teaching experience and 6 years of industry experience, to be precise a deep understanding of both theoretical and practical aspects of his*

*Serving in various leadership roles such as Head of the Department and Dean (Academic), also indicates that he has a good understanding of the administrative aspects of running an academic institution. Prof. Agashe is also credited with establishing the Investigator of Virtual Laboratory Project in the University. As the Principal Investigator of the Virtual Laboratory Project at COEP Technological University, Prof. Agashe is leading a team of researchers and engineers to develop innovative solutions in the field of virtual labs, an exciting and challenging role, considering the increasing importance of virtual labs in the education sector, especially during and since the pandemic. Prof. Agashe has published over several technical papers in national and international journals and conferences. His research papers have been widely cited in technical papers and reference books. He has guided 5 Doctoral students, with several more ongoing, and has supervised a significant number of postgraduate students.*

**Title of the talk:** *New approaches and techniques for Laboratory work*

**Abstract:** *As we gather to discuss the future of engineering education, it is imperative to acknowledge the critical role laboratories play in shaping the next generation of engineers. However, we are faced with a pressing issue: the decline in the quality of laboratory education due to increasing student numbers, outdated equipment, and a lack of emphasis on lab work. Fortunately, dedicated faculty members and skilled laboratory support have mitigated this decline, but the challenge persists. The crux of the problem lies in the inadequate assessment of competencies gained through laboratory work, leading to concerns about the preparedness of students for industry challenges. To address this, a consortium of 12 Institutes has developed innovative solutions, including virtual laboratories and remote-triggered laboratories. These cutting-edge approaches enable students to practice experiments in a simulated environment, reducing the fear of failure and damage to physical systems. At COEP Tech, we have taken this a step further by designing systems that track student performance, identifying areas of improvement, and providing real-time feedback. Our dashboard enables faculty members to pinpoint weaknesses and focus their efforts on supporting struggling students. This presentation will showcase our pioneering work in revolutionizing laboratory education, making it more engaging, rewarding, and effective in fostering professional growth. We invite fellow experts to share their insights and contribute to the development of this model, which has far-reaching implications for engineering education and beyond.*

**15:00 – 15:45 – Dr. Divya Navamani and Dr. Lavanya A. (SRM University, Chennai)**

**About the Speakers:**



**Dr. Divya Navamani.** *J is an Associate Professor in the Department of Electrical and Electronics Engineering, SRMIST, heading the Pedagogy Cell. She collaborates with Oxford and UCL on a model course and a research paper on active learning strategies. She visited UCL for curriculum development collaborations. She has published 80+ papers in reputed journals like IEEE, IET Electronics, and Elsevier. She holds three patents in power converters, with two granted in 2024. She completed an IEI-*

funded project on an Energy Harvester Interface for Microbial Fuel Cells. She received the IEEE Best Publication Award (2021, 2024) and a Teachers Associateship for Research Excellence from DST-SERB. She is a Senior IEEE member, Fellow of IEI, and Associate Editor of JCSC.

**Title of the talk:** *Innovative Learning Heutagogy: Engaging Students through Active Learning at SRM*

**Abstract:** *My talk will cover innovative learning strategies rooted in heutagogy, emphasizing student-centred and self-determined learning. It will explore active learning techniques such as role play, phrase match-up, exit tickets, and various engaging methodologies that enhance conceptual understanding. Additionally, I will highlight the integration of LEGO activities to foster creativity, problem-solving, and hands-on learning. These approaches have been successfully implemented at SRM, promoting deeper engagement and critical thinking among students.*



**Dr. Lavanya A.** is an Associate Professor in the Department of Electrical and Electronics Engineering at SRMIST, Kattankulathur, with 70+ publications in reputed journals, conferences, and book chapters. In 2024, she visited UCL, UK, to establish global collaborations in curriculum development and capacity building. A senior IEEE member and reviewer for esteemed journals, she has collaborated with NIWE on renewable energy research. She has coordinated 20+ funded workshops and training programs and received the MT Research and Educational Services Teaching Excellence Award in 2018. Her expertise spans Renewable Energy, Power Electronics, AI Tools for Academia, and Innovative

Teaching Methodologies.

**Title of the talk:** **Empowering Learning: Strategies for Effective Classroom Engagement in Engineering Education**

**Abstract:** *Enhancing student engagement in engineering education requires a thoughtful integration of active learning strategies and formative assessments. This session, "Empowering Learning: Effective Strategies for Engaging Engineering Students in the Classroom," presents a reflective analysis of pedagogical interventions implemented in an undergraduate course. The discussion will focus on their impact on student motivation, conceptual understanding, critical thinking, and collaboration. Beyond sharing experiences, this session aims to foster a dialogue with esteemed faculty and experts, inviting their perspectives on effective teaching-learning practices. By engaging in this discourse, the session seeks to validate and refine instructional strategies while exploring pathways to maximize learning impact in engineering education.*

