National Initiatives on Innovation and Entrepreneurship

Research Scholars Day 2019

Rajendra Mishra School of Engineering Entrepreneurship
IIT Kharagpur

Guru Mantra

Guru Brahma Gurur Vishnu Guru Devo Maheshwaraha,

Guru Saakshat Para Brahma Tasmai Sree Gurave Namaha .

गुरुर ब्रह्मा गुरुर विष्णु , गुरुर देवो महेश्वरः ।

गुरुर साक्षात परम ब्रह्म , तस्मै श्री गुरुवे नमः ।।

Akhanda Mandalaakaaram Vyaaptam Yenam charaacharam,

Tatpadam Darshitam YenaTasmai Sri Gurave Namaha .

अखंड मण्डलाकारम् व्याप्तम् येनम् चराचरम् ।

तत्पद्म दर्शितम येना तस्मै श्री गुरवे नमः।।

Agnyaana TimiraandhasyaGnyaana Anjana Shalaakayaa,

Chakshuhu Unmeelitam YenamTasmai Sri Gurave Namaha.

अज्ञेय तिमिरंधास्यज्ञानाय अंजना शलाकाय ।

चक्षुहु उन्मिलितम् येनम् तस्मै श्री गुरवे नमः द्वितीय ।।

From Director's Desk

भारतीय प्रौद्योगिकी संस्थान खड़गपुर
खड़गपुर-७२१ ३०२
Indian Institute of Technology Kharagpur
Kharagpur-721 302

प्रोफेसर पार्थ पी. चक्रवर्ती एफएनए, एकएएससी, एकएनएई
निदेशक
Prof. Partha P. Chakrabarti , FNA, FASc, FNAE
J.C. Bose Fellow
Director
Professor, Department of Computer Science & Engineering

January 07, 2019

Message

It gives me an immense pleasure to note that Rajendra Mishra School of Engineering Entrepreneurship, IIT Kharagpur is celebrating its Research Scholars' Day. I am pleased to see that souvenir is being published on this occasion. This endeavour would facilitate knowledge sharing and discussion for creating an indispensable link between academic and practical aspects of entrepreneurship.

Being front runner in technology education and research in India, IIT Kharagpur is dedicated to take the technology education and research to the world in a sustainable and inclusive manner. I am sure the deliberations held will immeasurably help the various professionals who will participate in it. I wish the organisers and the participants a grand success. The research work and discussion in this direction would be a catalyst for attaining the goal of alleviating societal problems through technological and managerial intervention.

I congratulate the School for providing a platform for exchange of ideas through this celebration. I have no doubt that the ideas evolved during this event will provide better insights for setting future research directions and applications in real scenarios. I am sure this will be a milestone in ensuring the highest standards in this profession. The galaxy of expert present will enormously benefit young researchers.

I wish the Research Scholars' Day a great success.

Partha P. Chakrabarti

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From Dean's Desk

भारतीय प्रौद्योगिकी संस्थान खड़गपुर
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Indian Institute of Technology Kharagpur
Kharagpur-721 302,India

Dr. P. K. Das, FNAE, FNASc
Dean, Postgraduate Studies and Research
Professor, Department of Mechanical Engineering

Message

Date: January 4, 2019

I am extremely glad to note that Rajendra Mishra School of Engineering Entrepreneurship, IIT Kharagpur is organizing Research Scholar Day on January 23, 2019 and that a souvenir is being published on this occasion.

It is of great significance that this event is going to be thoughtful upon several important topics, exploring various areas in national initiatives on innovation and entrepreneurship as the theme suggests. No doubt that this year too, the day will be observed with equal enthusiasm and zeal by students who would take this opportunity to demonstrate their latest findings and to exchange ideas of research, development and knowledge among the different research groups.

I congratulate them all for their effort and wish for the event a grand success.

Prasanta Kumar Das

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From Chief Guest's Desk

डॉ. डब्ल्यु.आर. रेड्डी,आई ए एस
महानिदेशक

Dr. W.R. Reddy, IAS
Director General

राष्ट्रीय ग्रामीण विकास एवं पंचायती राज संस्थान
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NATIONAL INSTITUTE OF RURAL DEVELOPMENT & PANCHAYATI RAJ
(Ministry of Rural Development, Government of India)
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MESSAGE

I am happy to note that the Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE) of Indian Institute of Technology, Kharagpur is organizing Research Scholars' Day 2019 to celebrate its 6th year of excellence in the field of Research.

In addition, the theme of the event i.e. "National Initiatives on Innovation and Entrepreneurship" have aptly been selected to envisage solutions of existing problems of society using technology.

Research Scholars are often seen as the individuals with skills and expertise in the field of their interest. They are expected to contribute to the arena of nation building through their quality research work.

I hope Research Scholars of RMSoEE will come up with many such prominent researches in the field of engineering and entrepreneurship in coming days to justify the eminence of IIT Kharagpur.

I wish all the very best to the Scholars and their supervisors for their future endeavors.

Dr. W. R Reddy, IAS
Director General, NIRDPR, Hyderabad

From STEP Managing Director's Desk

भारतीय प्रौद्योगिकी संस्थान खड़गपुर
खड़गपुर - ७२१ ३०२, भारत
Indian Institute of Technology Kharagpur
Kharagpur - 721 302, India

Prof. Satyahari Dey
Professor, Dept. of Biotechnology
Professor-in-charge, Incubation and Entrepreneurship Programs, S.R.I.C
Managing Director, Science & Technology Entrepreneurs' Park
Indian Institute of Technology, Kharagpur

MESSAGE

It gives me great pleasure to note that the Rajendra Mishra School of Engineering Entrepreneurship, IIT Kharagpur is celebrating their 6th Research Scholars' Day on 23rd of January, 2019. In tune with the revolution started by our Honourable Prime Minister that promises to bring remarkable entrepreneurial growth in all industrial sectors this year, the school is upholdingresearch and entrepreneurial aspects based on the theme "National Initiatives on Innovation and Entrepreneurship".

RMSoEE caters to the entrepreneurial need of students' keen in progressing their careers through start-ups. The School inducts students from multifarious domains giving them the freedom to explore and work in their niche areas of interest.

The research scholars should work with enthusiasm to evolve R&D programs for Invention, Innovation and Translation that will add further significance to the glorified name of IIT Kharagpur.

My best wishes for the endeavour!

Prof.SatyahariDey
Prof. Satyahari Dey
Professor, Department of Biotechnology
Prof-in-charge, Incubation and Entrepreneurship Programs, S.R.I.
Managing Director, Science & Technology Entrepreneurs' Park
Indian Institute of Technology, Kharagpur

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From Head's Desk

राजेन्द्र मिश्रा अभियांत्रिकी उद्यमशीलता स्कुल
RAJENDRA MISHRA SCHOOL OF ENGINEERING ENTREPRENEURSHIP
भारतीय प्रौद्योगिकी संस्थान, खड़गपुर- 721302, भारत
INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR - 721 302, INDIA

Entrepreneurship is based on three pillars – the entrepreneurial spirit, the "I will do whatever it takes to solve a problem" attitude and passion for your work. With this ideology, we celebrate the Research Scholar's Day to inspire the entrepreneurial minds in research.

It is indeed a great pleasure for me that my school is going to host the sixth Research Scholar's Day on 23rd of January, 2019. This edition of Research Scholar's Day follows the tradition of similar successful events held in previous years. The event gives the research students and the faculty members a unique opportunity to discuss different research topics and innovative ideas in an open forum.

