ENGINEERING EXCELLENCE AWARDS 2021

ONLINE ANNUAL CONVENTION

16th -18th DECEMBER 2021

Held Online at

INDIA INTERNATIONAL CENTRE, NEW DELHI

Indian National Academy of Engineering

INDEX

INAE LIFE TIME CONTRIBUTION AWARD IN ENGINEERING 2021

INAE LIFE TIME CONTRIBUTION IN ENGINEERING AWARDEE 2021

Mr Senapathy Gopalakrishnan

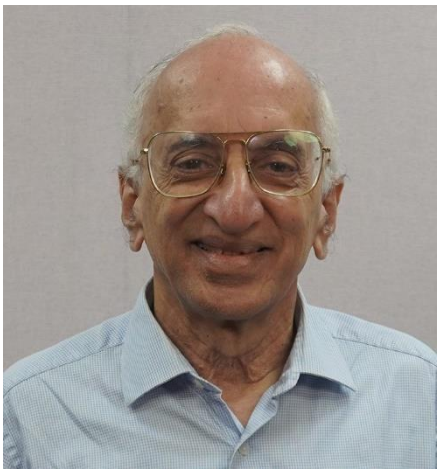
Co-founder Infosys & Chairman Axilor Ventures

Mr Senapathy "Kris" Gopalakrishnan is the Chairman of Axilor Ventures, an early-stage accelerator and venture fund and Co-Founder and former CEO of Infosys Ltd. He is one of the pioneers in the Information Technology (IT) industry and has been part of the leadership that built the IT industry in India over last 40 years. Infosys pioneered the Global Delivery Model for digital services delivery, built a model to create IT professionals in the country through education and training by industry, adopted and promoted the use of world class quality systems and governance processes such that Infosys and the industry are considered role models of world class industries from India.

Mr Kris Gopalakrishnan created Itihaasa Research and Digital which published the history of Indian IT industry as "itihaasa.com" and continues to document industrial and academic research in India. He supports research in Brain Sciences at IISc and IIT Madras and has set up the Center for Brain Research at IISc. Kris has set up several organizations that support innovation and entrepreneurship including the CII Center for Innovation, Entrepreneurship and Start-ups (CIES) in Hyderabad. He was elected president of India's apex industry chamber Confederation of Indian Industry (CII) for 2013-14 and served as one of the co-chairs of the World Economic Forum in Davos in January 2014. In January 2011, the Government of India awarded Mr. Gopalakrishnan the Padma Bhushan, the country's third-highest civilian honour.

Mr Kris Gopalakrishnan is awarded the INAE Lifetime Contribution Award in Engineering for the year 2021 in recognition of his outstanding contributions to the growth of Information Technology industry, as a supporter of world class research, innovation, and entrepreneurship in the country.

INAE LIFE TIME CONTRIBUTION IN ENGINEERING AWARDEE 2021



Prof MS Ananth

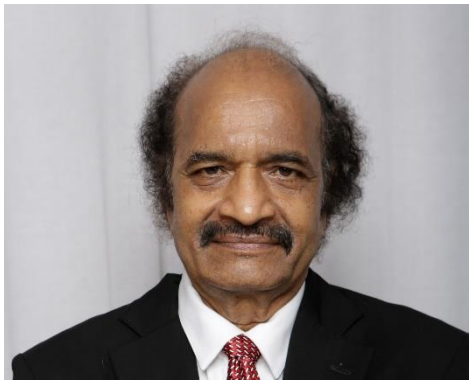
Emeritus Research Fellow, Department of Chemical Engineering, IIT Madras;
and Former Director, Indian Institute of Technology Madras.

Prof M.S. Ananth was Director IIT Madras between 2001-2011 and made several landmark contributions. He conceptualized and created the IITM Research Park, the first University-based Research Park in India. He is the primary architect of the open courseware project the National Programme on Technology Enhanced Learning (NPTEL). He is the only Vice Chancellor from India to have been invited to participate in the World Economic Forum (2007-2011). In December 2011, the journal I&EC Research (USA) published the Ananth-Festschrift Issue in his honour. He revitalized the alumni network raising over Rs.50 crores in donations. The Alumni have instituted a Rs 5 crore endowment in his name. Prof Ananth graduated from the AC College of Technology in 1967 with a gold medal in Chemical Engineering and obtained his Ph.D from the University of Florida in 1972. In IIT Madras, he was consistently rated a very good teacher and has won several research awards including the IIChE's Herdillia Prize and the R.W. Fahien Alumni Award of the University of Florida. He is a Fellow of IIChE and INAE. He was Member of both the SAC-C and the NMCC from 2007-2011. He has been a Visiting Professor in IIT Kanpur, IISc Bangalore, IIT Bombay, Princeton University, University of Colorado and RWTH, Aachen.

Prof MS Ananth is awarded the INAE Lifetime Contribution Award in Engineering for the year 2021 in recognition of his outstanding contributions as an institution builder and academician and seminal contributions to the growth of engineering education in the country.

PROF JAI KRISHNA MEMORIAL AWARD 2021
&
PROF SN MITRA MEMORIAL AWARD 2021

PROF JAI KRISHNA MEMORIAL AWARDEE 2021



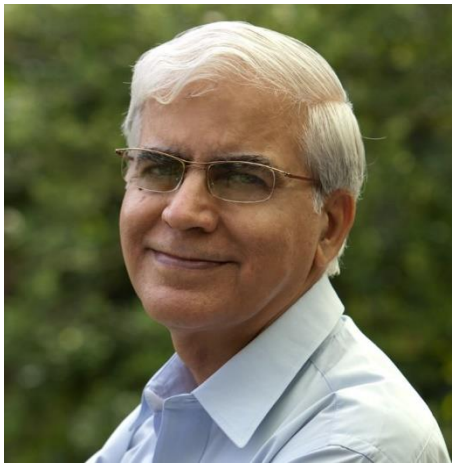
Prof GD Yadav

Emeritus Professor of Eminence and JC Bose National Fellow, Former Vice Chancellor & R.T. Mody Distinguished Professor, and Tata Chemicals Darbari Seth Distinguished Professor of Leadership and Innovation, Institute of Chemical Technology, Mumbai.

Prof Ganapati D. Yadav is one of highly prolific engineering-scientists in India who internationally recognized as an academician, researcher and innovator, including his seminal contributions to education, research and innovation in Green Chemistry and Engineering, Catalysis, Chemical Engineering, Energy Engineering, Biotechnology, Nanotechnology, and Development of Clean and Green Technologies. He has personally won over 125 national and international honours, awards, fellowships, editorships, and several LifeTime Achievement Awards. For over 10 years, he served as the Founding Vice Chancellor and R.T. Mody Distinguished Professor, and Tata Chemicals Darbari Seth Distinguished Professor of Leadership and Innovation at the Institute of Chemical Technology (ICT), Mumbai. He currently holds the titles of Emeritus Professor of Eminence and J.C. Bose National Fellow in ICT, Adjunct Professor at University of Saskatchewan, Canada, RMIT University, Melbourne, Australia and Conjoint Professor, University of New Castle, Australia. He was conferred Padma Shri in 2016 and received D. Sc. (Hon. Causa, DYPU) and D. Eng. (Hon. Causa, NIT Agartala). His research productivity is phenomenal: supervision of 104 Doctoral and 135 Masters Theses, 45 Post-Doctoral Fellows, 115 granted national and PCT patents, 3 books; h-index of 63, i10 index of 314; 14,600+ citations and 825+ specials lectures/orations/seminars. He is an elected Fellow of Indian National Science Academy, Indian Academy of Sciences, National Academy of Sciences, India, Indian National Academy of Engineering as well as The World Academy of Sciences, Trieste (TWAS). He is a Fellow of Royal Society of Chemistry, UK, Institution of Chemical Engineers, UK, Indian Institute of Chemical Engineers, Indian Chemical Society, and Indian Society for Technical Education, among others. He is currently the President of the Indian Chemical Society and Editor-in-Chief, Journal of the ICS being published by Elsevier. He is the Founder President ACS India International Chapter. He is on editorial boards of prestigious journals He serves as Independent Director, on five renowned limited companies: Aarti Industries Ltd, Godrej Industries Ltd, Meghmani Organics Ltd, and Bhageria Chemicals Ltd, and Clean Science and Technology Ltd. He is still actively involved in guiding doctoral students, patenting, publishing, consulting, and transferring technologies to industry.

Prof. G.D. Yadav is awarded the Prof. Jai Krishna Memorial Award for the year 2021 in recognition of his outstanding multifarious research contributions in the fields of Green Chemistry and Engineering, Catalysis, Chemical Engineering, Energy Engineering, Biotechnology, Nanotechnology, and Development of Clean and Green Technologies.

PROF SN MITRA MEMORIAL AWARDEE 2021



Prof Surendra Prasad

Department of Electrical Engineering, Indian Institute of Technology Delhi.

Prof Surendra Prasad received his education from IIT Kharagpur and IIT Delhi. He joined IIT Delhi as a faculty member in 1971, and eventually served as its Director from 2005-2011. Prof Prasad's research spanning nearly 50 years is concerned with the development of new techniques and algorithms for signal processing, many of fundamental importance and cited well in the literature. He has made pioneering contributions to indigenous R&D through execution of advanced projects in signal processing and digital communications. He played a leading role in setting up the Bharti School of Telecom Technology and Management and the School of Biological Sciences at IIT Delhi, through generous private endowments.

Prof. Prasad has been the recipient of a large number of awards and recognitions, including the Shanti Swarup Bhatnagar Prize, and is a Distinguished Alumnus of IIT Kharagpur. He has served on the Governing bodies of several leading institutions. As Chairman, NBA, he was responsible for securing membership of the Washington Accord, and advancing accreditation and ranking systems in the country.

