

# EnVision

SCHOOL OF ENGINEERING  
RESEARCH NEWSLETTER  
Edition IX



University  
Ranked  
in India Top 100 in the World

**No.1**



Ranked  
Private University in India

**No.1**



**No.1**  
for International  
Faculty in India



**5<sup>th</sup>** Best University in India  
by NIRF, MHRD,  
Government of India




**16<sup>th</sup>** Best in  
Engineering

**4<sup>th</sup>** Best University in India  
by Atal Ranking of  
Institutions on Innovation  
Achievements  
ARIIA

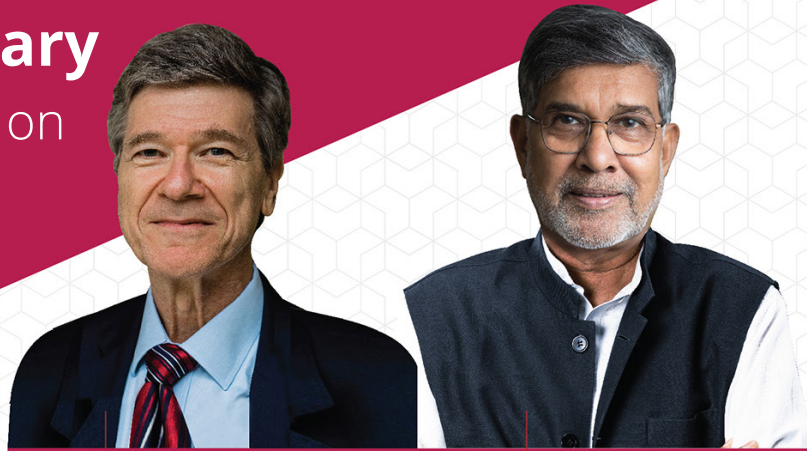


**NBA** National Board  
of Accreditation  
(B.Tech. B.Pharm)

 Recommended as  
**Institute of Eminence**  
University Grants Commission  
Government of India  
ज्ञान - विद्यान विमुक्तये

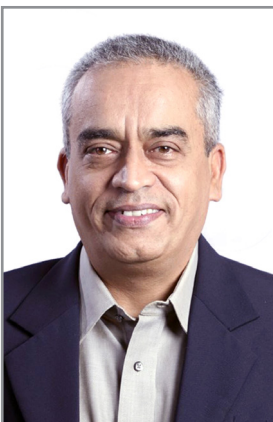


# Amrita Vishwa Vidyapeetham Confers its **First Honorary Doctorates** on



**Dr. Jeffrey Sachs**  
*World-Renowned Economist  
and Global Leader in  
Sustainable Development*

**Mr. Kailash Satyarthi**  
*Nobel Peace Laureate  
and Children's Rights Activist*



*I am extremely happy to present, the IX edition of EnVision!*

*It is a proud moment for Amrita fraternity, the University was awarded with an A++, the highest grade by National Assessment Accreditation Council (NAAC) in August 2021. The achievement is an affirmation of the exemplary accomplishments and commitment of the faculty, staff and students of Amrita. The Interdisciplinary research projects and collaborations are aligned with our Chancellors vision to contribute to a prosperous and sustainable future for all. The achievements of the students and faculty motivate and remind us all that challenges can be overcome through persistence and dedication.*

**Dr. Sasangan Ramanathan**  
Dean Engineering

# ***Center of Excellence in Advanced Materials and Green Technologies (CoE-AMGT)***

---

## ***About CoE-AMGT***

Center of Excellence in Advanced Materials and Green Technologies (CoE-AMGT) was set up in May 2013 through a grant from the Frontier Areas in Science and Technology (FAST) Scheme of the Ministry of Education, Government of India. This is the only Center grant and status awarded to a private university in India through that scheme and the only Center in the theme of Green Technologies. Subsequently, the Center has significantly expanded its research footprint, with 30+% of its funds from Indian and global industries. It is presently a world-class facility for advanced materials research with specific focus on green technologies for sustainable development.