With the number of research scholars approaching 50 and over 10 active areas of research, our sixth Research Scholars' Day is expected to be a memorable event. The enthusiasm from the students is overwhelming. The topic of the event is "***National Initiatives on Innovation and Entrepreneurship***" which is the theme upon which our research scholars are going to compete and present innovative ideas that ameliorates the entrepreneurial mind set for the development of nation.

As we aim for new highs on our sixth Research Scholars' day;

Let us start with a glance through our recent achievements:

- Ms. Jagruti Thakur successfully completed her doctoral degree.
- Mr. Manojit Ray, research scholar, working with Dr. Basab Chakraborty was awarded SHASTRI Research Student Fellowship (SRSF) in doctoral category for the year 2017-2018 by Shastri Indo-Canadian Institute to undertake a research project titled 'Behaviour Influencing Energy Gateway Transformation in Canada – An Involved Exploration' at the University of Toronto, Canada.
- Mr. Manojit Ray has hosted one international German student under RISE Worldwide Research DAAD, in the month of March, 2018.
- Ms.Akanksha Jaiswal, research scholar, working with Dr. Prabha Bhola has been conferred internship in BEEDIE School of Business, Canada in the coming summer of 2019 under the Simon Fraser-IIT India Initiative.
- PRISM (Promoting Innovation in Individuals, Start-ups and MSME), a program under DSIR, Govt. of India, workshop was conducted on 3rd August, 2018 in Techno India, Management Studies Building, DN-25; Sector V, Kolkata to create a general awareness program for engineering for availing Govt. of India start-up funds.

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- Prime Minsiter Yuva Yojna (Udyamita) Program, a flagship program of Government of India for Entrepreneurship Education to Youth, through Ministry of Skill Development and Entrepreneurship, was conducted in Techno India, Kolkata, in the month of 6th and 7th August, 2018 with the lines of PRISM Workshop to raise awareness of
- Entrepreneurship and innovation for technology college students. The workshop inspired more than 100 students.
- A workshop was conducted in the School with the title "Entrepreneurs' Mentoring Workshop & Panel Discussion on Value Creation through Innovation Engineering and Entrepreneurship- A Multi-Stakeholder Approach" on 15th November, 2018. The workshop attracted more than 30 participants from various colleges who were mentored on their prototype and proof of concepts so that they can modify their projects and apply for funding in future.
- Mr. Mohd Zuhair and Dr. Ram Babu Roy got the best paper award for "Sustainability of Healthcare Insurance in India: A Review of Health Insurance Scheme Launched by States in India" in International Conference on Sustainable Healthcare Design (ICSHD), October 4-5, 2018, Sydney, Australia.
- Mr. Piyush Dongre received the Institute Challenge Grant for the project under SGSIS scheme, which is focussed towards developing highly detailed 3D models for a large-scale environment.
- Last but not the least; the School has received a grant of Rs. 1.44 cr. in FY 2018-19 from the Diamond Jubilee fund of the Institute to build new laboratories and to strengthen the existing ones in various technology areas. A space expansion initiative has also been approved to create workshop, laboratory and scholars' office infrastructure. These will certainly strengthen the research activities in the years to come.

Our school is gratified by the accomplishments of our students and faculty, and we are expecting that the seminars will be exhilarating and thought-provoking. Following the tradition of previous years, we expect this year's event will radiate immense enthusiasm and inspiration for innovative minds.

I wish this event a grand success!

Partha Pratim Das

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From Research Coordinator's Desk

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Dr. Titas Bhattacharjee
Assistant Professor
Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE)

Welcome to the 6th Rajendra Mishra School of Engineering Entrepreneurship Research Scholars Day, a tradition that started in 2014. The day celebrates the research, entrepreneurial, and creative scholarly accomplishments of research scholars across various interdisciplinary areas. The program reveals how vibrant scholarly activity is in RMSOEE, with approximately 50 students representing more than 10 research areas presenting their work. In addition to the work we see on RS Day, the determined and talented RMSOEE scholars are publishing in scholarly journals and also presenting at national and international conferences.It is the intimate relationship between research scholar and faculty members that ultimately produces a researcher who has the capacity and passion to make our world a better place. Their contribution is the evidence of the rich intellectual environment that thrives in our school.

This year, the theme of the event is "***National Initiatives on Innovation and Entrepreneurship***" and we are delighted to continue the tradition of hosting an eminent guest speaker, by welcoming Dr.W.R.Reddy, Director General, NIRDPR to campus.At RMSOEE, we believe that research is the catalyst for innovation. These explorations help solve the problems of our time and ensure that society does not become stagnant. This year too, we see the synergetic relationship between academia and society with our research scholars competingon innovative ideas towards the development of nation. On RS Day, let's celebrate this relationship and, most of all, the RMSOEE scholars, who are poised to become the innovators and leaders of tomorrow.I wish the event a grand success.

Titas Bhattacharjee

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Assistant Professor
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About School

Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE) was established at Indian Institute of Technology Kharagpur in the year 2010. The school aims to encourage the entrepreneurial minds and impart strong entrepreneurial culture and ecosystem for venture creation and early start- ups. It is a revolutionary step forward by integrating the academic and practice aspects of entrepreneurship education. The school offers a 5 year integrated dual degree with M. Tech in Engineering Entrepreneurship and B. Tech in engineering discipline. The students selected through JEE for B. Tech or dual degree M. Tech in any engineering department can opt for this program from their second year of study according to department change over rules. This unique school for the first time provides the opportunity for engineering undergraduate students to design product while pursuing their academic degree during entire period of study (5 years) for dual degree. Students who major in entrepreneurship are exposed to new venture creation

through which they gain understanding of process pertaining to skills, knowledge and experience required to become successful entrepreneur. The school offers unique curriculum which has been designed to give students an opportunity to develop their own creative skills thereby applying principles of engineering management, marketing and finance to the challenges of starting new business, growing and managing business towards scalability. The school is equipped with innovation lab for ideation and innovative thinking from second year onward. The students work on their innovative idea to convert it into product. The various funding structures available in the entrepreneurial ecosystem at IIT Kharagpur provide flexibility to students for building and testing their prototypes. The students are individually mentored by faculties and successful entrepreneurs in their endeavor. Spearheaded by number of fellows and doctorates from leading institutes and universities amongst its faculty, the school also runs a vibrant Doctoral/ MS Program aimed to bridge intellectual gaps in relevant interdisciplinary studies related to innovation and entrepreneurship literature. It enriches the value of knowledge, technology intervention and transfer, and overall ecosystem development for innovation and entrepreneurship.

Research Activities and Researchers of Dr. P. P. Das

A Team of Digital Heritage, Software Engineering, and Healthcare Studies

Name: Sayani Mondal
Research Area: Program Comprehension Using Eye Tracking

Name: Himadri Bhuyan
Research Area: Analysis & Interpretation of Bharatanatyam Dance using Machine Learning

Name: Gurunath Reddy M
Research Area: Vocal Melody Extraction from Polyphonic Music

Name: Abhijit Debnath
Research Area: Multi-Modal Approach Towards Lecture Video Indexing and Retrieval

Name: Dr. Partha Pratim Das
Designation: Head of Department, RMSoEE & Professor Dept. of CSE
Research Interest: HCI for Digital heritage, Computer Vision and Image processing, Software Engineering, Multimedia Data Analytics

Name: Shibabroto Banerjee
Research Area: Analysis of Plethismographic Signals

Name: Pravanjan Samanta
Research Area: Logic Design with Memristor

Name: Abhisek Chowdhury
Research Area: Human Behavioral Profiling for Healthcare

Name: Abhay Kole
Research Area: Fault Tolerant Quantum Computing

Prof. Partha Pratim Das is a Professor, Dept. of CSE and the Head of RMSoEE. From the school, he is guiding eight research scholars. His research scholars are Himadri, Sayani, Shibabroto, Gurunath, Abhijit, Pravanjan, Abhay, and Abhisek, who are working in various fields and their key research areas are given below.