Prof Surendra Prasad is awarded the **"**Prof. SN Mitra Memorial Award" for the year 2021 in recognition of his outstanding contributions in the field of Engineering, especially as a teacher, mentor, researcher, academic administrator and accreditor.

INAE OUTSTANDING TEACHERS AWARD 2021

INAE OUTSTANDING TEACHERS AWARDEE 2021

Prof Suman Chakraborty

Department of Mechanical Engineering, Indian Institute of Technology Kharagpur.

Prof. Suman Chakraborty, Professor in the Mechanical Engineering Department, IIT Technology Kharagpur and Sir J. C. Bose National Fellow of DST completed his undergraduate studies from Jadavpur University and Masters and Ph.D from the Indian Institute of Science, Bangalore. His teaching career started in Jadavpur University. In August 2002, he joined IIT Kharagpur as Assistant Professor, where he has continued his service in different portfolios, including his earlier position as the Head of the School of Medical Science and Technology, Institute Chair Professor, INAE Chair Professor, and present assignment as the Dean of Sponsored Research and Industrial Consultancy. His current areas of research include microfluidics, nanofluidics, micro-nano scale transport, with particular focus on biomedical applications.

Prof Chakraborty was awarded the Shanti Swaroop Bhatnagar Prize in the year 2013. He has been elected as a Fellow of the American Physical Society, Fellow of the Royal Society of Chemistry, Fellow of ASME, Fellow of all the Indian National Academies of Science and Engineering, recipient of the National Academy of Sciences India-Reliance Platinum Jubilee Award for Application Oriented Research, G. D Birla Award for Scientific Research, Indo-US Research Fellowship, Scopus Young Scientist Award for high citation of his research in scientific/technical Journals, and Young Scientist/ Young Engineer Awards from various National Academies of Science and Engineering. He has also been an Alexander von Humboldt Fellow, and a visiting Professor at various leading Universities abroad. He has a large volume of impactful publications in top International Journals with high citations and a unique expertise in technology development for the under-served population and community health-care. Throughout his teaching and research career, spanning over a couple of decades, he has offered extremely popular open-access online courses that are widely acclaimed all across the globe.

Prof. Suman Chakraborty is awarded the INAE Outstanding Teachers Award for the year 2021 in recognition of his all-round contributions to teaching and research in the area of Mechanical Engineering and its interdisciplinary applications and for being an exceptional role model towards motivating a new generation of students and young researchers as a figure of iconic inspiration

INAE OUTSTANDING TEACHERS AWARDEE 2021

Prof Sukumar Mishra

Department of Electrical Engineering, Indian Institute of Technology Delhi.

Prof. Sukumar Mishra, Associate Dean (R&D), IIT Delhi holds B.Sc (Engg), M.E. and Ph.D. degrees in Electrical Engineering from Sambalpur University, Orissa. He has taught at University College of engineering, Burla (now VSSUT) for little over 11 years, and continuing as a professor at IIT Delhi since last 18 years. Based, on his research during this period he has been honoured with Young Scientist award by Orissa Bigyan Academy, INSA medal for Young Scientist, INAE Young Engineer award, INAE Silver Jubilee Young Engineer Award, The Samanta Chandra Shekhar award by Orissa Bigyan Academy and NASI-Reliance Platinum Jubilee award. He has also been conferred with INAE Industry Academic Distinguished Professor and INAE Chair Professorship. Throughout, his entire teaching and research career, spanning over more than three decades, Professor Mishra's teaching has been based on two beliefs, namely, 'guided self-learning is the key to success for a student' and 'Each student need to be given a chance to explore their inherent potential'. His way of teaching has always been to excite the students so as to ignite their imagination. Throughout his career, he has been endeavouring to do just that. He is overwhelmed by the love and affection shown to him by his many students, and this he considers his biggest achievement and award as a teacher.

Prof. Sukumar Mishra is awarded the INAE Outstanding Teachers Award for the year 2021 in recognition of his outstanding contributions to teaching and research in the area of Electrical Engineering and for mentoring students in innovation and research activities.

INAE WOMAN ENGINEER OF THE YEAR AWARD 2021

INAE WOMAN ENGINEER OF THE YEAR AWARDEE 2021

Academia Category

Prof Sharada Srinivasan, Professor, National Institute of Advanced Studies (NIAS), Bangalore

Prof. Sharada Srinivasan, National Institute of Advanced Studies has made outstanding research contributions in studying ancient metal artefacts, mining, extractive metallurgy, smelting, alloying and artisanal metal crafts in India and Asia. She developed techniques of archaeometric characterisation of copper alloy icons, using lead isotope ratio geo-chemistry with spectrochemical elemental and trace element analysis, for the classification of icons and determination of provenance, and covering the early use of leaded bronze, brass and metallic zinc. She contributed to studies in geo-archaeology and mining heritage by exploring old mines and slag heaps related to copper, bronze, gold and ferrous metallurgy; employing SEM and EPMA techniques. She undertook archaeometallurgical investigations to identify pre-industrial production landscapes for wootz steel whereby wrought iron was carburized to ultra-high-carbon wootz steel (UHCS) using crucible processes. Her book 'India's Legendary Wootz Steel' charted the trajectory of wootz, the first high grade steel made in antiquity, which was studied by Michael Faraday and spurred metallurgical developments leading up to the Industrial Revolution. It touched on the properties of UHCS as advanced materials such as superplasticity and as nanomaterials. Her research identified rare intermetallic quenched martensitic beta high-tin bronzes (23%), going back to south Indian megalithic sites, ranking amongst the earliest examples. Her ethnometallurgical studies on mirror crafts from Aranmula in Kerala showed them to be of high-delta (33% tin) bronze alloy. She has explored Harappan copper-base metallurgy. She has nearly 80 publications.

Prof. Sharada Srinivasan is awarded INAE Woman Engineer of the Year Award 2021 in recognition of her outstanding research into engineering applications and materials characterisation in studying ancient metal artefacts, mining, extractive metallurgy, smelting and alloying.

INAE WOMAN ENGINEER OF THE YEAR AWARDEE 2021

R&D Category

Smt Madhumita Chakravarti, Director, Centre for Millimeterwave Semiconductor Devices and Systems (CMSDS), Kolkata

Smt Madhumita Chakravarti, Director, CMSDS, DRDO has made outstanding contributions towards the development and success of India's Air-Defence Programme. She has been working for DRDO/RCI in different capacities and has played a major role in the design and development of the Radio Proximity Fuze (RPF) system against Air-Borne targets for use in Surface to Air, Air to Air and for BMD class of weapon systems. She was involved in the design, and led the project from inception to completion, leading to the production of RPF systems. The innovative 'End Game Algorithm' developed by her to meet the engagement scenario of maneuvering as well as ballistic targets shows competitive state-of-the-art performance in this field. Towards her vision of a complete indigenization of the system, she designed and developed RF multifunction MMICs (Monolithic Microwave Integrated Circuits). Her research includes enhancing range resolution using over-sampling techniques for generation of R/D maps and using ambiguity diagrams for target detection with a processing time of a few microseconds to match the speed of the target. The systems have been qualified for extreme dynamic and climatic conditions to meet the requirements of Indian Air-Force and Indian Army. The reliability of the system designed by her is around 99.96%. Her system is being inducted in most of the air-defence weapon systems developed by DRDO.

Smt Madhumita Chakravarti is awarded the INAE Woman Engineer of the Year Award for the year 2021 for her outstanding contributions towards the development and success of Indian Air Defence Systems.

INAE WOMAN ENGINEER OF THE YEAR AWARDEE 2021

Industry Category

Ms Vartika Shukla, Chairperson & Managing Director,
Engineers India Limited, New Delhi.

Ms. Vartika Shukla is C&MD of Engineers India Limited (EIL). She is also holding additional charge of Director (Technical) and Director (Finance) of the company. An Engineering graduate from IIT, Kanpur, she is also certified with an Executive General Management Program from IIM (Lucknow). Ms. Shukla started her career as a Management Trainee in EIL's Process Design & Development Division in the year 1988. She has been associated with various functions of the organization during her vast career. She has been closely associated with developing in-house competencies and strategizing for new business opportunities both in the core hydrocarbon sector and in diversified areas of operations. She has played a key role in several new initiatives of the company in the areas of BioFuels, Digitization, Energy Efficiency, Make in India, and StartUp India and was instrumental in forging several key Collaborative Partnerships for expansion of EIL's Technology Portfolio. She has also made an immense contribution to the development of National Policies especially in the area of BioFuels and future road map for the refining and petrochemical sector.

Ms Shukla is an active member of various Industry forums like FIPI, CII, FICCI, and has served on the Editorial Board of FIPI Journal as well. She has also authored a number of research papers suggesting strategies & technical solutions to the Oil & gas industry. She is also the recipient of various prestigious national and international awards. She was the first woman executive in the Indian Oil & Gas industry to be bestowed with PETROFED Woman Executive Award. She is also a recipient of the SCOPE Excellence Award and MoPNG Innovation Award to name a few. Recently, she has been conferred with the Distinguished Alumnus Award by IIT-Kanpur in recognition of her stellar contributions in the field of Chemical Engineering and Technology.

Ms. Vartika Shukla is awarded the INAE Woman Engineer of the Year Award for the year 2021 for her outstanding contributions towards the growth of the Indian industry in general and Oil and Gas industry in particular.