## ***The Team***

A multidisciplinary team of 20 faculty including those from backgrounds in Chemical Engineering, Materials Science, Chemistry, Physics, Polymer Engineering, Mechanical Engineering, Civil Engineering, Environmental Engineering, Aerospace Engineering and Statistics form the core faculty affiliated with the Center. The Center also hosts 25+ PhD scholars, masters and undergraduate students who pursue their research with one or more of the faculty. The Center facilities are managed by a Technical Manager.

## ***Facilities***

The Center hosts the Major Analytical Instrumentation Facility of Amrita's Coimbatore Campus. Presently, the Facility includes advanced characterization tools such as Field Emission Scanning Electron Microscopy, X-Ray Diffractometry, Differential Scanning Calorimetry, Thermogravimetric Analysis, Gas Chromatography, Ion Chromatography, Mass Spectrometry, Infrared Spectroscopy, UV-Visible Spectroscopy and Diffuse Reflectance Spectroscopy. In addition, Inductively Coupled Plasma Optical Emission Spectroscopy, Total Organic Carbon Analysis and BET Chemisorption Analysis are being procured.

## ***Research Themes***

- The Center pursues cutting-edge research in five major thematic areas:
- Energy Materials, Technologies and Devices,
- Sustainable Resource Management,
- Polymers and Nanocomposites for Strategic Applications,
- Process Intensification, and,
- Bio-Inspired Materials.

## Energy Materials, Technologies and Devices ---



Dr. Thirugna-sambandam GM



Dr. D. Nikhil Kothurkar



Dr. Sudip Batabyal



Dr. Murali Rangarajan



Dr. D. Kumaresan



Dr. Udaya Bhaskar Reddy Ragula



Dr. R. Krishna Prasad

Aligned with the National Hydrogen Mission, major research activities are focused on hydrogen production (through water electrolysis, hydrolysis of hydrides, photoelectrochemical water splitting) and storage (bulk and metal hydrides). Major funding is from Australian Mines Ltd and an Indo-Norway grant. A NIDHI PRAYAS grant has been awarded for prototyping water electrolyzer.

Faculty are working on developing flexible, roll-to-roll-printable dye sensitized solar cells and perovskite solar cells based on earth abundant materials. They represent efforts towards indigenizing the next-generation solar cell technologies. Efforts are also ongoing towards the development of novel nanostructured materials for supercapacitors. Major funding has been received from DST-SERI, DRDO and SERB for these initiatives.

Another path-breaking initiative is the production of engine-grade fuels (e.g., diesel/ gasoline) through a highly efficient and selective indigenization of the Fischer-Tropsch process, in a modular, scalable system with a goal of a farmer producing his/her own fuel from his/her own farm waste. Amrita faculty have also successfully produced hydrogen from biowaste, with a major funding from HPCL R & D.

## Sustainable Resource Management

---



Dr. Murali Rangarajan



Dr. K. Nithya



Dr. Sriram Devanathan

Research activities of CoE-AMGT address the two-fold challenge in sustainable management of water and soil quality, viz., technologies for real-time monitoring of quality and versatile technologies for simultaneous treatment of multiple pollutants. In the former, with funding from MHRD and Amrita, faculty have developed sensors for heavy metal ions, a variety of emerging pharmaceutical contaminants and NPK (soil macronutrients) in agricultural run-off waters. Efforts are ongoing for developing portable, IoT-compatible, real-time sensors deployable in harsh water and soil matrices to monitor these parameters.

Another major initiative is towards the development of versatile technologies for removal of multiple emerging pollutants from water. We are exploring four specific technologies, viz., electrocoagulation & advanced oxidation (pharmaceuticals, nitrates, phosphate), packed bed electrochemical reactor (heavy metals), natural materials & nanomaterials-based packed bed adsorbers (heavy metals), and cementitious materials (porous concrete filters for heavy metal removal).