Prof. Das has broad interests in Digital Heritage. "Computer Analysis of Bharatanatyam Dance" is an exciting research project that he initiated a few years back. His research scholars capture the dance with Kinect and performed various audio, video, motion, and human-movement analyses. The analysis of several aspects of dance leads to Dance transcription, building a tutoring system, dance interpretation, and synthesis.

On similar lines, he is also working on Vocal melody extraction from polyphonic music. Vocal melody extraction is the task of extracting the fundamental frequency (F0 or pitch) of the lead vocal source from the polyphonic music which has plenty of commercial and non-commercial applications. Classical signal processing and most recent advanced deep learning approaches are adopted to solve the complex melody extraction from polyphonic music.

While in the industry, Prof. Das observed critical lacunae in the working of young developers which lead to poor work quality and low productivity. Leveraging recent advances in a sensor (Eye-Gaze Tracking) and processor (Dynamic instrumentation) technology, he is trying to build tools for quality and productivity estimation and enhancement.

He is also working on multi-modal approach towards lecture video indexing and retrieval. In this area, several techniques are being explored for identifying appropriate features from video and audio contents of the lecture. The research goal is to

automatically generate meta-data from lecture videos for its efficient indexing and retrieval.

He also has a keen interest in human behavioral profiling for Healthcare and medical instrumentation. Concerned research is based on Pulse Oximetry, a cheap and non-invasive method to measure pulse rate and oxygen concentration in human blood which leads to an early prediction of heart diseases. Besides, he has an interest in reversible and quantum computing and memristive devices.

Prof. Das is the Principal Investigator of a project in collaboration with SAC-ISRO and working on "Hands-Free Gesture Control for Immersive Image Navigation." He is also the Joint Principal Investigator for "National Digital Library of India" Project of NMEICT, MHRD, with the Director, IIT Kharagpur Prof. P. P. Chakrabarti. The project is building an educational portal for all students of India. He is also the Professor-in-Charge, IIT Kharagpur Research Park at Kolkata.

Research Activities and Researchers of Dr. B. Chakraborty

A Team of Smart Grid, Renewable Energy & Storage Research

Name : Priyanka Laha
Research Area : Energy Modelling

Name: Bipul Krishna Saha
Research Area: Renewable energy

Name: Sunil Pradhan
Research Area: Energy Storage

Name: Manojit Ray
Research Area: Serving the unserved in energy

Name: Dr. Basab Chakraborty
Designation: Associate Professor, RMSOEE
Research Interest: Energy – Smart Grid, Renewable Energy & Storage

Name: Jignesh Singh Sindha
Research Area: All-terrain vehicle

Name: Ankit S Dandiwala
Research Area: Electric 3-wheeler vehicle dynamics

Name: Rajesh K Ahir
Research Area: Smart Meter Data Analytics

Prof. Basab Chakraborty joined the institute in 2013. Prior to that, he was involved in the development of new cost effective and energy efficient chemical process for the manufacturing of lead acid batteries for fourteen years. He is faculty convener of IIT Kharagpur for Institution's Innovation Council, MHRD. Prof. Chakraborty is presently working on Integration of Renewable sources of Energy in Smart Energy distribution network, Energy Storage systems, Waste heat utilization and Development of All-terrain electric vehicle. In his previous assignment in corporate industrial R&D, he was instrumental in forming the Research center and spearheaded basic research on the frontiers of electrochemistry and material science to evolve cost effective new materials suitable for the improvement of the product line. The transformation of the research outputs into commercial products was the major achievement of him. Apart from that, he has published more than 15 papers in international peer reviewed journals of repute along with papers in several international conferences and one commercialized international patent. He was awarded Excellent Young Teacher Award in 2017. Till date, Prof. Chakraborty has successfully guided one PhD scholar and is currently supervising 7 scholars. To list the present scholars,

Bipul is developing a practical model for low-grade waste heat recovery. Priyanka is developing an energy model for India which could be employed in capacity planning of renewable energy. Jignesh's research focuses on dynamic analysis of the active tilt controlled electric three wheelers and developing stable control system with least computation and sensory requirement. Manojit is working on the role of evolving technology & operating framework on Prosumer Engaged Affordable Energy Access. Sunil's research focuses on developing an advanced lead-acid battery for renewable storage applications. Rajesh is focusing on smart meter data analytics that will enable

utilities to increase the business value of data collected to address the challenges. Ankit is developing a control system for improving stability of electric three wheelers.

Research Activities and Researchers of Dr. B. Bhowmick

Techno-Entrepreneurial- Leadership Research Group

Name: Jayshree Patnaik
Research Area: Resource Constrained Innovation and Sustainability

Name: Arpita Ghatak
Research Area: Social Entrepreneurship: Seeking A Sustainable Model

Name: Sumit Biswas
Research Area: Mitigation of Uncertainties in Project Portfolio Management

Name: Dr. Bhaskar Bhowmick
Designation: Assistant Professor, RMSOEE
Research Area: Technology- Management for Sustainability

Name: Ajit Kumar Pasayat
Research Area: Technology Value Chain and Sustainability for Start-Ups

Name: Rosalin Sahoo
Research Area: Sustainable Healthcare Management

Name: Aftab Alam
Research Area: Technology Intervention and Start-Up Sustainability in Emerging Countries Perspective

Prof. Bhaskar Bhowmick is instrumental in establishing the Techno-Entrepreneurial-Leadership Lab (TEL Lab) in the school to appropriate the pace of presently growing area of technology-entrepreneurship and sustainability through leadership. His research interest indicates of a multidisciplinary approach in Innovation and Techno-Management. He has developed expertise in the innovation ecosystem, firm & environment relationships, dynamic capabilities of firms, leadership and sustainability. The major objective of TEL Lab is to explore, establish, and evaluate the potential models which can indicate better use of organization, technology and intangible resources towards sustainability. TEL Lab has successfully produced two PhD graduates, Ms Susmita Ghosh and Ms Sonal Hukampal Singh. Mrs Susmita in her thesis has worked on the uncertainties in entrepreneurship climate by studying the start-ups, while Ms Sonal, in her thesis, has explored areas of developing the framework on grassroots innovation for entrepreneurial success in the Indian context.

At present six research scholars are working as members of TEL Group and are working on various fields. Ms. Jayshree Patnaik is pursuing her research in constraint-based innovation leading towards a sustainable future and enabling inclusive development. Mr. Sumit Biswas is pursuing his research in uncertainty in project portfolio management due to dynamism and complexities within the organization, dealing single and multiple projects. Ms. Rosalin Sahoo is pursuing her research in developing a smart and sustainable health-care model by building an ecosystem which is less complex and more transparent so that existing gaps in accepting new technological transformations in various health sectors can be met. Mrs. Arpita Ghatak is pursuing her research in Social Entrepreneurship to develop a sustainable framework and understand current business models used by social entrepreneurs which will help them to achieve scalability. Mr. Ajit Kumar Pasayat is pursuing his research on developing an analytics-based model for both

start-up companies and investors where the performance of the companies can be understood and predicted to improve their productivity and scalability. Mr. Aftab Alam is pursuing his research on creating a framework and build models to build technology intervention in MSME/start-up to improve the efficiency and sustainability. TEL Lab researchers like others in the school aspired to contribute to society at large through building capability and creating eco-system.