INAE YOUNG ENGINEER AWARD 2021

INAE YOUNG ENGINEER AWARDEE 2021

Dr Sri Harsha Kota

Associate Professor, Department of Civil Engineering,
Indian Institute of Technology Delhi

Dr Sri Harsha Kota has made significant research contributions in the areas of air quality management and health including regional/urban air quality modelling and development affordable indoor and outdoor air purifiers. In addition to forty publications (Total citations: 1779, H-Index: 21 and I10-Index: 31), four air purification designs of Dr. Sri Harsha Kota for indoor environment, bus stops and police booths were granted by Indian Patent Office. Further a testing chamber for studying efficiency of air filters was designed and application for grant of its full patent is under review.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Puneet Kumar Patra
Assistant Professor, Department of Civil Engineering,
Indian Institute of Technology Kharagpur

Dr. Patra has devoted his academic career towards understanding the fundamental constructs of mechanics, and how they may be used to address challenges in engineering. His innovative theoretical and simulation techniques have led to an improved understanding of the material behaviour at multiple scales, and the underlying mechanisms of energy dissipation within them. His research on temperature control algorithm in molecular dynamics simulations has led to the "Patra-Bhattacharya thermostat", enabling the high-fidelity modeling of far-from-equilibrium dynamical processes that routinely take place in natural systems. Another important aspect of his work is related to the consistent evaluation of the continuum scale elastic properties of small-scale systems, and utilizing them for understanding multiscale engineering problems. By handshaking molecular dynamics simulations with the continuum scale smooth particle hydrodynamics, his research has shown that a quantitative agreement between these two methods can be achieved. He has exploited the link between dynamical systems theory and statistical thermodynamics to provide fundamental insights on – the flaws in existing simulation algorithms, the nature of rolling friction at small-scales, the role of collisions in making transport properties non-divergent, the computation of free-energy differences by means of a new steady-state fluctuation theorem, and incorporating Casimir forces in atomic scale simulations.

INAE YOUNG ENGINEER AWARDEE 2021

Mr Pankaj Malhotra

Scientist, Tata Consultancy Services

Mr Pankaj Malhotra developed robust systems and methods for i. anomaly detection, ii. diagnostics and classification, and iii. prognostics from multivariate time series of sensor data while addressing real-world challenges like lack of labeled training data, modeling inter-sensor and inter-temporal correlations across large number of sensors, handling non-stationarity, leveraging structure of equipment in designing neural networks, etc. He was granted 14 patents corresponding to 5 unique inventions across geographies such as USA, Japan, Australia, etc. in the area of prognostics, equipment health management, and time series analysis. He is primary author of one the most influential research papers on deep learning methods for anomaly detection in time series with over 1500 citations since 2015 (as per Google Scholar). He published 23 peer-reviewed research papers with over 2000 citations in the research area of Machine Learning for Predictive Maintenance, Prognostics and Health Management; Reliability Engineering, and Time Series Analysis and is primary author of the research paper that improved upon existing state-of-the-art methods for Prognostics and Health Management in 2016 beating all published benchmarks on NASA's Aircraft Engine Time-to-Failure Estimation benchmark dataset. He led the 3rd place winning team in the international annual data challenge organized by The International Prognostics and Health Management Society in 2018.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Abir De

Assistant Professor, Department of Computer Science and Engineering IIT Bombay

Sets are ubiquitous in machine learning. A wide variety of machine learning applications depend heavily on selecting and representing subsets of data points. We have designed a subset selection algorithm for efficient learning with minimal sacrifice in predictive accuracy. To do so, we provide a novel regression problem formulation which minimizes the training loss with respect to the subset of training data, while ensuring that the validation error remains below a certain threshold. We have also tackled the problem of human-in-loop learning from a subset selection viewpoint. Here, our goal is to decide which subset to outsource to humans and the rest to machines, so that human and machine working together show superior performance than what they would have achieved at an individual level. Another contribution of Dr De is node selection problem in the context of privacy preserving link prediction where, given a query node u, we aim to recommend a set of k-nodes from the potential neighbours, so that the recommendation does not leak private information to u.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Neha Khatri

Senior Scientist, Department of Manufacturing Science & Instrumentation,
CSIR-Central Scientific Instruments Organisation, Chandigarh.

Dr. Neha Khatri has made significant contributions in the areas of ultra-precision machining, specifically on diamond machining technology, and nano-finishing of precision optical components. She has a research experience of more than 10 years in the field of ultra-precision machining for various projects of societal and strategic importance. She has received many best paper awards in various international conferences, BRICS Young Scientist award for her contribution in developing ultra-precision machining protocols for optical instrumentation. Recently, she is awarded with "Raman Research Fellowship" for the year 2020-2021 to carry out Research at College of Optical Sciences, University of Arizona, Tucson, USA. Her major contributions include design and development of Silicon mirrors for focusing of X-rays, development of indigenous avionics components such as reflectors for Taxi and Landing Lights of aircrafts, diffractive optical elements for thermal imaging cameras, technologies for low-vision aid for nearly blind people as well as development of precision instrumentation towards whole slide digital microscopy for biomedical imaging. Her research outcomes have been acknowledged through high impact publications, technology transfers as well as international collaborations with reputed research groups. She is an innovative researcher with specific expertise in developing micro-machining process chains and fabrication protocols for difficult-to-cut materials. Such expertise and techniques are of immense scientific importance as they are now being used to develop indigenous optical assemblies for X-rays and avionics see-through displays.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Sourav Mondal

Assistant Professor, Department of Chemical Engineering,
Indian Institute of Technology Kharagpur

Dr Sourav Mondal is actively involved in frontier areas of Chemical Engineering with major research thrust in fluid dynamics and transport phenomena. His contribution covers both fundamental and applied research. His research work is related to membrane separation technologies, electro-hydrodynamics in microscale environment, liquid crystal hydrodynamics, viscous fingering, phase separating flows, convective heat transfer and adsorption. He has proposed fundamental mass transfer relationships for different engineering conditions in the membrane separation processes. The classical work is based on the developing mass transfer boundary layer analysis over the membrane surface and have predicted improved mass transfer coefficient compared to the film theory; theoretical models on adsorption coupled to diffusion in mixed-matrix-membrane filtration. He has made outstanding contribution in the mass transport of electro-kinetic flow in a microchannel. The enhancement in mass transport as a function of the electrical parameters is defined for the first time. He is working to control viscous fingering in porous medium for non-Newtonian fluids. From the linear stability analysis, he has predicted that maintaining a time dependent flowrate (based on the fluid rheology) the evolution of the fingering pattern can be controlled and even suppressed. This is an important contribution in the future enhanced-oil recovery techniques**.**

INAE YOUNG ENGINEER AWARDEE 2021

Mr Sri Harsha Nistala

Scientist, Tata Consultancy Services, Pune

Mr Sri Harsha Nistala is engaged in research and development in the areas of process modeling & simulation, model-based optimization, iron ore agglomeration, industrial analytics and digital twins. He developed several novel techniques for improving quality of iron ore sinter, reducing undersized sinter and recycling steel plant wastes. He contributed significantly to the development and deployment of Virtual Sinter^{TM}, a digital twin of the integrated sinter plant that combines rigorous physics-based models and ML models, and comprises of real-time plant-wide prediction, simulation and optimization modules, and novel automatic retuning capabilities for physics-based and ML models. He also made significant contributions to the development of Metafur, a digital twin of the blast furnace with real-time prediction and diagnostics capabilities w.r.t hot metal silicon. Along with his team, he developed a 1-D dynamic physics-based model and AI models for real-time fault detection and diagnosis in industrial gas turbines, and optimized settings for improving the thermal efficiency of combined cycle gas turbine power plants by ~0.4-0.6%. He also made significant contributions to InTwin^{TM}, a novel AI-based platform for development, deployment and management of industrial digital twins. His work has been successfully implemented in various steel plants and resulted in benefits on an industrial scale.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Abheejeet Mohapatra

Assistant Professor, Department of Electrical Engineering, IIT Kanpur

With the large-scale integration of the intermittent and green Renewable Energy Sources (RESs), such as Wind Farms (WFs) and solar PVs, optimizing the electric power network for its operation, protection, and control has become an arduous task. Robust optimization-based practically scalable techniques are developed to account for the RES generations and load uncertainties in the AC power network, which did not exist earlier. Reliable and quick strategies for electrical fault detection, location, classification, and islanding detection in power networks with RESs are developed. Coordinated control strategies for the optimal operation and utilization of tap changers, capacitors, storage systems, smart inverters, and controllable loads for voltage and frequency regulation in AC microgrids are proposed. Real-time approaches for accurate inertia estimation and enhancement and wind speed forecasting for WFs are further proposed for improved operation and control of the power network. No other data or approximations are required, which is generally necessary for other previous techniques. Appropriate dynamic equivalent models for WFs and synchronous generators are also developed as satisfactory approaches did not exist before this research. The developed strategies, after field implementation, indicate improved operation, protection, and control of the AC electric power network.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Manas Kumar Jena
Assistant Professor, Department of Electrical Engineering,
Indian Institute of Technology Palakkad

The research contributions of Dr. Jena resulted in the design and development of multiple software solutions which are being used to operationalize wide-area monitoring systems in the control room. The software solutions developed by Dr. Jena and his team are currently deployed in the control rooms, such as ISO-New England, American Electric Power, etc. As a subject matter expert of GE's Grid Solution team, he had also contributed to the development of an offline engineering analysis software called "*Phasoranalytics*" which was delivered to ONS-Brazil in 2019. He also contributed to the design and development of an innovative and methodological approach to prevent relay mal-operation during stressed power system conditions. Dr. Manas has authored 17 international journals and 8 international conference publications.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Manan Suri

Associate Professor, Department of Electrical Engineering,
Indian Institute of Technology Delhi