## Bio-Inspired Materials

---



Dr. Prasanna Ramani



Dr. R. Yamuna



Dr. Sriram Devanathan



<https://www.saukhyampads.org/>

One of the significant research focus areas of the Center is on Bio-Inspired Materials. Major efforts are on preparing, purifying and characterizing natural and nature-inspired products which possess numerous medical properties, including antioxidant and anticancer molecules. Among the class of molecules studied include peptide nucleic acids, berberines, porphyrins and their nonlinear optical properties, cobaloximes and molecular sensors. In addition, researchers have worked on low-cost, sustainable solutions such as low-cost, banana-fiber-based sanitary pads (Saukhyam2) in collaboration with Amrita SeRve. This product won the Most Innovative Product Award in 2016 by the National Institute of Rural Development, India. In 2020, the Saukhyam team won the Social Enterprise of the Year Award from the Women for India and Social Founder Network Coalition.

# Polymers and Nanocomposites for Strategic Applications

---



Dr. K. Jayanarayanan



Dr. Meera Balachandran



Dr. M. Kannan



Dr. N. Rasana



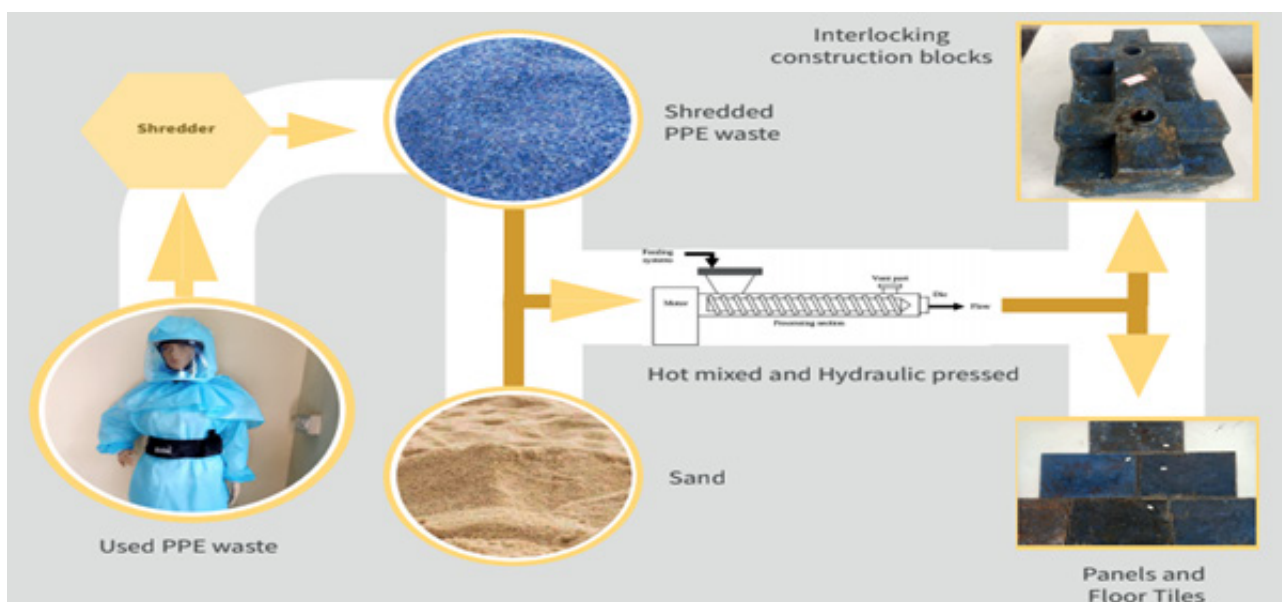
Dr. K. M. Mini



Dr. Shantanu Bhowmik

Research in polymers and nanocomposites is a core strength of the Center and the Department of Chemical Engineering and Materials Science. Amrita has developed components including multi-layer shear dampers that have been utilized in the building of ISRO's space rockets for more than 15 years. Amrita has also secured consistent funding from Department of Atomic Energy to develop multi-scale polymer composites-based materials and rubber-based composites for storing radiation wastes and utilization in highly corrosive environments.