Research Activities and Researchers of Dr. P. Bhola

Technological Innovation & Entrepreneurship Research Group

Name: Animesh Ghosh
Research Area: Rural Technology, Innovation and Entrepreneurship

Name: Debraj Bhattacharjee
Research Area: Automatic Transmission Control

Name: Dr. Prabha Bhola
Designation: Assistant Professor, RMSoEE
Research Interest: Econometric & Statistical Modeling, Data Analysis, Entrepreneurship & Technological Innovation

Name: Akanksha Jaiswal
Research Area: Strengthening supply chain for efficient product development

Name: Harshit Vallecha
Research Area: Energy Planning and Policy

Prof. Prabha Bhola is designated as Assistant Professor, Rajendra Mishra School of Engineering Entrepreneurship, Indian Institute of Technology Kharagpur. Her areas of research include Technological Innovation, New Product Development, Entrepreneurship & Sustainability and Business Analytics. Presently she is working on 'Product Analytics & Modeling' along with initiation of 'Community Energy Planning and Policy' project. Till date, Prof. Bhola has successfully guided one PhD scholar and one MS. She got more than 30 publications in journals, conference proceedings and book chapters.

In her research team currently four scholars are working in various research problems. Animesh Ghosh has joined recently under the supervision of Dr. Prabha Bhola. He will introduce his years of experience of working in rural India on technology, innovation and entrepreneurship in his research work. Akanksha Jaiswal is working in the area of Supply chain and product development. She is trying to develop a model to reduce the failure of new product in the market based on the identified metrices. Harshit Vallecha is working in the area of energy planning and policy. His research aims to propose optimal energy planning and policy implications to energy service providers in order to ensure energy security to energy deprived population in India. Debraj Bhattacharjee is doing research in automotive electronics. He is developing logic for electronic transmission control with the application of data driven approach for improving the power management in hybrid electric vehicle.

Research Activities and Researchers of Dr. T. Bhattacharjee

A Research Team of Financial Analytics

Name: Ashish Vazirani
Research Area: Startup Valuation

Name: Manali Chatterjee
Research Area: Corporate governance of newly public firms

Name: Dr. Titas Bhattacharjee
Designation: Assistant Professor, RMSoEE
Research Interest: Corporate Governance

Name: Bijitaswa Chakraborty
Research Area: Content analysis of corporate disclosure

Name: Sayani Mondal
Research Area: Program comprehension using eye tracker

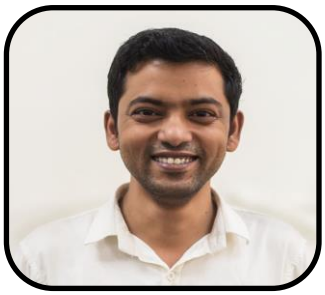
Prof. Titas Bhattacharjee's research is mainly focussed on shareholders' wealth generation by reducing information asymmetry and ensuring good governance practices across firm lifecycle --- from startup to large corporate. She is presently supervising 3 PhD scholars (Manali, Bijitaswa and Ashish) and co-supervising one PhD scholar (Sayani). Generally, an enterprise is valued on the basis of future cash flow projections, where projections are based on past performances and market share. On the other hand, startups and young organizations don't have the historical data to predict their future performance. Investors are valuing startups based on factors which are highly subjective and bring the element of bias in the process. In the research of Ashish, the goal is to suggest a comprehensive method of startup valuation which can help to provide stable worth of startups and avoid economic crashes. Moving forward, startups in their growth phase often go public to raise additional funds via Initial Public Offering (IPO). The new public firms are subject to abide by the stringent regulatory norms. The goal is to ensure good governance practice to minimize the information asymmetry and gain investors confidence. Manali is working on this research question. Finally, the communication of corporate information with the stakeholders happens through corporate disclosure which impacts market performance. Along with the numeric information corporate disclosures contain a large amount of unstructured textual information. Such qualitative information gives additional insights to the analysts and researchers. However, analysing such a large amount of text manually are tough, time consuming and complex. With the evolution of dictionary based approach and machine learning, sentiment analysis of such textual disclosure in automated way is gaining popularity in recent times. Thus another research area of the group is automated content analysis of corporate disclosure and its impact on market. Bijitaswa is working on this research objective on how to reduce the information asymmetry and make the market more efficient.

Research Activities and Researchers of Dr. P.K. Dan

Product Analytic and Modelling Research Team

Name: Debraj Bhattacharjee
Research Area: Automatic Transmission Control

Name: Sireesha Tamada
Research Area: Automatic Transmission Control



Name: Manish Chandra
Research Area: Automated Manual Transmission Development

Name: Sanyka Banerjee
Research Area: Automated Manual Transmission

Name: Dr. Pranab Kumar Dan
Designation: Associate Professor, RMSoEE
Research Interest: Product Design and Development

Name: Sourabh Mandol
Research Area: Power Split Hybrid Vehicle Transmission

Name: Saikat Nandi
Research Area: Transmission System of Hybrid Electric Vehicles

Name: Prasenjit Parta
Research Area: Transmission System of Hybrid Electric Vehicles

Name: Richa Malviya
Research Area: Medical Image Analysis

Prof. Pranab Kumar Dan is an Associate Professor of the School whose research interests are focused in the area of Engineering Design Process, Product Engineering & Prototyping and Manufacturing Systems Engineering. His research team comprises of Sireesha Tamada, Manish Chandra, Sanyka Bannerjee, Debraj Bhattacharjee, Sourabh Mandol, Richa Malviya, Saikat Nandi and Prasenjit Patra. The work mainly spans from product development and realisations through various optimizations and modelling techniques. The effective methods of product redesign and reverse engineering products or parts are being developed through design modifications in the Product Analytic and Modelling laboratory. 3-D Laser Scanning and point cloud generation supported with Portable Coordinate Measuring Machine, computer aided engineering and simulation software are used for the research in the domain of Robust optimization. Currently, his research group aims to develop and optimize automotive transmission systems using the CAD/CAE support with statistical software and simulation modeling.

Dr. Dan's research is multidisciplinary in nature and he envisions a strong team of electrical and electronics engineers along with mechanical engineers to work on different problem areas of the automotive drivetrain. His scholars are working with different types of Automobile Transmission systems such as Automatic Transmission, Dual Clutch Transmission, Automated Manual Transmission and Hybrid Electric Vehicles.

In vehicles equipped with Automatic Transmission, research is directed towards obtaining better control over gear shifting and enhanced vehicle performance using automotive control techniques. The gear shift quality, an assessment of improved drivability, performance, fuel efficiency and other important characteristics of the vehicle is also being studied.

The area of design and optimization of the gear shifting and synchronization process in an Automated Manual Transmission is being explored. One aspect of work in this area deals with the design of new gearbox architecture for improving driving comfort, reducing weight and enhancing efficiency of the gearbox. The other aspect aims to improve the design parameters of the synchronizer part along with other integral parameter improvements. The improved synchronizer design will cater to optimal power output, reduction of shifting time and maximization of the output torque, leading to the development of a noble transmission system design with improved efficiency.

Effective methods are being deduced to design and develop power split hybrid vehicle transmission system with high fuel economy and reliability through Computer Aided Engineering (CAE) by optimizing geometric parameters of transmission elements. The focus is on improving the existing powertrain control of the hybrid electric vehicle by developing logic for electronic transmission control, which will further lead towards better and efficient powertrain control.