Dr. Manan Suri leads the NVM & Neuromorphic Hardware Research group at IIT Delhi. His research/engineering contributions lie in the domain of Semiconductor Non-Volatile Memory (NVM) Technology and its Advanced Applications such as- Neuromorphic & Edge-AI Hardware, Hardware Security, Memory-Centric Computing and Sensing. His engineering contributions span cross-layer starting from materials/devices to circuits, architectures, algorithms, systems, applications and performance benchmarking. He has pioneered several novel NVM circuit applications for the first-time in the global NVM & neuromorphic community. Of particular value is his work on exploitation nanodevice variability and stochasticity. He was selected by MIT Technology Review as one of the world's Top 35 Innovators under the age of 35. He received the prestigious IEEE EDS Early Career Award (2018), NASI Young Scientist Award (2017), IEI Young Engineers Award (2016) and Laureat du Prix (2014) from the French Nanosciences Foundation. Dr. Suri holds several filed and granted patents, has authored 85+ publications and successfully led 10+ sponsored research projects/consultancies as a principal investigator. Dr. Suri is the founder of IIT Delhi deep-tech start-up which has developed and successfully deployed multiple indigenized technology solutions. He also serves as an advisor to leading technology companies and government bodies of repute.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Niraj Kumar
Principal Scientist,
CSIR-Central Electronics Engineering Research Institute, Pilani,

Dr. Niraj Kumar has led the development of technologies for novel and portable “High-power Plasma-assisted sub-THz” (HP-THz) source. He is leading various national and international collaborative sponsored projects in the field of high power and compact THz source for the non-destructive testing application. He has designed and developed a novel plasma-assisted sheet electron gun, which generates high current density (> 1 kA/cm^2) without the application of any external magnetic field (Granted patent 359771). Moreover, the alignment between the electron gun and other components like beam adapter, beam-wave interaction structure, and coupler of the sub-THz source should be less than 0.1 degrees for efficient generation of sub-THz radiation. Therefore, in an innovative manner, all these components (dimensions in the order of 100’s micron) have been developed on a single vacuum grade copper plate by optimization of the micro-fabrication technique (Patent application number 202111015499). The achieved dimensional deviation is less than 7 microns, and the level of alignment between components is ~0.002 degrees. The achieved average surface roughness is less than 60 nm, which enhances the coupling efficiency of the HP-THz source. He is also a recipient of the CSIR young scientist award (2018), Raman Research Fellowship (2019), Buti (2017) and VEDA (2010) young scientist award.

INAE YOUNG ENGINEER AWARDEE 2021

Dr S Mathavaraj

Scientist – SE, U. R. Rao Satellite Center, Indian Space Research Organisation

A novel space trajectory design has been designed for India's prestigious landing mission: Chandrayaan-2, the first of its kind. These designs have been adopted during the mission, leading to the success of achieving the desired lunar orbit that passes through the landing site at sunrise time. Furthermore, a multi-phase constrained fuel-optimal trajectory has been designed for the Chandrayaan-2 lander - Vikram. Another notable contribution is the in-house development of a nonlinear robust control design for a reusable launch vehicle (RLV) during the critical re-entry phase where the margin for error is small. In addition to this, attention is also focused on India's upcoming asteroid landing missions. For handling such missions, a deep learning-based navigation approach has been proposed to achieve the crucial task of landing site detection. Apart from this, a new computationally efficient nonlinear optimal control guidance technique, named Unscented Model Predictive Static Programming has been envisaged for India's pioneering soft-landing mission on an asteroid. Another resourceful contribution is the monograph publication which comprises various nonlinear optimal control and adaptive guidance ideas to ensure precise close formation flying of satellites in presence of system non-linearities and unknown disturbances.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Samadhan Ananda Pawar

Postdoctoral Researcher, Department of Aerospace Engineering,
Indian Institute of Technology Madras

Dr. Samadhan Pawar has made significant contributions to understanding combustion dynamics and oscillatory instabilities in engineering systems by applying methodologies from nonlinear dynamics and complex systems theory. He introduced the framework of synchronization theory to investigate the coupled interaction between the acoustic and turbulent reacting fields in combustors during the onset of thermoacoustic instability. He has also developed novel mitigation strategies based on the phenomena of amplitude death and asynchronous quenching. He further devised a smart passive control to suppress thermoacoustic instabilities in gas turbine combustors and has filed a patent on it. Dr. Pawar has co-authored 26 peer-reviewed papers that are published in reputed journals, and has presented his work at 23 national/international conferences. He has co-authored a book titled “Thermoacoustic Instability: A Complex Systems Perspective” published by Springer Nature which elucidates the application of complex systems theory to understand and control thermoacoustic instability. He has been awarded the ‘ISEES Young Scientist Award 2020’ by the International Society for Energy, Environment and Sustainability and the ‘Institute Research Award’ by the Indian Institute of Technology Madras in 2018.

INAE YOUNG ENGINEER AWARDEE 2021

Dr Chandra Sekhar Tiwary

Assistant Professor, Department of Metallurgical and Materials Engineering,
Indian Institute of Technology Kharagpur

The research of Dr. Tiwary is primarily focused on developing newer class of nanostructured engineering materials that exhibit superior properties. These include newer nanostructured multiphase alloy composites based on eutectic alloys (specially intermetallics) as well as two- dimensional materials of metals and alloys. His research spans from the entire process of designing and understanding the issues to actual development of these materials. His research involves adopting 3D printing to recreate the various nature inspired structures and carrying out experiments to determine stress distribution and following it up with a finite element stress distribution modelling. He has also developed unique high energy cryo-mill that can operate at cryogenic temperatures for a long duration and is scalable. The application of this mill has led success to a major socially relevant research on recovery and recycling of e-waste. He has developed a unique 3D porous architecture by interconnecting nanomaterials like graphene and nanotubes to create materials with up to high porosity with high surface area and mechanical strength, which is utilized in energy and environment applications. He has also pioneered synthesis of 2D materials of metals and alloys (e.g. Ga, ReS2, Te, Mo-Se-Te, Mo-W-S etc) and natural ores (Hematite, Illemanite etc).

INAE YOUNG ENGINEER AWARDEE 2021

Mr Pushkar Varshney

Senior Research Manager, IndianOil Corporation Limited,
Research & Development Centre, Faridabad

Mr. Pushkar Varshney is involved in the development of various technologies and execution of several technical projects during his 12 years of service at IndianOil R&D Centre. His significant contribution is the involvement in the development and successful commercialization of Octamax® technology from Lab-to-Market. Octamax® is a 'state-of-the-art' technology developed by IndianOil R&D Centre for conversion of C4 streams from Cat Cracker to produce high-octane stream, which can be directly blended into Gasoline pool. Octamax® is a 'need-of-the-hour' technology for production of BS-VI Gasoline and to augment Gasoline volume owing to very high blending Octane (>110) of Octamax® product. This technology is the first of its kind in India. The first unit of 55 kTA capacity based on this technology was commercialized at Mathura Refinery (MR). He was involved from concept to developing the technology, preparation of Basic Design and Engineering Package (BDEP), and commissioning of Octamax® technology unit at MR. In addition to the above, he was also involved in the development of Light Naphtha Isomerization process using 'Mixed Metal Oxide' Catalyst which is under active consideration for commercialization in one of IndianOil Refinery.

INAE YOUNG INNOVATOR
&
ENTREPRENEUR AWARD 2021

INAE YOUNG INNOVATOR & ENTREPRENEUR AWARDEE 2021

Dr Chandan Kumar Jha

Post-Doctoral Fellow, Electrical Engineering, IIT Gandhinagar,
Founder, Galanto Innovations Private Limited

FBG-Glove is a highly sensitive and robust fibre-optic glove that could track hand movement with very high accuracy. The glove is able to measure fine finger movements with a resolution of 0.1° and an accuracy of less than 1°, which will enable doctors to monitor a patient's recovery and appropriately modify the treatment regimen. The glove uses fibre Bragg grating (FBG) sensors to measure finger movements that are known for reliability, accuracy, high sensitivity and immunity to electromagnetic interference (EMI). Also, calibration of the developed glove is straightforward which makes it easy to use. This is due to the remarkably linear input-output characteristics of the FBG sensor. A virtual hand rehabilitation system designed using the glove for stroke patients will be helpful in making rehabilitation programs engaging and efficient. The device could enable the quantitative assessment of recovery progress, helping doctors to assess the patient and suitably customize the therapy. Such a system could play an important role in making rehabilitation services accessible to rural and resource-poor areas. Furthermore, the glove will also find use in biomedical research studies, and the virtual reality gaming and simulation industry.

INAE YOUNG INNOVATOR & ENTREPRENEUR AWARDEE 2021

Dr Madhan Balaraman

Senior Principal Scientist, CSIR-Central Leather Research Institute, Chennai

Dr Madhan is a Young Associate of INAE and he has made important contributions towards gaining insights on the stability and stabilization of collagen leading to the development of effective/affordable biomaterials with applications in tissue engineering. Dr Madhan has contributed to 120 peer reviewed publications in international journals, 29 patents (including 16 global) and several technologies. Four of his technologies have been licensed for commercial use. India with a population of more than 70 million afflicted by diabetes, affordable collagen-based biomaterials for the treatment of chronic wounds is an important need for the country. Dr Madhan had innovated the development of collagen based composite biomaterials stabilized by biopolymers and plant polyphenols resulting in several candidate materials that are successful in management of chronic wounds. One of the patented collagen composite scaffolds developed by Dr Madhan's group was transferred to a start-up company M/s SynerHeal Pharmaceuticals in 2015. Two of Dr Madhan's PhD graduates who were associated with the development of this technology, Dr Satiesh Kumar Ramadass and Dr Sathiamurthi Perumal have been encouraged to become part of Synerheal team as technopreneurs. Dr Madhan supported the commercialization efforts, and Synerheal team led by Mr Naveed Ahmed made the products with the brand name SEESKIN and SYNERHEAL, which are available in the market from 2017-2018. These products are now being used for a wide range of wounds. Chronic wounds of several Leprosy Cured but Deformed Persons at Sri Ramakrishna Math, Chennai had been healed based on this collagen composite biomaterials technology developed. The collagen composite scaffold technology has impacted the lives of several thousands of people in making available effective and affordable collagen biomaterials, thereby averting amputations and reducing the wound/social burden of the country. Dr B Madhan is being awarded INAE Young Innovator and Entrepreneur Award 2021 for the successful development and commercialization of the Collagen Composite Scaffold that are used for the treatment of Chronic wounds.