Faculty are also working on developing recycling technologies. A recent example is the development of technologies for recycle and reuse of waste PPE kits in construction panels and floor tiles. A schematic is shown below:



*PPE Waste Recycling for Construction Panels and Floor Tiles*

## Process Intensification

---



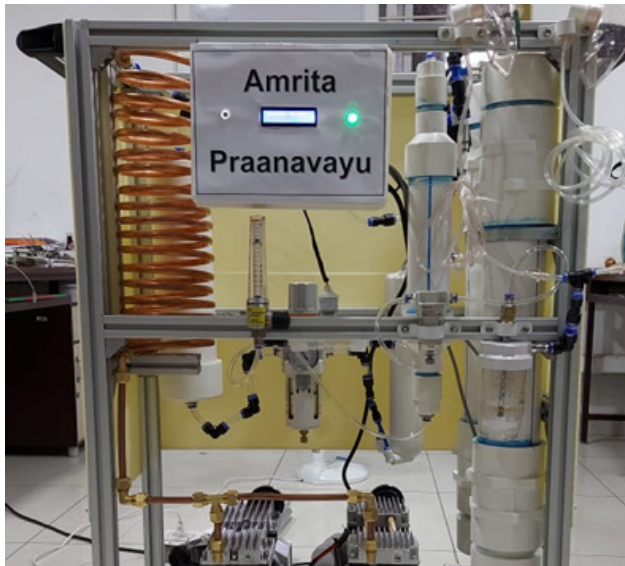
Dr. Udaya Bhaskar  
Reddy Ragula



Dr. Murali  
Rangarajan



Dr. Sasangan  
Ramanathan



Amrita Praanavayu: Indigenous Oxygen  
Concentrator

As defined in the journal *Chemical Engineering Progress*<sup>1</sup>, “Any chemical engineering development that leads to a substantially smaller, cleaner, and more energy efficient technology is process intensification.” Next-generation technologies are not just energy and resource efficient but also green, sustainable and versatile. Intensified equipment, and processes are a cornerstone of green technologies. Thus, the Center’s research is driven by developing intensified equipment/processes where possible.

Center faculty have developed a microchannel

heat exchanger/reactor that has 10x better performance than present, commercial microchannel heat exchanger. This versatile, intensified equipment is now being deployed in multiple applications, including in precision cooling during semiconductor manufacturing (funded by one of US’ major semiconductor research industry), solar-thermal-based combined generation of power and refrigeration (funded by DST-SERI), hydrogen production from biowastes (funded by HPCL) and engine-grade fuel from syn gas.

Center faculty have also developed intensified, high-surface area electrochemical reactors for heavy metal removal (funded by SERB) and for hydrogen generation by water electrolysis. Another fantastic example of Center’s research, particularly with major social and strategic implications, is the development of an indigenous oxygen concentrator, Amrita Praanavayu, during the second wave of the Covid pandemic. Shown in the figure below, this can supply 12-15 liters/min of 95+% pure oxygen. Funded by Navy, this concentrator can also be utilized in closed spaces in defence vessels (e.g., submarines).

All these efforts are gradually converging around developing solutions for decarbonization of India and the world. Recently, the Center has partnered with Durham Energy Institute of Durham University, UK to develop solutions for sustainable thermal energy management in Foundation Industries in India and the UK.