His research work is mainly conducted in Product Analytic and Modelling Lab. He presently is the Chairperson of Global Entrepreneurship Summit and the Principal Investigator of two projects: Designing of Automotive Gearboxes Utilising High Performance Engineering Simulators - Optimisation ISIRD, SRIC and Uchhatar Avishkar Yojana MHRD. He is also the Co-Principal Investigator of Pradhan Mantri Yuva Udyamita Vikas Abhiyan (PM-Yuva) Ministry of Skill Development and Entrepreneurship, Govt. of India and National Initiative for Design Innovation MHRD.

Research Activities and Researchers of Dr. M.K Mondal

Sustainability by Design Group

Name: Naveen Karri
Research Area: Designing of new framework for the extraction of wind energy in urban and semi-urban areas

Name: Aashish Kumar
Research area: Improvement of thermal management using innovative topologies of heat sink for portable thermoelectric cooling system

Name: Dr. Manoj Kumar Mondal
Designation: Assistant Professor, RMSoEE
Research interest: Banking and Finance
Product Development – Overlapping multiple disciplines, Clean Tech.

Name: Bishnu P Bose
Research Area: Recycling selected solid wastes for Civil Engineering Applications

Name: M Raj Kumar
Research Area: Design of Innovative Drip Emitters and IoT Based Control Mechanism for Novel Micro-Irrigation System

Prof. Manoj Kumar Mondal has worked in various industries including senior positions in banking. He has received several laurels for his innovations including gold medal for Best Innovation (2008) awarded jointly by Lockheed Martin, Stanford University, University of Texas at Austin USA and FICCI India. Dr. Mondal is presently guiding research scholars in various product development projects as delineated below:

1. Utilizing Selected Waste Materials in Construction Industry: Research Scholar – Bishnu Pada Bose [Background: Civil Engineering]

   Process technologies for recycling of various wastes into construction materials is the focus of this research. Materials such as waste thermoplastics, coalmine overburden, iron ore tailings, and rice husk have been successful tested along with fly ash, common clay, sand and cement to make fired and cured bricks. Use of waste materials, replenishing the depleting natural resources, making lightweight and energy efficient bricks are the major research considerations. The process of transfer of the technologies resulting from the research is being actively discussed with multiple ventures in brick manufacturing industry.

2. Design of Innovative Topologies of Pin Fin Heatsink for Improving Thermal Management and Applying Them in Practical Thermoelectric Cooling Systems: Research Scholar – Aashish Kumar [Background: Electrical Engineering]

   The goal of the research is to improve efficiency of thermoelectric systems – cooling, heating and power generation by improving thermal management. Simulation studies of heat transfer performances of different geometrical topologies of pin-fin heatsink have been carried out using ANSYS-Fluent to find better design. Actual heatsinks are being fabricated for practical experimentation to compare with the simulation results. Based on the best performance, the

cooling, heating, and electric power generation will be estimated. The topology demonstrating the best performance will be used in an innovative portable thermoelectric cooling system. The hardware evaluation of this project is under process.

3. Designing a Roof-Top Wind Turbine of Improved Efficiency for Deployment in the Urban and Semi-Urban Areas: Research Scholar – Naveen Karri [Background: Energy Engineering]

   Installation of wind turbines on the roof-top is limited due to poor efficiencies of available designs and inadequate wind velocities in city areas during most part of the year. Innovation in design of the turbine is necessary for their extensive application. The present research is focused on exploring various possible configurations and topologies of turbines and innovate design of more efficient roof-top wind-turbine. Development of the framework for gathering data from different cities are in progress. Design and simulation of various topologies of turbines are being explored simultaneously.

4. Development of Improved and Automated Micro-Irrigation System through Innovation in Drip Emitter and IoT Based Control: Research Scholar – M Raj Kumar [Background: Agricultural & Food Engineering]

   The research aims to improve micro irrigation system in two aspects: development of a flow-regulated drip emitter and a method for automated dispensing of irrigation through IoT based control mechanism. Early design of a drip emitter has been made, using which, need-based flow rate of discharge of water can be regulated. Some prototypes have been made using 3D printing for evaluation of the designs.

Research Activities and Researchers of Dr. R.B Roy

Research Group of Healthcare, Big Data Analytics, AI and Computer Vision

Name: Sharad Kumar
Research Area: Public Health

Name: Sreekanth V K
Research Area: Decision Modeling

Name: Md. Zuhair
Research Area: Healthcare Data Analytics

Name: Dr. Ram Babu Roy
Designation: Assistant Professor, RMSoEE
Research Interest: Healthcare Data Analytics

Name: Piyush Dongre
Research Area: Large Scale 3D Reconstruction

Name: Saurabh Singh Thakur
Research Area: Healthcare Data Analytics

Name: Abhisek Chowdhury
Research Area: Healthcare Data Analytics

Name: Arghya Adhya
Research Area: Content Delivery network

Prof. Ram Babu Roy is presently serving as Assistant Professor in the Rajendra Mishra School of Engineering Entrepreneurship. He is supervising Seven research scholars. The scholars working under him are Sharad Kumar, Sreekanth V K, Mohd. Zuhair, Piyush Dongre, Saurabh Singh Thakur, Argya Adhya, and Abhishek Chowdhury.

Research group under his supervision is working on some important research problems in Healthcare, Big Data Analytics, AI and Computer Vision. The various research problems they are working on are Knowledge management for improving maternity care, Decision modelling in emergency care, Planning intervention for Cardiovascular Disease prevention, designing healthcare insurance for rural India, Soft computing techniques for digital image processing and Behavior Monitoring for Personalized Proactive Care.

Prof. Roy has successfully guided One PhD scholar and is supervising 6 research scholars. Prof Roy has research collaborations with faculties from reputed universities nationally and internationally. He has research collaborations in Taipei Medical University, Taiwan; National Taiwan University; Aalto University; University of Helsinki, Finland; and Indian Institute of Management Calcutta.

He is a reviewer in International Journals and Conferences and associate member in The Institution of Electronics and Telecommunication Engineers (IETE). He along with his team has published several research articles in peer reviewed Journals and Conferences. His scholars had also been awarded with international research fellowship, Best paper awards, and Institute Challenge Grants. Recently their research work related to the applications of IoT in healthcare has also been widely covered in National media for its novelty.

Research Activities and Researchers of Dr. M. Banerjee

A Team of Tissue Engineering, Drug Development and Bio Pesticides Research

Name: Pawan Prabhakar
Research Area: Phytochemicals, Drug Delivery Systems, Nano biomaterials

Name: Dr. Mamoni Banerjee
Designation: Assistant Professor, RMSoEE
Research Interest: Phytochemicals, Healthcare Management, Drug Development, Bio-pesticides

Name: Ragavi R
Research Area: Healthcare Management, Regenerative Medicines, Tissue engineering

Name: Pallabi Kandar
Research Area: Phytochemicals, Bio pesticides, Soil Science

Dr. Banerjee's research area comprises an interdisciplinary work of Agriculture, Biotechnology, Nanotechnology and allied research. She has an expertise in developing novel formulation from phytochemicals from different plant species for drug development and bio pesticides.

Current Research work in Dr. Banerjee's Group:

Ragavi R is doing her research work in regenerative medicine and tissue engineering. In regenerative medicine, usage of MSCs (Mesenchymal stem cells) and their organ specific differentiation towards therapeutics is an emerging, yet promising approach. Comparative studies of stimuli like electrical, magnetic and electromagnetic could help to identify the beneficial tool for future regenerative medicine. Further, a designed micro-chamber bioreactor for in vitro cell culture with 3D structure using nanofiber is a current scope where MSCs have proved to greatly respond to micro environmental signals and differentiation into particular cells. In vivo studies with such stimulated cells can be more effective and beneficial tools in tissue engineering applications.