INAE YOUNG INNOVATOR & ENTREPRENEUR AWARDEE 2021

Mr Nikhil Kurele
Nikhil Kurele, Cofounder & CEO,
Noccarc Robotics Private Limited

Mr Harshit Rathore
Harshit Rathore, Cofounder & CTO,
Noccarc Robotics Private Limited

NOCCARC V310 is a compact yet advanced ICU Ventilator that has been developed by Noccarc during the 1st wave of the pandemic with an aim to treat COVID-19 patients also having inclusive features to treat a wide range of other respiratory problems. V310 is powered by European turbine-based technology that enables it to be used without the requirement of compressed medical air. Having 14 modes of ventilation including pressure-control, volume-control & HFOT modes, V310 provides both invasive & non-invasive therapies making it a comprehensive device suitable for any ICU environment. V310 is known for its easy to use and operate design among healthcare professionals and has one of best user interface amongst the products available in the market. The inbuilt battery allows V310 to operate for up to 8 hours without external power, making it one of the highest in the segment. With its promising and high value-to-price offering, NOCCARC V310 is being appreciated and used by both government and private hospitals in India and neighbouring countries. Launched in July 2020, the ventilator has already reached an Installation base of 3000+ devices across 500+ hospitals.

INAE YOUNG INNOVATOR & ENTREPRENEUR AWARDEE 2021

Dr Sebastian C. Peter

Associate Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)
Jakkur, Bangalore

Prof. Sebastian Peter has made significant contributions to efficient synthesis of materials for a variety of applications with a special attention to Fuel Cell, CO_2 Reduction and Water Splitting. He established a global standard Carbon Capture and Utilization (CCU) facility at JNCASR for both fundamental and translational research. His work has focused on the development of cost-effective, cyclable and efficient catalytic materials that facilitate chemical reactions that are central to efficient conversion and utilization of energy and storage in the form of chemicals and fuels. Utilizing basic concepts of chemistry, he controlled the structural chemistry of materials to enhance their catalytic performance towards a selected reaction. He also developed the process engineering by establishing a special wing of chemical engineers to integrate various components (CO_2 capture, H_2 generation, CO_2 conversion and purification) into a complete economical and sustainable solution. To translate the fundamental research to commercial technology, he co-founded a start-up "Breathe Applied Sciences Pvt Ltd" with a team of Chemists, Engineers and Physicists and has successfully scaled up the conversion of CO_2 to methanol to the pilot level (300 kg CO_2/day) with an estimated cost of 12-15 RS/litre, which is much cheaper than the market price (25-35 Rs/litre).

INNOVATIVE STUDENT PROJECTS AWARD 2021

DOCTORAL LEVEL

Dr Indrasis Das

Engineering College/Institution: Indian Institute of Technology Kharagpur

Title of Thesis: For onsite treatment of blackwater to facilitate reuse of treated water and electricity generation for onsite applications.

Summary of Thesis: Decentralized microbial fuel cell (MFC) technology-based bioelectric toilet was designed and developed in this research. Bioelectric toilet can efficiently treat toilet waste and produce reusable quality treated water for toilet flushing, which can reduce 80-90% freshwater consumption. Anaerobic oxidation of organics in MFC causes charge-separation and produces electricity, which can be stored and used for night-time illumination of toilet premises. Odour problem is absent in this toilet technology because of anaerobic oxidation process does not release obnoxious gasses. To reduce the price and improve sustainability, alternative low-cost non-platinum-metal-based cathode catalysts, clay-ware-based proton exchange membrane were developed and innovative bio-electrochemical technology based field-scale reactor was designed. A mathematical model was developed to predict the performance of a field-scale MFCs. To understand the scalability, 1500 L (IIT Kharagpur) and 720 L (NTPC NETRA, Greater-Noida) wastewater treatment units of bioelectric toilets were designed and reusable quality of treated water (Chemical oxygen demand of 76 ± 12 mg/L; biochemical oxygen demand of 23 ± 6 mg/L and most probable number of coliform below 100 per 100 mL of water) was achieved. A very low-cost clay-ware-cylindrical MFC-based portable treatment unit was also designed, which caused a five-folds reduction in the cost of toilet construction.

Dr Arpita Biswas

Engineering College/Institution: Indian Institute of Science, Bangalore

Title of Thesis: Algorithms for Fair Decision Making: Provable Guarantees and Applications

Summary of Thesis: Fairness is a fundamental consideration in many applications wherein a finite set of discrete resources are required to be divided among a finite set of agents. This has led to a vast literature that spans theoretical computer science, mathematics, and microeconomics. This thesis makes foundational contributions to the theory of fair allocation by establishing that fairness is achievable for a broad class of allocation problems. The thesis establishes the universal existence of some well-studied fairness notions and provides efficient algorithms to obtain fair solutions. Further, new fairness notions are introduced, and novel theories are established. This thesis also puts forth a scale of fairness, that provides a deep understanding of the hierarchical relationship between the new and existing fairness notions. In addition, instantiations of the solution frameworks have been used for solving problems in two diverse application domains, namely recommendations and classification problems. This is a testament to the real-world applicability of the proposed theory. Moreover, these frameworks can potentially be used in more generic systems for fair decision making.

Dr Vijai Laxmi

Engineering College/Institution: Indian Institute of Technology Bombay

Title of Thesis: Design and Development of Microdevices for Platelet Rich/Poor Plasma Separation from Blood

Summary of Thesis: The objective of the thesis is to design and develop a simple, compact, and passive microdevice for platelet-rich plasma (PRP) and platelet-poor plasma (PPP) separation from blood. Both PRP and PPP find wide applications in the field of dermatology, sports medicine, and in coagulation studies. Although, centrifugation is frequently employed to extract PRP and PPP, recent advancements in the field of microfluidics place microfluidic-based separation methods in advantageous positions over the conventional ones. In this study, several microdevices were designed utilizing combined effect of biophysical phenomena, hydrodynamic forces and geometrical effects. All the microdevices were fabricated using single-layer of photolithography and soft lithography processes. Extensive experiments were performed on microdevices to study the effect of various parameters such as flow rate, initial concentration of blood cells, and microchannel geometries. One of our proposed microdevices, comprising sudden constriction-expansion, is able to separate and enrich platelets with ~15 folds enrichment at 0.4 ml/min flow rate using whole blood. In addition, the microdevice is also able to separate PPP with 94.7% purity while working with diluted blood. Later, biological evaluation of samples in terms of platelets-activation level, morphology of platelets, and total-protein content shows no adverse effect on the quality of samples post separation from the microdevice.

Dr Khushboo Suman

Engineering College/Institution: Indian Institute of Technology Kanpur

Title of Thesis: Microstructure and Viscoelasticity of Physical Gels

Summary of Thesis: The research performed in this thesis reports new concepts and findings for systems undergoing liquid-solid transition. The thesis presents the first experimental estimation of all the scaling and hyper-scaling exponents for a gel forming system, accurate prediction of the gel time, unique gel-glass transition, correlation between multiple viscoelastic properties which govern the macroscopic behaviour, development of a model to predict the deviation from linear response as well as weakly nonlinear behaviour of a critical gel and design of robust test methodologies which are closer to application scenarios. The developed theory and experimental measurement technique can be applied to numerous industrial materials, pharmaceutical products and foodstuffs undergoing sol-gel transition and highlight the physics behind their macroscopic behaviour. The knowledge of gelation time and viscoelastic properties can be extremely useful in predicting the flow behaviour and designing a variety of commercial products.

Dr Syed Shahjahan Ahmad

Engineering College/Institution: Indian Institute of Science, Bangalore

Title of Thesis: Modeling, Characterization, Control and Design of Switched Reluctance Machines

Summary of Thesis: The thesis contributes to switched reluctance machine (SRM) construction, modeling, novel characterization method, current control for low-speed operation, optimal single-pulse control for high-speed operation, power converter for SRM and characterization of prospective magnetic materials for high-speed SRM. The thesis effectively addresses magnetic nonlinearity and double-saliency of SRM to arrive at simple models to evaluate back-emf, besides prediction and control of current, torque and speed. A novel constant current injection-based characterization method is proposed for SRM without requirement of rotor blocking. Relation between output current and control input of single-pulse-operated switched reluctance generator (SRG) is derived and voltage build-up condition is established. Incremental changes in output and control input of SRG is analyzed, and a real-time optimal angle control strategy is proposed which does not require stored machine characteristics. SiC devices based 50 kHz, 800 Vdc, 50 Arms power converter (asymmetric H-bridge) is developed for 20 kW 3-phase SRM, incorporating a new fast short-circuit protection technique. A multi-stage, direct-coupled, low-output-offset, precision power amplifier (70 Vpk, 10 Apk, DC-5 kHz) is developed for magnetic material characterization. One 10000-rpm air-cooled and another 30000-rpm liquid-cooled SRM prototypes are designed and fabricated. Solid- and slitted-rotor SRM for high-speed and/or high-temperature applications are fabricated and investigated.