## FUNDED PROJECTS

---

### AMRITA COLLABORATES WITH SONY INDIA SOFTWARE CENTRE (SONY SENSING UNIVERSITY PROGRAM (SSUP))

#### *An Edge-based Cyber-Physical System for Smart Polyhouse Solar Drying of Agricultural Food Products*

Department of Computer Science and Engineering



Dr. Vidhya Balasubramanian  
b\_vidhya@cb.amrita.edu



Dr. V. Ananthanarayanan  
v\_ananthanarayanan@  
cb.amrita.edu



Dr. Shunmuga Velayutham. C  
cs\_velayutham@cb.amrita.edu



Dr. Gowtham R  
r\_gowthan@cb.amrita.edu



Dr. Karthi R  
r\_karthi@cb.amrita.edu



Dr. P.R. Janci Rani.  
Department of Sciences  
b\_janci@cb.amrita.edu

Amrita has bagged a collaboration with Sony India Software Centre Pvt Ltd, that aims to study and develop next generation edge computing and federated learning systems. The study will be applied to augment a Polyhouse solar drying and processing unit with intelligent spresense based sensing and control systems, resulting in an intelligent and cost-effective edge driven cyber-physical system (CPS). The research would be in two phases. The first phase would be to design a cost effective and energy efficient smart Polyhouse solar drying CPS , that augments existing Polyhouse solar drying unit with sensors and actuators to support intelligent monitoring of parameters like temperature and moisture within the unit, and also the quality parameters of the Agro-products that are processed. Data from with Real-time alerts on drying would be subject to predictive analytics to improve the quality of processing. The Second phase would be to design an Edge Network using Spresense within the intelligent polyhouse solar dryer to support distributed sensing, control and learning without the need for extensive cloud infrastructure. A knowledge base will be maintained as part of this proposed work which systematically records information related to food items include source ingredients, packaging, preservation and many more. This in turn will get recommendations from the system like best time to process a particular product, best product to process at the current slot etc. In addition, user can also obtain inferences from the real-time sensing and knowledge representation. A query interface



allows the user to submit customized queries to get both inferences and recommendations based on the monitored parameters. This work aims to enhance the research in intelligent Edge-Driven Cyber-physical system, in a novel and critical area of food processing and food safety.

## COLLABORATION WITH --- **V-GUARD INDUSTRIES LIMITED**

### *Ageing studies on the performance of slip additive modified PVC compound for Anti-termite House Wiring Cable (AT HWC) applications*



Dr. K. Jayanarayanan  
kj\_narayanan@cb.amrita.edu



Dr. Meera Balachandran  
b\_meera@cb.amrita.edu



Dr. M. Kannan  
m\_kannan@cb.amrita.edu

Department of Chemical  
Engineering & Materials  
Science

The collaborative project with Industry partner V-Guard Ltd would perform a systematic study on slip additives to arrive on a suitable PVC compound formulation for Anti Termite housing wire cable applications. Slip additives when added to the PVC compound formulation aids in reducing the pulling force of the cables. However, leach out of the additives during the shelf life and service can affect the performance and acceptability of the cable. Hence, the slip additive content has to be optimized to improve pulling ease while circumventing the leach out problem. The mechanical behavior of the PVC compound with slip additives before and after ageing will be estimated. Further, the change in chemical composition of the compound during ageing will be assessed by spectroscopic techniques. From the systematic studies, a suitable PVC compound formulation will be suggested, which can reduce the pulling force and blooming of the additives.

# THE UK-INDIA FI-Sus TEM COLLABORATION



Durham  
University

*UK-India Foundation industries Sustainable  
Thermal energy management collaboration  
with Durham university, UK*

Department of Chemical Engineering & Materials Science,  
Amrita Vishwa Vidyapeetham

---



Dr. Murali  
Rangarajan  
r\_murali@cb.amrita.edu



Dr. Sasangan  
Ramanathan  
sasangan@amrita.edu



Dr. Sriram  
Devanathan  
sriram@blr.amrita.edu



Dr. Udaya Bhaskar  
Reddy Ragula  
u\_bhaskarreddy@  
cb.amrita.edu)

Durham University, UK.

---



Dr. Tony Roskilly



Dr. Nicola Hall



Dr. Janie Ling-Chin

The UK-India FI-Sus TEM Collaboration brings together Amrita University and Durham University, UK to work together for technical exploration, and business case study to contribute towards transforming foundation industries. This project will focus on thermal energy management (using pinch analysis) and the utilisation of waste low-grade heat as well as renewables where feasible. This will build upon the strengths of each partner such as patented adsorption energy storage and thermochemical cycles, hybrid-heat pumps technology, development of phase change thermal storage materials and thermo chemical carrier fluid-based heat recovery and utilisation technology to recover ultra-low and low-grade waste-heat sources for heating, cooling, drying etc. in industrial processes. Focusing on the foundation industries, the UK-India FI-Sus TEM Collaboration will have the following objectives: Create a transformation-focused virtual network to connect leading researchers and facilities, industry and key stakeholders through engagement activities, Understand research and laboratory capacities to identify research linkages and gaps in transforming thermal energy management technology and operations., Develop business case along supply and demand chains to meet challenges in thermal energy management and the utilisation of waste low-grade heat and Maximise impact on research, industry, economy, environment and society.