Pawan Prabhakar is pursuing his research work in drug development and delivery from phytochemicals ; as phytochemicals are of high economic importance because they open a wide window for the development of new drug formulations. Chemicals synthesized drugs have created a problematic situation due to increase in resistivity of pathogens and microbes against most of the drugs across the world. Extraction of such compounds, their screening, pharmacokinetics and clinical trials are very much important for a drug formulations proved to be safe and efficient. In our research work , we are engaged in phytochemical extraction, procedures for separation, purification, isolation, and characterization for novel drug formulation. Such formulations when loaded into a

targeted nano drug delivery systems are proved to be highly effiecient, biocompatible, biodegradable and non-toxic to the living cells.

Pallabi Kandar is working in biopesticide development since pest management in India rely mainly on chemical pesticides, the excessive use of chemical pesticide leads to environment pollution and health problems. Hence it is the demand of time to go for such alternatives to overcome these problems and havoc situations. Botanical pesticides are one of the highly efficient and environmental friendly formulations focused over the globe .These compounds have no adverse effect on environment and they are easily decomposed by microbes in soil as they are not toxic to non-target organisms, thus maintaining the biological diversity of the predators and offer high level safety to human, animal and other non-target organisms. We are engaged in phytochemical extraction and development of plant extract based formulations biopesticide and its efficacy study on pests like lepidopteran larvae.

RMSoEE Research Scholars' Day Competition 2019

A. Team Name: Swachh

Team members: Piyush Kumar Dongre , Rajesh K. Ahir ,Priyanka Laha, Akanksha Jaiswal , Sreekanth V. K , Ankit S. Dandiwala

Title: Making Public Toilets Hygienic

Abstract:

Clean and safe to use toilet is a necessity of any nation. Unclean toilets are one of the major causes for many infectious diseases especially Urinary Tract Infection. Maintaining and keeping public toilets clean and hygiene is a big challenge. These un-sanitized toilets make large population of India vulnerable to such infectious diseases. We need to develop solutions that could address the problems arising from both individual user and service provider. In this submission we have created solutions which are in align with Swachh Bharat Abhiyan by Govt. of India. Our solution (Wrap & Crap) empower an individual to use the public toilets safely and carefree manner. This can be carried by an individual or can be made available as a utility in public restrooms. On the other side, our solution (Close & Clean) technologically enables the service provider to keep toilets sanitized and clean. This technology can be retrofitted to an existing toilet to sanitize the toilet seat after every use. Moreover, it will allow the service provider to monitor the level of cleanliness of toilet.

B. Team Name: Urja : Energy from Life

Team Members: Aashish Kumar, Sireesha Tamada, Sanyka Banerjee, Jayshree Patnaik, Pallabi Kandar, Pawan Prabhakar, M Raj Kumar

Title: Microbial Fuel Cell for Energy harvesting

Abstract:

Research into alternative renewable energy generation is a priority, due to the ever-increasing concern of climate change. Microbial fuel cells (MFCs) are one potential avenue to be explored, as a partial solution towards combating the over-reliance on fossil fuel based electricity. Microbial fuel cells (MFCs) are bioelectrical devices that harness the metabolisms of microbes to produce electrical power directly from organic material. MFCs offer the possibility of generating electric current from a wide range of soluble or dissolved complex organic wastes and renewable biomass. In recent years, the over-consumption of fossil fuels has led to serious scarcity of conventional resources and ecological pollution. This technology can be a suitable solution for energy harvesting in rural areas, especially off-grid regions. The main advantage of this technique is the direct conversion of chemical energy into electrical energy by disposing plenty biodegradable wastes like cow-dung, rotten fruits and vegetables, etc. For large scale production of electricity, a MFC plant may be installed in which a number of small MFC systems can be stacked together to form a large source of electricity. Current challenges associated with microbial fuel cell are its low yield of power generation, ohmic losses, etc. So, considering these problems and challenges, the

microbial fuel cells can be used to produce electrical energy which will be cost-effective and sustainable to the environment.

C. Team Name: Waste to Watt

Team Members: Abhoy Kole, Bishnu Pada Bose, Harshit Vallecha, Manojit Ray, Sourabh Mondal, Sunil K Pradhan

Title: A Waste-to-Energy Based Strategic Implementation of Green Energy Generation from Biogas in Urban Community

Abstract:

Strategies to solve the dilemma of energy demand, waste management and greenhouse gas emissions is a growing concern and require immediate attention for the ever growing population worldwide. Municipal Solid Waste (MSW) can be utilized to recover energy in the form of heat, electricity and alternative fuel like biogas which is a renewable source of energy. This paper presents the study of municipal solid waste (MSW) of Delhi urban area (among the most polluted cities in the world, projected to produce 17,000–25,000 tonnes/day of MSW by the year 2021). MSW is a potential source of biogas which is a potential fuel cell energy source. This study explicates strategies for power generation to derive power from MSW generated from Delhi urban and suggest an ideology for effective power generation and lead to creation of wealth through creation of new ventures by aspiring entrepreneurs.

D. Team Name: We-Care

Team Members: Manish Chandra, Himadri Bhuyan , Richa Malviya , Saurabh Singh Thakur, Ajit Kumar Pasayat, Asish Vazirani

Title: Prevention of Fake News Generation and Circulation on Social Media

Abstract:

Fake news is one of the major concerns for the governments and society across the globe. Indian government has also asked several social media companies, especially WhatsApp, to curb the fake news across their platforms. As per the several studies the most common mode of fake news is through the image files. Since the information is stored in the image form, it is quite difficult to extract the information check its content for the presence of any kind of provocative messages. Therefore, instead of looking into the content which is difficult in case of image some other mechanism is required which can track the source of content generation. In this case, when the image is found to be provocative, the source could be known and action could be taken by the concerned authority. By establishing the source of content generation, we can easily fix the liability of the user generating the fake and provocative content. We propose an algorithm to encounter this problem. In most of the cases, user do it because they think that they can't be caught. We have tried to fix the liability to user for their content. Our algorithm works on the principle of block-chain where identification of the origin of each image file or messages can be done locally. The content will be tagged with the physical address (MAC id) and local user name at the source and this information will keep flowing along with the content. Every time it is forwarded to another destination the new mac id will also be added which will help to identify the end user along with the user generated the content.

E. Team Name: Falcon

Team Members: Naveen Karri, Debraj Bhattacharjee, Animesh Ghosh, Prasenjit Patra, Rosalin Sahoo, Arpita Ghatak

Title: Development of Frugal drone for multi-utility application

Abstract:

Drones are in the market for a quite some time and are used in multiple applications. The flight time of these drones is dependent on the payload and size of the battery. Particularly in the applications of the areal search and surveys, longer flight time is very crucial. The developed prototype, achieves the stated feature by adding a retractable wing system. The novelty of the prototype lies in the design, which has been designed with an inspiration from flying squirrel. This wing system is used to glide over a geographical area. It can be controlled by the wind area and tail vane. During the glide mode the BLDC motors are turned off. When minimum pre-set height is reached, the BLDC motors are turned on again to reach to the maximum pre-set height. This greatly improves the battery life and flight time by 10 % against traditional design of quadcopter.

The designed prototype of team Falcon, has used convolution neural network based image processing and GPS data based search algorithm for enhancing applicability of designed prototype. Therefore, the team envisions its usage in surveillance, search operation, agriculture, delivery of low weight payload in different emergency, R&D etc. Apart from the design, the team also suggests an innovative and novel business framework for enhancing its applicability in day to day life in various sectors mentioned above.