Dr Sanghamitra Ghosal

Engineering College/Institution: Indian Institute of Engineering Science and Technology Shibpur

Title of Thesis: Ternary Hybrid Junctions of Semiconducting Oxide Nanostructures, Reduced Graphene Oxide and Noble Metal for Improved Gas Sensor Device Applications

Summary of Thesis: Pristine nanostructures of semiconducting metal oxides (SMO – e.g TiO_2-NTs/MnO_2-NFs/WO_3-NFs) failed to address the mutually competing and sometimes conflicting requirements for developing room temperature low concentration alcohol sensor with fast response kinetics and high sensitivity. To mitigate this problem, surface engineering using reduced graphene oxide (RGO) or noble metal (Pd) were tried individually to form binary hybrid sensing layer. The present endeavour aims to unify the advantages of nanostructure semiconducting oxide, RGO and Pd for creation of a ternary hybrid sensing layer to bringforth synergistic advantages mitigating the problems of commercially available alcohol sensor devices. The oxide nanostructure plays the role of basic sensing matrix where due to extremely high surface to volume ratio, increases the response magnitude (%RM ~ 92-97%) of the sensor. RGO acts on a high mobility distributed connector among the neighbouring nanostructure leading towards improved response (~ 12-26s) or recovery kinetics (~ 23-40s). Pd nanoparticle due to their catalytic activity, bringforth substantial reduction in operating temperature (~27°C - 50°C). As the future outlook, the sensor might be used in health care sector to determine the etiology of fatty liver or liver cirrhosis and also in the sector of food quality monitoring.

Dr Syed Idrees Afzal Jalali

Engineering College/Institution: Indian Institute of Science, Bangalore

Title of Thesis: Evaluation of Power-Law Creep in Bending

Summary of Thesis:

- A *tenfold benefit* in terms of *time of testing*, *capital and running cost* and *sample volume* was established in this new creep testing method.

- A high throughput creep characterization (in primary and secondary creep) from a *single sample* and *single test* with unambiguous correlation with uniaxial creep was established.

- A unique feasibility of obtaining bulk and size effect characterizationa from a *single sample* and *single test* was demonstrated.

- This testing method can be performed on conventional creep setups with a minimal modification.

- Revitalization of a 90-year-old technique by adaptation of digital image correlation concurrent to bending test was demonstrated.

- Bending creep was established as a reliable high throughput creep testing method that has huge application in curtail engineering sections like aerospace, land-based power generation and outer space industry to name a few.

Dr Parvaiz Ahmad Shiekh

Engineering College/Institution: Indian Institute of Technology Kanpur

Title of Thesis: Engineering Bioinspired Polyurethane Scaffolds to Attenuate Oxidative Stress and Hypoxia for Cardiac and Dermal Tissue Regeneration

Summary of Thesis: Dr. Parvaiz worked on the exciting subject of translational medicine which is considered to be the future of biomedical research. He started synthesizing antioxidant and oxygen releasing polymeric materials for targeting oxidative stress and hypoxia in various human diseases and unravel their behavioural mechanisms under in-vitro and in-vivo conditions. Taking forward, he used this antioxidant polyurethane to develop oxygen releasing antioxidant implants and proposed their application in the treatment and regeneration of various diseases such as diabetic foot ulcers, cardiovascular diseases, myocardial infarction, nerve and bone injuries. Dr Parvaiz, in collaboration with other researchers in the lab and around the country developed novel therapeutic and regenerative scaffolds for diabetic foot ulcers and myocardial infarction. He further developed an oxygen releasing antioxidant wound dressing "OxOBand" for treatment and management of diabetic wound ulcers. This patented technology/product enhanced wound closure with development of mature epithelial structures in regenerated skin tissue, a remarkable outcome in chronic diabetic animal ulcer model. Another important invention carried out by Dr. Parvaiz was development of a bilayered oxygen releasing cardiac patch for treatment of myocardial infarction. This advanced therapy showed promising effect in pre-clinical animal models. The invention has also been patented. Both the therapeutic approaches have high translational potential and are being further evaluated in preclinical and clinic trials. These technologies offer promising potential for their clinical translation in next decade.

INNOVATIVE STUDENT PROJECTS AWARD 2021

MASTER'S LEVEL

Ms Vasamsetti Sri Harika

Engineering College/Institution: Jawaharlal Nehru Technological University Kakinada

Title of Thesis: Health Monitoring of Structures under Ambient and Vehicle Excitations.

Summary of Thesis: Structural health monitoring (SHM) is the process of implementing a damage detection strategy for engineering structures, identifying the remaining useful life of the structure, and also helping in saving human lives from catastrophic failures. Mobile Sensor Technology has become a viable, low-cost, effective, and rapid bridge condition screening and inspection alternative to (SHM) approaches with static high-fidelity sensing. Both the re-deployable sensing and drive-by monitoring of mobile sensor technology eliminate the overheads associated with the traditional SHM in terms of installation of large numbers of sensors and on-site maintenance of equipment on the bridge. The re-deployable sensing-based monitoring involves repositioning mobile sensors (very limited sensors, say minimum of two sensors) in a series of static configurations by progressively moving along the target bridge independent of vehicle loading and time. An enhanced damage diagnostic technique using the fractal dimensional analysis of mode shapes estimated from re-deployable mobile sensor system is proposed towards direct SHM of bridges subjected to both ambient and vehicle excitations. The drive-by bridge monitoring methods are found to be successful in extracting dynamic properties of the bridge (including damage if any) from the vibration response of the vehicle. An inspection vehicle designed with a vehicle frequency beyond the interested bridge frequencies to be extracted and recommendation of low vehicle speed, high vehicle damping is concluded from detailed theoretical and numerical vehicle bridge interaction studies in this thesis to capture significant dynamics of the bridge. A robust Wavelet packet decomposition approach is proposed for damage identification of bridges using moving inspection vehicle response/single vehicle sensor computation.

Ms Tapadyoti Banerjee

Engineering College/Institution: Indian Institute of Technology Kharagpur

Title of Thesis: Design the Authenticated Encryption scheme by exploiting the randomness property of the Cellular Automata

Summary of Thesis: The thesis studies the Authenticated Encryption (AE) schemes based on Cellular Automata (CA). The main contribution of this thesis is to construct an AE scheme, where both the encryption and authentication have been performed by exploiting the randomness property of the CA. Concerning the present scenario, AES-GCM is considered to be the most efficient NIST standard high-throughput AE mode, although, the winners of the CAESAR competition (Competition for Authenticated Encryption: Security, Applicability, and Robustness) reflect a significant role in the world of authenticated encryption. But researchers have pointed out multiple security issues of this established AES-GCM scheme. We explore whether CA can be a better cryptographic primitive to overcome some of these flaws. As a result, we have proposed RACE, Randomized Counter Mode of Authenticated Encryption using Cellular Automata. In general, hash-based authentication plays a vital role in the authentication. To increase the security strength of the authentication function, we have explored the domain of the double-block-length hash function. Finally, we successfully intersect this domain with the CA-based hash design and introduce NCASH, Non-linear CA-based Hash function. The main achievements are that it produces a 2n-bit length hash value from the n-bit length key, whereas most of the double-block-length hash functions use a 2n-bit length key for n-length block ciphers, which is quite expensive. And the comparative studies show that our design gains better security than most of the existing related works. Moreover, the implementation results on the FPGA platform show the feasibility of practical applications. Finally, we propose the scheme EnCash, which offers a new CA-based cost-effective design structure, both for encryption and authentication.

Mr Sampad Laha

Engineering College/Institution: Indian Institute of Technology Kharagpur

Title of Thesis: The Dynamics of Blood on Paper Matrix and its Implication in Point of Care Diagnostics

Summary of Thesis: In this thesis, the complex dynamics of blood on paper platform has been primarily explored. At first, experimental investigations on blood imbibition through dry filter paper, have been performed using blood of different hematocrit levels. Despite an intuitive dependence of blood dynamics on hematocrit level, the experimental results, indicate that the diffusivity of blood through paper bears a universal signature irrespective of its hematological constituents. Next, in order to extract specific hematological information from wicking patterns, blood diffusion studies have been carried out through paper pre-wetted with glycerol. Due to viscosity difference between glycerol and blood, fingering instability develops at the interface of the two liquids and the degree of fingering, characterized by its fractal dimension value, is found to exhibit an exclusive one-to-one mapping with the hematocrit fraction of blood. Based on the fractal dimension values of blood patterns, different ranges of hematocrit have been identified bearing direct clinical significance to the different severity levels of anemia. The image analysis and detection algorithms have been implemented within a smartphone device, leading to the development of a low-cost, user-friendly, point-of-care platform for timely screening of anemia in resource-poor settings where it is practically impossible to deploy sophisticated diagnostic facilities.

Ms Lubna Muzamil Rehman

Engineering College/Institution: Birla Institute of Technology and Science-Pilani, K.K Birla Goa Campus, Goa

Title of Thesis: Understanding the Thermodynamics of Salt-water systems.

Summary of Thesis: The global requirement for clean water for drinking and irrigation purposes has significantly increased over the past few decades. In this study, hypersaline solutions with salinity up to 100g/kg have been studied for desalination and energy generation applications.

1. An analysis of thermo-acoustical properties using ultrasonic velocity, resulted in the understanding of various interactions occurring in hypersaline solutions. A critical analysis of Intermolecular free length, free volume, relaxation time, B/A Non-linearity factor, and internal pressure was done. Some crucial questions such as the reason behind an average value of 35 g/kg seawater salinity have been answered in this study.
2. Novel correlations for the determination of Osmotic, Internal and Vapor Pressure as a function of ultrasonic velocity have been developed for the first time.
3. A comprehensive framework which simplified the approach for an engineer to make an informed choice between Desalination and Salinity-Gradient power technologies based on ultrasonic velocity alone, was developed.
4. Highly selective novel Polysulfone Thin Film Composite Hollow fiber membranes for desalination of hypersaline solutions and WEN applications have been fabricated.
5. Novel Thermo-Osmotic Energy Conversion (TOEC) technologies, have been explored using fabricated patented novel PSF+TFC HF membranes.