---

**PROJECT SPONSORED BY**  
**SCIENCE AND ENGINEERING RESEARCH BOARD**  
**(SERB-DST)**

**Development of scaled-up, pump-less, free-convection-driven soluble lead redox flow battery**



Dr. Mahendra Naktuti Nandanwar  
Department of Chemical Engineering & Materials Science  
mn\_nandanwar@cb.amrita.edu

Global issue of climate change has resulted in widespread use of renewable energy sources such as solar energy and wind energy. These sources, though clean, are inherently intermittent which makes them unreliable. Thus, unless cost-effective large scale energy storage technologies are developed, global dependence on fossil fuels is only expected to increase with ever growing global energy demand. As of now, such large-scale energy storage technologies are still under developmental stage. Among these technologies, redox flow battery technology is seen as a potential candidate. Such batteries has an order of magnitude higher cycle life compared to commercially available static lead acid battery or lithium ion battery. The higher cycle life makes these batteries cost effective over longer term. The project has developed a novel concept of pump-less, free-convection-driven redox flow batteries. Unlike conventional redox flow batteries, these batteries doesn't require pump and hence reduces system cost to bring the system to commercially affordable level.

**DST FUNDED PROJECT – COST EFFECTIVE FLOATING SOLAR ENERGY GENERATION TECHNOLOGIES**

**Design and Development of cost-effective floating solar energy generation technologies and infrastructure for achieving zero-energy villages**

Department of Civil Engineering, Amrita Vishwa Vidyapeetham



Dr. B Soundharajan  
b\_soundharajan@cb.amrita.edu

**Project Partners**



INDIAN INSTITUTE  
OF TECHNOLOGY  
**PALAKKAD**

The floating solar plant on water bodies can provide cost efficient, and low maintenance commercial solar solutions that promote reliable power supply to remote rural communities. A World Bank study shows that use of floating solar panels on the surface of water bodies has been growing rapidly during the past eight years mainly in the developing countries. The aim of this project is to design and develop a cost-effective floating solar energy generation technologies and infrastructure for achieving sustainable village communities and increasing the period of water availability in village's water bodies by reducing evaporation loss. The project also focuses on affordable, long-lasting floating structure to mount the solar panels.

## *Development of high efficacy solid state supercapacitors with high energy and power density based on hybrid ionic liquid and thermally reduced graphene*

**INDIAN SPACE RESEARCH  
ORGANIZATION (ISRO) –  
RESPOND SCHEME**



Dr. C.Sarathchandran  
Department of Sciences (Chemistry)

The project aims to develop a novel solid state supercapacitor with improved electrochemical interactions between electrode and electrolyte through ISRO-RESPOND SCHEME. Supercapacitors are devices with rapid energy storage and delivery characteristics so that they can cover the energy/power density gap between the battery and electrostatic capacitors. Demand for Supercapacitors arises from the high energy density required by various modern applications like electric vehicles, UPS systems, windmills, space vehicles, regenerative braking, load levelling systems etc. Supercapacitors can be broadly divided into three categories, such as , Electrical double layer capacitors (EDLCs), where electrostatic charge accumulated at the electrode-electrolyte interface give raise to capacitance, Pseudocapacitors, where a fast redox reaction/Faradaic charge reaction of the electro-active species produces capacitance, and Hybrid capacitors, where the charge is stored both electrostatically and electrochemically. Growing academic and industrial interest in supercapacitors and energy storage devices is evident by the number of manuscripts published worldwide. However, the specific energy of a supercapacitor ( $\sim 10\text{-}20 \text{ Wh}\cdot\text{kg}^{-1}$ ) is roughly an order of magnitude lower than that of batteries ( $\sim 200\text{-}250 \text{ Wh}\cdot\text{kg}^{-1}$ ). The performance of a supercapacitor depends significantly on electrode

material and electrolyte. Thus, enhanced energy/power density can be achieved by increasing the electrode capacitance and electrolyte voltage window. Extensive studies have been directed towards the development of materials that satisfy all the requirements of a perfect electrode-electrolyte system. The system will be suitable for high temperature applications with wider electrochemical stability window, mechanical strength and improved safety. Thereby, the project is designed to develop high energy/power density supercapacitors that will be used in future missions of Vikram Sarabhai Space Centre (VSSC).