F. Team Name: Kalpataru

Team Members: Shibabroto Banerjee, Bipul Saha , Abhijit Debnath , Manali Chaterjee , Saikat Nandi , Bijitaswa Chakraborty, Aftab Alam

Title: Smart and Dynamic Time Table Management System

Abstract:

Many colleges use manual way of preparing timetables with large number of students is very time consuming. This usually ends up with various courses clashing this may be either at same room or with same teachers having more than one course at a time. These are just due to common human errors, which are very difficult to prevent in the processes. To avoid these problems people usually taking the previous years' timetable and modifying it but still it is a difficult job to do incorporate changes. To overcome all these problems, we propose this system. This system will take various inputs like details of students, subjects and classrooms and teachers available, depending upon these input it will generate possible time-table, making the utilization of all of these resources in a way that will best suit any of constrains of college rules. The system will also allocate another faculty in case the one who is assigned is absent and the class is going vacant.

Experience of Conferences and Workshops from Research Scholars

1. **Sireesha Tamada**

The IEEE Vehicle Power and Propulsion Conference, one of the flagship conferences of the IEEE Vehicular Technological Society was held in Chicago, IL, USA in August 2018. I had the privileged opportunity of attending the conference for presenting my paper titled 'Modelling and Formulation of Optimal Clutching Sequence in Automatic Transmission'. The conference provided a forum for sharing ideas and gaining knowledge in the area of vehicle propulsion systems. It was a vast platform of speakers, authors and delegates from all over the world, and it was over-whelming to discuss my research ideas with them. It helped me to further deepen my knowledge in the area of ongoing research on vehicle transmission. The added benefit of attending such conferences is the confidence gained in meeting and interacting with eminent personalities in your research field. The authors of the book 'Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles' by Prof. John G. Hayes, University College Cork, Ireland and G.Abas Goodarzi, US Hybrid Corporation, USA had presented a tutorial and it provided a wonderful insight in the area of Electric Vehicles. I also had the chance of listening and meeting the keynote speaker at the Women in Engineering WIE Luncheon, Martin "Marty" Cooper also known as the 'Father of the Cell Phone'. These experiences count a lot in shaping a person professionally by making the best of such an exposure.

2. **Sanyka Banerjee**

The experience of attending an international conference is always enriching in various ways. Recently I had the opportunity to present my research work at the 48th International Conference of Computers and Industrial Engineering from 2nd -5th Dec 2018, Auckland, New Zealand. The session in which I presented my paper was on the topic of Data Science and Analytics for Smart Manufacturing. My paper dealt with the Optimization of Automotive Gear Synchronizers using Response Surface Methodology technique. I received interesting and helpful technical insights while presenting my research paper from the esteemed dignitaries and experts of the field who attended the conference from all around the world. This interaction with Professors and scholars, working on the same field as mine gave me a unique exposure which will be helpful for my research. The added perks of attending such conferences are visiting new places, gathering new experiences and coming out as a person with more confidence and zeal.

3. **Debraj Bhattacharjee**

The American Society of Mechanical Engineers organized its International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 2018 during 26th August to 29th August in Quebec City, Canada. The focus of the conference was emergent technologies that impact the critical engineering issues of product design and development, manufacturing, and the management and integration of information systems throughout the product life-cycle. It had been a great experience attending ASME 2018 IDETC/CIE as; it provided me opportunity to interact with research students, faculties and industry persons from around the globe. During the presentation of my research article "A

Fuzzy Based Propulsion Selection for Fuel Efficiency in Hybrid Electric Vehicle", I got valuable suggestions from the experts, which will be beneficial for my ongoing research.

4. **Jayshree Patnaik**

I had the opportunity to attend and present my research work at the 2018 IEEE IEEM (International Conference on Industrial Engineering and Engineering Management) from 16th -19th Dec 2018, Bangkok, Thailand. IEEE IEEM is the leading international forum which focuses to disseminate, to all branches of industries, information on the most recent and relevant research, theories and practices in Industrial Engineering. I got to interact and communicate with different Professors, Scholars from different parts of the world which helped me to understand the recent advancements and trends in my research domain. Moreover, presenting my work in front of a new set of audience and receiving suggestions from reputed panelists is itself an achievement which further gave me an impetus to be more focused and have an undying passion towards my research area.

5. **Sourabh Mandol**

The 48th International Conference on Computers and Industrial Engineering (CIE 48) was held in Auckland, New Zealand from the 2-5 December 2018, hosted by The University of Auckland, New Zealand. The main theme was "Next generation industrial and manufacturing technologies". It was a great privilege to be present in the conference where I had the opportunity to share my research contents and receive expert reviews. My topic for presentation dealt with effective utilization of

Computer Aided Engineering (CAE) process for smart manufacturing, titled, "Engineering Simulation for Product Design and Development in Cyber-Physical Context: A Case-Based Study". The comments from program committee members and reviewers was very useful for planning my research work particularly with software-based tools and methods for enriching outcomes from design data. Another most important experience for me was an interactive session organized by the program committee where the participants interacted with the editor-in-chief of six reputed journals which aimed at discussing journal publishing policies and how we can publish articles in high quality journals. Overall it was a very good experience to discuss research contents in a worldwide forum.

6. **Jignesh Sindha**

The ASME 2018 conference was organized in Quebec City, Canada. This conference was unique in the sense that it has eight conference tracks running in parallel with a large number of participants for interdisciplinary groups. We had an opportunity to interact with the field experts, professors and students working in the diverse research areas. We also got a chance to attend expert sessions which were very insightful and it was a one-time opportunity to look into the life of successful research personas.

7. **Bipul Krishna Saha**

The International Conference on Energy, Environment and Sustainable Development was organized in London (CEESD 2017), where I met many intelligent and sharp international colleagues, experienced veterans and specialists in various energy disciplines. I fully enjoyed the four days' event with

many interesting technical seminars and discussions on various energy-related topics. Several technical sessions in the CEESD, which I attended, had been very informative and insightful on their particular subjects. It also helped me to adopt an international perspective on how to benefit from the exchange of ideas, sharing of energy expertise, socializing with international counterparts, etc., in the meantime examine its relevance to my career in India.

8. **Sourabh Sigh Thakur**

I had the opportunity to attended 2018 Informs International Conference during 17-20 June, 2018 at Taipei, Taiwan. I presented a paper on "Predicting Depressive Symptoms in Students using Smartphone-based Sensor Data" in the conference. My presentation attracted the interest of the audience and the presented work was appreciated. I have also got a chance to meet several eminent researchers of my field in the conference.

9. **Aashish Kumar**

In the month of December, I got an opportunity to pursue a training-cum internship at Entuple Technologies Pvt. Ltd., Bangalore. Entuple Technologies is a private firm which is one of the chief technological consultant to the Computational Fluid Dynamics (CFD) simulation software giant ANSYS Inc. They organize various training programs throughout the year, ranging from basics to high-level competency under guidance of trained professionals with noteworthy experience. CFD simulation plays an imperative role in procuring the optimized results from a set of modified geometries when put under specific operating conditions. In my internship period, I learned to design and study several topologies of heat sinks with specific geometrical modifications and then analyze those under steady and unsteady/transient conditions to find out the topology

with maximum thermal management. In this course, I learnt ANSYS Workbench, design modeler, geometric modeling, meshing, ANSYS FLUENT, heat transfer with steady state and transient analysis that encouraged me to use Ansys-Fluent simulation for my problem, in particular. On completion of this internship with the immersive hands-on learning experience, I have developed a decent level understanding of the concepts of CFD using industry standard simulation tool.