**15:45 – 16:30 – Shri Vallish Herur (Prayoga, Bengaluru)**

**About the Speaker:**



*With over two decades of experience in education research and experiential learning, Vallish Herur has been shaping innovative pedagogical approaches. As the Managing Trustee of Prayoga Institute of Education Research since 2015, he leads efforts in advancing rigorous education research and overseeing institutional operations. Prayoga is a not-for-profit organization dedicated to addressing critical challenges in school education., with a particular focus on science and mathematics learning. The institute's research explores key areas such as Science and Mathematics Education, Teacher Education. His expertise extends beyond institutional leadership to curriculum design, content development, and teacher training. Since 2013, he has mentored a homeschooling community, designing a fully experiential curriculum and developing customized evaluation frameworks for individualized learning. His interest in educational philosophy, pedagogy design, and content development reflects his commitment to improving school-level education through research-driven practices. Vallish also served as Senior Consultant, Technical Secretariat supporting the National Steering Team tasked to develop the National Curriculum Framework based on NEP 202. He has contributed to national education policy discussions as a member of State Focus Groups for Karnataka's DSERT and India's NCERT, working on position papers for the National Education Policy (NEP) on Environmental Education and Alternative Ways for Schooling. Previously, as a Director at BASE Educational Services Pvt. Ltd. (2002–2016), he played a key role in managing school-level academic programs and overseeing operations in one of India's premier institutions for competitive exam preparation. Beyond his professional pursuits, Vallish's interests are in philosophy and Carnatic classical percussion.*

**Title of the talk:** *Inquiry as a Scientific Method in School-Level Education– A Competency-Based Approach*

**Abstract:** *Science education must go beyond the passive transmission of knowledge and actively engage students in the process of discovery. Inquiry-Based Learning (IBL) provides a structured framework for experiential learning, where students develop scientific understanding through questioning, investigation, data analysis, and reasoning. Grounded in constructivist learning theories, IBL mirrors the scientific method, enabling students to acquire knowledge by actively exploring concepts rather than passively receiving information. A critical aspect of implementing IBL in school-level education is aligning it with students' cognitive development stages. This necessitates a gradual progression from structured inquiry (where students follow a given process) to guided inquiry (where they design investigations under teacher guidance) and ultimately to open inquiry (where they independently formulate and explore research questions). This structured transition ensures that students develop scientific competencies*

*progressively, equipping them with the necessary skills for higher-order scientific thinking. Beyond content knowledge, science education must nurture a range of competencies such as classification, seriation, conservation, etc., which serve as the foundation for higher-order abilities like scientific inquiry, analytical reasoning, critical thinking, and decision-making. These competencies enable students to develop the abilities necessary for advanced scientific thinking, ultimately shaping them into independent thinkers and problem solvers. This talk will present insights from Kriya, an ongoing education research initiative at Prayoga, which seeks to develop scalable, evidence-based methodologies to ensure that every child in India learns science experientially. Kriya aims to bridge the gap between research and practice, exploring how competency-based, inquiry-driven approaches can transform school science education and foster a scientifically literate generation.*

**16:30 – 17:15 – Prof. M. S. Hegde (Former Convener, IISc - TDC Chellakere)**

**About the Speaker:**



*Prof. M. S. Hegde received his PhD from IIT Kanpur in 1976 in Plasma Spectroscopy. He then joined IISc in 1978 as a Lecturer in the Solid State Structural Chemistry Unit at IISc and went on to become a full Professor in 1995. Prof. Hegde served as the Chair of SSCU from 1997 to 2000, and Dean of Science Faculty at IISc from 2008-2010. During this period Prof. Hegde was also one of the foremost champions for setting up the UG BS (Research) program at IISc. Prof. Hegde is a recipient of the MRSI Medal conferred by the MRSI Society and also the Alumni Excellence in Research Award (IISc) for 2010. Prof. Hegde is a Fellow of the Indian Academy of Sciences. After his superannuation, he served as Convener at IISc-TDC Chellakere between 2010 - 2020, where he nurtured and curated with great care the teacher training programs from PUC to MSc levels.*

**Title of the talk:** *Science and Mathematics Teachers Training at IISc-TDC Chellakere: An Experiment*

**Abstract:** *Basic science education is the key to achieve economic development through Science and Technology for a country. Be it developing a medicine, putting satellites in space for communication, producing seedless grapes or harvesting energy from sun - all need people having sound knowledge in respective fields. All these come under science and mathematics education at high school and Pre-university stages. Excitement in science comes from doing experiments and solving problems in math. Therefore, science and mathematics education at School and PU level is too important. Creating interest in Science and Math depends on the teachers at this stage. Toppers in science go to PU and toppers in PU go to Engineering and Medicine and left over go to BSc. Even here toppers*

*in BSc go to University for MSc and those who could not make to university teach science and math in high schools. Those who cannot go to research after MSc become PU and BSc college Teachers. Thus, at each stage, students are taught by teachers at least one level lower than desired. One way to make improvement in the competence of teachers from high school, PU, BSc and MSc level is to train them by the teachers from advanced Institutions such as IISc and IITs. This will instill confidence in them. IISc started an experimental program on Teachers' Training in the Talent Development Center (TDC), in its new campus at Challakere, Karnataka. In TDC, Training is given at four levels for Science (Physics, Chemistry, Biology) and Mathematics teachers. This training program has been developed and implemented in 2011. For 14 years, over 20,000 (twenty thousand) Teachers from Govt. and Govt. aided Institutions have been trained. The training program is a residential program for 10 to 15 days. Teachers do experiments in science and solve problems in math within their syllabus from text books. Average scores of teachers in the pre-test are about 22%, which increases to 75 to 80% post-test. Impact of trained teachers on the SSLC results of student showed that the number of students scoring 60 % and 70% is doubled. In this lecture, we present the uniqueness of the methodology of training. Teachers' knowledge can be enhanced to a desired level. Performance of the students showed huge improvement when they were taught by teaches who received training at TDC.*