Ms Jashaswini Bhuyan

Engineering College/Institution: Indian Institute of Technology Bhubaneswar

Title of Thesis: Performance Analysis and Optimization of Receive Diversity PLC system with imperfect CSI in Nakagami-m noise environment

Summary of Thesis: The thesis considers the statistical analysis of the receive diversity-based PLC channels. In the thesis, the author employs Minimum Mean Square Error method for the channel estimation of both correlated and uncorrelated PLC systems corrupted by Nakagami-*m* background noise for M-ary phase shift keying modulated data symbols, to obtain the channel gain vectors, which has not been carried out in the prevalent literature. The closed form expressions of the symbol error probability are obtained using the characteristic function approach. The work utilizes the relationship between the symbol error probability and data rate of the PLC system with imperfect channel state information to obtain the optimal pilot symbol duration fraction which maximizes the data rate along with the minimization of the symbol error probability. Thus, the analysis results in optimized system performance. The numerical results manifest that by operating the system below the tolerable system error probability and at lower values of *m,* the system can be operated at lower pilot signal to noise ratio thereby saving pilot symbol power and thus providing design insights.

Ms Shruti Tandon

Engineering College/Institution: Indian Institute of Technology Madras

Title of Thesis: Investigating the intermittency route of chaos to order transition in laminar and turbulent thermoacoustic systems

Summary of Thesis: Combustion engines exhibit complex dynamics. The combustor dynamics transitions from low-amplitude chaos during combustion noise to ruinously high-amplitude periodic oscillations (order) referred to as thermoacoustic instability via the route of intermittency in disparate thermoacoustic systems. We develop a phenomenological model to explain the cause and features of intermittent bursting in laminar and turbulent thermoacoustic systems. We propose that the interaction of slow-fast timescale oscillations is responsible of intermittent bursting behaviour prior to the onset of thermoacoustic instability in low-turbulence systems. In high-turbulence systems, the features of bursting are dictated by the underlying turbulence that dominate the slow-fast effects. Further, the emergence of order from chaos is a well-known phenomenon in turbulent thermoacoustic systems which is conventionally studied using dynamical systems theory. We proposed that such a transition from chaotic to periodic (ordered) dynamics can be viewed as a phase transition which is similar to Bose-Einstein condensation of the trajectory in the phase space. This new perspective facilitates cross-fertilization of tools and concepts from quantum statistical physics to analyse chaos-to-order transition in classical turbulent systems. We employ complex networks to deduce the topological transformations in the phase space and propose reliable early warning indicators to identify the onset of oscillatory dynamics.

Mr Nampelly Ganesh

Engineering College/Institution: Indian Institute of Technology Madras

Title of Thesis: Eddy Resolving Simulations of Cavity Flows

Summary of Thesis: In this thesis, we have performed a series of eddy-resolving simulations of open cavity flows. Initially, our in-house solver COMPSQUARE is ported onto multiple GPUs. As a result, the converged statistics (Mean flow and Reynolds stresses) for the cavity consisting of 40 million grid points are obtained within 24 hours on 2 V100 GPU cards. The results are validated against the experiments. The predictions are in favourable agreement with the measurements in the downstream portion of the cavity. However, discrepancies are observed in the initial evolution of the shear layer due to turbulent fluctuations. Hence, the code has been modified to introduce the FST ahead of the cavity. Furthermore, hemispherical roughness elements are used as a passive flow control technique to reduce the noise radiated from cavities. Boundary data immersion method (BDIM) algorithm is extended to handle multiple roughness elements. A maximum reduction of 12dB noise is observed in the presence of roughness. Densely packed roughness elements are found to be much more effective in suppressing the noise than the sparsely spaced roughness. A plasma actuation model, an active flow control method is coded parallelized on GPUs to minimize the computational cost. The plasma model is validated and demonstrated the effect of plasma on cavity flow.

INNOVATIVE STUDENT PROJECTS AWARD 2021

BACHELOR'S LEVEL

Mr Love Kush Tak

Engineering College/Institution: Indian Institute of Technology Bombay

Title of the Project: Calorific value determination of Reject Fractions from Mechanical Biological Treatment Plant

Summary of project: The project initially started with determining the CV of reject fractions obtained after treating Municipal Solid Waste in the MBT plant of Kanjurmarg Landfill. The reject fractions were segregated into five categories, i.e., plastics, cardboard and paper, food and yard waste, textiles, fine materials, and inorganic stones and metals. The reason for knowing their calorific value is to see if they can be used instead of standard fuels such as coal in industries. Bomb calorimeter was used to determine their calorific value for experiments. It has a maximum sample capacity of 10cc, which was not enough to make a representative sample. So, there was a need to increase the sample size capacity to test the samples. To solve it, we designed a new setup, CalVaDet (A Setup for ***Cal***orific ***Va***lue ***Det***ermination of Heterogeneous Geomaterials). It has a sample size of 100cc, and the design has been filed for a patent and is in the process of fabrication. Fractions like fine materials have a very low CV, making it difficult to measure it in a conventional bomb calorimeter. The ratio of sample volume to the volume of water has been increased in CalVaDet, making it feasible to determine the CV of such materials. This instrument allows to measure CV for heterogeneous geomaterials and can be easily set up in the lab.

Mr Aditya Chetan **Ms Brihi Joshi**

Engineering College/Institution: Indraprastha Institute of Information Technology, Delhi

Title of the Project: Understanding Adversarial Collusive Activities in Online Social Networks

Summary of project: Social platforms like Twitter, Reddit, etc., are fast becoming mainstream platforms for advertisement, brand promotion, and high-risk applications such as disaster management. The number of retweets/upvotes garnered heavily influences content diffusion on these platforms. Hence, detecting users who might be using inorganic ways to gain retweets is imperative. A prominent way in which users do this is by bartering appraisal (eg. 'Likes', 'Retweets', etc.) between themselves (a type of a ‘give and take’ relationship). Such users are termed Collusive Users, and the activity is called Collusion. Collusion is enabled through Blackmarket services, which are web-based portals that provide a platform for colluders to connect and barter appraisal. We propose an unsupervised method for collusive retweeter detection on Twitter called CoReRank. We model interactions between users and tweets through retweets as a directed bipartite graph, and capture the interdependency between the credibility of users and the merit of tweets via a set of axioms. Further, recurrence formulations combine the graph, behavioural information and topical diversity of the content present in the tweets to obtain the final rankings of users. We also propose CoReRank+, for semi-supervised settings (when some labelled data are available). We theoretically show that CoReRank is guaranteed to converge in a finite number of iterations, and scales linearly with the number of edges present in the graph. This work was also accepted at a top-tier international conference (ACM International Conference on Web Search and Data Mining - WSDM) and journal (ACM Transactions on Intelligent Systems and Technology - TIST).

Mr Ashwin Agrawal **Mr Rohan Katkar** **Mr Suyash Dadmal**

Engineering College/Institution: College of Engineering, Pune

Title of the Project: Design and Development of agricultural harvester mechanism for bulbous crops like onions.

Summary of project: The project relates generally to the field of farm harvesting machines for bulbous crops such as onions, and more particularly to a harvesting mechanism suitable for multi-row raised-bed crop patterns (Bed furrow bed method). The design of the harvesting mechanism is a mechanized solution analogous to hand-picking which is accomplished by belt and pulley arrangement. An attempt has been made to design the harvester for the low power capacity tractors range. The size of the harvester has been decided with respect to the agro-technical features of the crop. This mechanism eliminates the problems faced in existing designs such as damage to the bulbs, inability to adapt to dense cropping patterns, complexity, cost, and delivers comparatively higher efficiency. Further, this harvesting mechanism can be used either as an attachment to the tractor or can be self-propelled as required. The goal behind this project was to provide Indian farmers with a frugal and effective solution that will help them in reducing the harvesting cost which otherwise in case of manual harvesting method is increasing every day because of increasing labour scarcity. Also, we wanted to encourage Indian farmers to practice the raised bed plantation as this plantation has proved to increase yield and water productivity.

Mr Merul Ritesh Shah

Engineering College/Institution: Institute of Chemical Technology, Mumbai

Title of the Project: Design of a brine preparation unit to manufacture 2000 TPD of soda ash using sea water as raw Material.

Summary of project: Soda Ash manufacturing through Solvay Process requires Brine as raw material in large quantities. The current popular process to produce brine from seawater using Reverse Osmosis has several disadvantages. Primary disadvantage is that since it is a non-spontaneous process, it is energy intensive and requires high pressure pump. To support these high-pressure pumps, heavy duty steel is required which increases overall project cost. To overcome these challenges, we need to look out for new innovative processes like Forward Osmosis. Mechanism of Forward Osmosis is well established, however its usage in Brine Production is relatively new. By using seawater as feed and saturated salt solution as draw, we can transfer freshwater spontaneously to dilute the draw. This draw can then be re-saturated through salt dissolver and most of it can be sent as product. The remaining part can be sent back into FO member module as draw. In this way, through recycle loop, we carry out continuous extraction of pure water directly into starting material. By optimizing Feed to Draw ratio, we can achieve flux which is comparable to Reverse Osmosis. In terms of applications, it can also be used for offshore oil recovery, fertilizer solutions and refined products through recrystallization.

Ms Sakshi Sushant Naik

Engineering College/Institution: Indian Institute of Technology Hyderabad

Title of the Project: Novel strategies in Automated & Physics-driven Deep Learning for Real-time Optimal design of Cascaded Industrial Crystallizers.