10. Animesh Ghosh

i. United Nations Development Programme (UNDP) in partnership with DAY-NRLM, World Bank and GIZ conducted a national consultation on 'Driving Growth of Women-Owned Enterprises: Experiences and Way Forward' on the 18th and 19th of December 2018 at UN House, New Delhi. I had the opportunity to attend the workshop as an invitee along with Dr. Prabha Bhola from Rajendra Mishra School of Engineering Entrepreneurship (RMSoEE) , IIT Kharagpur. Eminent speakers from Government, Non-Government and Private sector jointly introspected on current status of entrepreneurial activities around women lead enterprises. They also reflected on how different stakeholders can participate and contribute in augmenting the economy of nation through such enterprises.

ii. One Day Seminar as well as Paper Development Workshop on Social Entrepreneurship in Developing Nations in a Digitally Connected World was organized by Social Informatics Research Group, Indian Institute of Management Calcutta in Academic Collaboration with College of Business and Economics, Australian National University on 2nd Jan 2018. I had the opportunity to attend the same with Ms. Arpita Ghatak from RMSoEE, IIT Kharagpur as presenter of envisaged research study. It was an overwhelming experience to present the idea

get feedback from Dr. Israr Qureshi, Professor of Social Entrepreneurship, ANU and ICT4D and Dr. Babita Bhatt Lecturer, ANU. In addition, their presentation and research experience on Social Entrepreneurship in Developing Nations in a Digitally Connected World was worth mentioning.

Achievements of RMSOEE Research Scholars

1. Manojit Ray, a research scholar, working under Prof. Basab Chakraborty has been accorded the prestigious RISE Worldwide Research Host for the year 2017-18 by The RISE Worldwide, DAAD, Germany. Selection is based on a global competition with most awardees located in top Universities and Research Centers of Developed Countries. A German Scholar would soon be joining Manojit for research on 'Crypto currency Anchored Distributed Energy Transaction Platform'.
2. Piyush Kumar Dongre won project under S.G.S.I.S scheme, which is focussed towards developing highly detailed 3D models for a large-scale environment. The outcome technology of this project can be used in preserving our heritage sites which are degrading due to the aging effect and weather conditions.
3. Piyush Kumar Dongre has two entries in the final round of ongoing up. AI challenge from Centre of Artificial Intelligence, IIT Kharagpur. They are:
   a) "Deep Learning based flexible 3D mapping and odometry", where they are developing flexible SLAM where we estimate the uncertainties and then select the appropriate modes to rely on for mapping and odometry.
   b) "T-API" (talk based API), which will be an NLP based tool that combines the user's voice with 3rd party APIs. This technology can be used to develop any documentation/codes/diagrams etc through voice commands. This will help to reduce the onscreen time of any individual.

4. Sourabh Sigh Thakur was awarded Taiwan Education Experience Program (TEEP) fellowship by the Taiwan government.

Publications from RMSoEE in 2018

1. **Mondal M. K.**, B. P. Bose & P. Bansal (2018), Recycling Waste Thermoplastic for Making Lightweight Bricks, Journal of Environmental Management. (Manuscript Number: JEMA-D- 18-02790R1

2. **Sharad Kumar,** Roy, R. B. (2018)., Comparing the Long-term Health Impact of Increasing Cigarette Price and Raising the Legal Age of Smoking in India, 62 nd National Annual Conference of Indian Public Health Association (IPHACON 2018), King George's Medical University at Lucknow on February 9 –11, 2018.

3. **Mohd Zuhair** and Ram Babu Roy, Sustainability of Healthcare Insurance in India: A Review of Health Insurance Scheme Launched by States in India. International Conference on Sustainable Healthcare Design (ICSHD), October 4-5, 2018, Sydney, Australia. (**Best Paper Award**)

4. **Jignesh Sindha**, Basab Chakraborty and Debashish Chakravarty (2018) Simulation based trajectory analysis for the Tilt controlled high speed narrow track three wheeler vehicle. To be presented at ASME IDETC/CIE, August 26-29, 2018 in Quebec City, Canada.

5. **Sourabh Mandol**, Pranab K Dan and Manoj Kumar Mondal. Engineering Simulation for Product Design and Development in Cyber-Physical Context: A Case-Based Study. Proceedings of the 48th International Conference on Computers & Industrial Engineering. 2018. ISSN 2164-8689. Elsevier. (InPress)
6. **Sourabh Mandol**, Pranab K Dan and Manoj Kumar Mondal. Modeling for Optimality in Design of Planetary Ring Gear to Reduce Stress Development a Response Surface Methodology Based Parametric Modelling Approach. In 2018 3rd International Conference for Convergence in Technology (I2CT) (pp. 1-4). IEEE.
7. **Sanyka Banerjee**, and Dan, P. K., (2018), Response Surface Methodology Based Engineering Informatics with A Case On Optimal Shifting Time in Automotive Gear Synchronizers; International Conference of Computers and Industrial Engineers (CIE 48) proceedings, 2-5 December 2018, Auckland/New Zealand
8. **Jayshree Patnaik**, and Bhaskar Bhowmick. "Revisiting appropriate technology with changing socio-technical landscape in emerging countries." Technology in Society (2018).
9. **Jayshree Patnaik,** Bhowmick, B. (2018). Revisiting Sustainability Issues at the Local Level: Implementation Challenges. International Conference on Sustainability and Business (SUSBUE 2018), Indian Institute of Management Calcutta, January 13-14, 2018.

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Testimonials from Alumni

1. Dr. Rana Basu

"My PhD journey at RMSoEE has been a wonderful experience. The multicultural and entrepreneurial environment of the school with its strong emphasis on interdisciplinary research is really very inspiring and motivating"

2. Dr. Amrita

""Everything is fine at the End, if it is not fine then it is Not the End — John Lennon".

Earning a Ph.D. is not a terminus, but it is the beginning of a new expedition. The duration of Ph.D. enables you to handle the challenges of your voyage of life fearlessly. The whole duration requires rigor and determination. RMSoEE has guardians who at every step support and guide their research voyagers very well. The School is the best place to move forward with your research ideas. I had a great experience in exploring and shaping my research interests at School. Research Scholar's Day during my times had given me great insights and opinion from researchers from different fields. RS Day is a platform to showcase your research work and improve. I wish everyone at School all the best for Research Scholar's Day 2019. Believe in yourself and follow your research dreams."

3. Dr. Pradipta Chandra

"This is my great opportunity to tribute to my alma mater, RMSoEE, my graduating school in IIT Kharagpur. RMSoEE has provided me the opening to pursue the research

on my choice, 'Capacity Development of Indian Farmers through Technology Transfer: Exploring Challenges and Redesigning Options', a truly interdisciplinary research. The international appreciation for this research has indicated the ability of the school to produce interdisciplinary Ph. Ds with par excellence matching perfectly with the thesis parameters of IITKGP. My department has provided me the confidence to pursue the research in engineering entrepreneurship which is the real time urge in the top-priority research. Research scholars' day (RS Day) has been playing beautiful instrumental role in gradual development of the individual research scholars through peer review process. I am grateful to my alma mater RMSoEE and IITKGP. I wish all the success and growth of my beloved school."

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Few Moments from 2018

Figure 1 GES 2018 Inauguration

Figure 2 Research Scholars' Day 2018 inauguration

Figure 3 First Cricket Team of RMSoEE in RSPL

Figure 4 Teachers' Day Celebration at RMSoEE

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