Summary of project: This project aimed to develop data-driven solutions for performing multi-objective optimization of industrial crystallization system to accomplish the task in real-time, which is crucial in pharmaceuticals and fine chemicals industries. The crystallization process includes complex phenomena such as crystal breakage which leads to a system of integro- partial differential equations which are extremely time-consuming to solve, making the online optimization of the process challenging. Physics-Inspired Neural Networks (PINNs), Deep feedforward Neural Networks (DNNs) and Support Vector Machines (SVMs) were critically studied and considered to build data driven surrogates owing to their immense popularity, scalability and incredible functionality. To overcome the problem of heuristic-based design of deep learning models, we worked towards development of a novel neural architecture search algorithm and training sample size estimation algorithm based on PINN, DNN and SVR. The surrogate assisted multi-objective optimization was then performed using evolutionary algorithms resulting in sixty-eight-fold speed improvement than the conventional method, thus making the multi-objective optimization of complex crystallization process feasible in real-time. The generic algorithms developed demonstrate significant scope of scale-up and commercialization in parallel computing frameworks to perform real-time nonlinear control and optimization in deterministic and stochastic environments.

Mr Ishank Shekhar

Engineering College/Institution: Indian Institute of Space Science and Technology, Thiruvananthapuram

Title of the Project: Generation of 24-Sided Polygonal Voltage Space Vector Structure with Reduced Hardware Complexity.

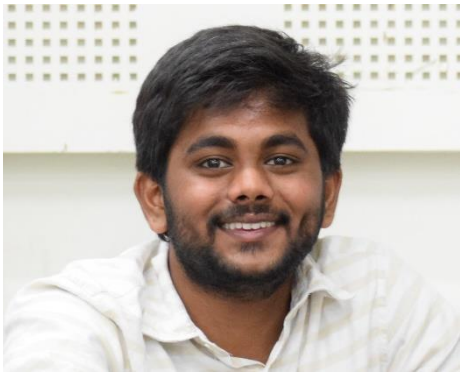
Summary of project: A new scheme for generation of 24-sided polygonal voltage space vector structure (VSVS) using virtual vectors generated through switched averaging of hexagonal VSVS in dual inverter fed open-end winding induction motor drive is proposed in this project. The proposed scheme heavily suppresses low order harmonics in the motor voltage compared to the six-step operation in conventional hexagonal VSVS based switching in the over-modulation region of operation of the drive required at higher speeds. Conventional ways of generating 24- sided polygonal VSVS used six capacitors (with their voltage controller circuits) and thirty switches. The hardware complexity was reduced in two stages. By using induction motor with open end stator winding configuration the number of switches was reduced from 30 to 24, while maintaining harmonic performance almost at the same level and paved way for further reduction in hardware complexity in subsequent steps. Further reduction in hardware complexity was obtained by a new scheme using two virtual dodecagonal VSVS to generate 24-sided polygonal VSVS in dual inverter fed open-end winding induction motor configuration, needing just twelve switches and two isolated DC sources. Finally, 24-sided polygonal voltage space vector-based switching scheme was developed for dual inverter fed open-end winding drive fed from a single DC source. This new scheme also reduced the dc link voltage requirement by almost 40% and kept the common mode current to zero. The proposed scheme was experimentally verified on a laboratory prototype. The experimental results validated the theoretical concepts developed in this project and established the capability of the proposed scheme in suppression of low order harmonics that causes torque pulsation in motors.

Mr Shashank Tomar

Engineering College/Institution: Indian Institute of Space Science and Technology, Thiruvananthapuram

Title of the Project: Launch Vehicle Landing Trajectory Optimisation.

Summary of project: Landing trajectory optimisation of rocket first stage (Modelled after the SpaceX Falcon 9) was carried out using global/adaptive pseudospectral methods. Accuracy and spectral convergence of existing methods were analyzed and a new multi-objective integral residual error minimisation method (which used goal attainment optimisation) was proposed to increase the accuracy and reliability of existing pseudospectral methods. The final trajectory optimisation framework developed was found to be robust to changes in initial guess, boundary conditions and control bounds. Existing research on pseudospectral methods does not extensively discuss the error on integrating the system dynamics. This study looks at the error as a sum of error due to RK-4 integration and ODE defect at non-collocation points. A novel weighted objective function was introduced to improve the efficacy of the residual error minimisation method proposed in existing literature. Incorporation of nozzle gimballing and rocket's inertia in the modelling process enhanced the efficacy of the point mass model. Additionally, pk-adaptive pseudospectral method was investigated for the rocket landing problem. The code developed can be used for a myriad of applications, such as drone guidance, robotic locomotion, UAV path planning and limb motion planning for handicapped people that require fast, efficient and reliable trajectory generation.



Mr Sontam Govardhan Reddy

Engineering College/Institution: Indian Institute of Technology Hyderabad

Title of the Project: Dynamic modulation of light using plasmonic nanostructures on elastomeric PDMS substrates

Summary of project: Nanostructures supporting localized plasmon resonances (LPR) can be used for controlling the properties of light like intensity and phase. In the current project, plasmonic nanostructures on PDMS elastomeric substrates were developed to mechanically control the coupling between two plasmonic resonances, thereby paving the way for dynamic control of optical radiation. Initially, numerical simulations were carried out to understand the effect of various structural parameters like island size, periodicity, and strain on the optical response of the island film using COMSOL Multiphysics. Subsequently, gold islands were prepared by solid state de-wetting technique on the PDMS substrates. The sample is then uniaxially stretched along one axis, to change the plasmon resonance wavelength, by changing periodicity of gold nanoparticles. I observed that the measured transmission spectra show a blue shift at increasing strains, when the polarization of light is along the stretching direction (called as X polarized light). This is because the nanoparticles move further apart from each other along the stretch axis, with increasing strain. Similarly, the transmission spectra show a red shift when the light is polarized normal to stretch direction, at increasing strains (called as Y polarized light). In addition to shift in resonance wavelength, there is change in intensity of the light, these helps in developing flexibles devices with dynamic control.

INAE YOUTH CONCLAVE COMPETITION AWARDS 2021

INAE YOUTH CONCLAVE COMPETITION AWARDEES 2021

Theme I: Waste to Wealth:

1st Prize: - Mr Samarth Chakankar, Mr Rohan Sinha, Mr Giridhar Sharma from Vellore Institute of Technology, Vellore

2nd Prize: - Mr Aarya Sanjaykumar Shah, Mr Saiyed Shahid Hussain, Mr Preet Patel from Parul Institute of Technology

3rd Prize: - Ms Ruhika Bulani, Ms Astha Jain, Ms Meghna Nakhate from D.Y Patil College of Engineering, Akurdi,

Theme II: Digitization and Revolution in Logistics:

1st Prize: - Ms N. Malathy, Ms S Nithya Kalyani, Ms S Preethi from KCG College of Technology

2nd Prize: - Mr Moneshk Rai Bajaj, Mr Shubham Parmar, Ms Tanishka Gupta from Lakshmi Narain College of Technology, Bhopal, Madhya Pradesh

3rd Prize: - Ms Shruti Panpaliya, Ms Riya Patel, Ms Rajvi Shastri from Sarvajanik College of Engineering and Technology

Theme III: Engineering Intervention to fight against COVID-19 and Healthcare Management:

1st Prize: - Mr Nallam Prem Kishan, Mr BV Vardhan Reddy, Mr M Sri Pritham from Amrita Vishwa Vidyapeetham, Chennai

2nd Prize: - Ms Sri Roopa, Mr Srikesharam B, Mr Sreyan Kumar S from St. Joseph's College of Engineering

3rd Prize: - Mr Maheshwaran P, Mr Jayasurya J, Mr Rithish M from PSG College of Technology, Coimbatore

Theme IV: Teaching and Learning in Pandemic:

1st Prize: - Ms Dharani Manne, Ms Bhavana Rajaputana, Ms Harika Mahalakshmi S from St. Joseph's College of Engineering, Chennai

2nd Prize: - Mr Saurav Kumar Pandey, Mr Prasad Choulwar, Ms Astha Pankaj Kashyap from GH Raisoni Institute of Engineering & Technology, Pune

3rd Prize: - Mr Jinit Sanghvi, Mr Swebert Correa, Mr Aayush Yadav from College of Engineering, Pune

Session on 'Azadi ka Amrit Mahotsav'

1st Prize: - Ms Jyoti Ratna Shree from National Institute of Fashion Technology, New Delhi, Mr Mayank Kanubhai Patel and Mr Shubham Khatri from Indian Institute of Technology Kanpur

INNOVATION IN MANUFACTURING PROCESSES (IMP- 2021)

INNOVATION IN MANUFACTURING PROCESSES (IMP-2021) WINNERS

- **UG Category:**
  - First Prize: Nitheesh P, Surya Bharath for “Natural fiber extraction Machine for Sustainable Development (Pineapple Fiber)” (affiliation: KCG College of Engineering, Chennai)
  - Second Prize: Mohammed Safi A for “An Autonomous Drowning Rescue System (One's SEGAIN)” (affiliation: Sri Venkateshwara College of Engg, Sriperumbudur)
- **PG Category:**
  - First Prize: Mayank Kanubhai Patel for “Novel Approach for 3D printing of High Strength Al7075 alloys” (affiliation: IIT Kanpur)
  - Second Prize: Prashanth M, Nayana Kumari JR, Chaithra D for “Development of low cost falling weight deflectometer” (affiliation: M S Ramaiah University of Applied Science, Bengaluru)
- **Startup Category:**
  - First Prize: Refaz Ahmad Wani, Shugufta Akhter, Ishfaq Ahmad Wani for “Spade and Hoe” (affiliation: Wani Agri Tools Plant, Anantnag, J&K)
  - Second Prize: R Sai Chandra Teja, C Krishna Mohan, C Vishnu for “State-of-the-art Multi-class Wafer Defect Detection & Segmentation in Semiconductor Manufacturing” (affiliation: CKM Vigil Pvt Ltd, Hyderabad)

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