## **FUNDING FROM** \_\_\_\_\_ **VISION GROUP OF SCIENCE AND TECHNOLOGY** **FOR NEW DIAGNOSTIC TOOLS FOR OCULAR INFLAMMATION**

### ***Measurement of light scatter in the anterior chamber of the eye for objective quantification of intraocular inflammation***



Dr. Surekha Paneerselvam,  
Dept. of Electrical and Electronics Engineering

In a survey of the prevalence of Uveitis in South India, it is stated that nearly 1 in 200 adults  $\geq 40$  years of age in rural South India have been affected by ocular inflammation. There is a need for new diagnostic tools that can detect with more granularity and sensitivity. The existing laser flare meter has limited applications due to the limited dynamic range at higher flare measurements. Therefore, the project aims for an alternative to the existing device, in terms of offering higher precision. This also enables use in a clinical setting more readily, and could pave the way for the adaptation of aqueous flare meter as a diagnostic tool in uveitis clinics and most importantly as a tool in pharmacological studies of uveitis in animal models. The project would help the Ophthalmologist in diagnosing the severity of anterior uveitis objectively with a measuring time of fewer than 5 minutes. Hence, the early detection and clinical management of the disease can be achieved. Uveitis is an inflammatory disease of the eye, in which there is leakage of serum proteins and cells into the aqueous humor. With the increase in protein concentration, results increase in the intensity of the light scatter (or flare) in the Ocular fluorometer. Clinically the flare, severity of uveitis can be detected and quantified by the DLS technique. Novelty is grading uveitis by measuring the distribution of cells and proteins in the aqueous humor by using DLS technique.

AMRITA COLLABORATES WITH

## ***BHARAT ELECTRONICS Ltd. MAC layer Design for Indoor LiFi***



Dr. Navin Kumar  
Department of Electronics & Communication  
Engineering

LiFi is an indoor applications and intend to replace or work with WiFi system.

LiFi is based on visible light communication (VLC), a kind of optical wireless communication (OWC) technology. VLC system uses light wave, especially visible light to transfer data information in optical wireless channel. Thus, communication range is limited to line of sight (LoS) and short to medium distance. Though, available bandwidth is huge, the data transfer is limited to electronics and light source and detector. The system has multiple advantages such as simultaneous dual function (lighting and data communication), energy saving, no health hazards and many advantage from LED lighting systems. Though, VLC may not be a substitute to most popular radio frequency (RF) systems, but can be a supplementary technology and for some applications, it can be stand-alone system.

## ***EXTRAMURAL RESEARCH FUNDS FOR PROJECT THROUGH SERB-CRG***

### ***Design and Development of a Combustion based micro power generator***



Dr. Ratna Kishore V  
v\_ratnakishore@cb.amrita.edu  
Department of Mechanical Engineering.

This Project aims to propose design and development of liquid fuel based micro power generator and diffusion flame based micro power generator. The micro combustor will be connected to TEG model (working on Seebeck effect) to generate power from fuel combustor directly. This work is primarily to make micro power generator more compact using liquid fuel and increase the range of the power generation by increasing stability limits with diffusion flame based micro power generator. This work bears significance due to an increasing trend towards the development and miniaturization of various mechanical and electromechanical systems such as laptops, tablets, micro-airplanes and micro-pumps because they have been observed to improve the quality of our daily life. The designed micro power generator will help empowering various rural communities who does not have access to electricity. This designed micro power generator will be of great use at times of emergency and disaster conditions which results power failure for long periods. In the course of the proposed work, several issues like flame stabilization in micro combustors over a wide range of operating conditions, increase in heat transfer from flame to TEG module through heating cup and finally maximize the power generation from the system.

# En MEET

*Meet  
Our Success*



**Dr. Dhanesh G. Kurup**

Professor, Department of  
Electronics and Communication Engineering,  
ASE, Bangalore Campus.  
dg\_kurup@blr.amrita.edu

## *Early Days*

His fascination on electromagnetic fields during his B.Tech lead him to take Masters degree in microwave and radar from IIT-Roorkee and subsequently a Ph.D. degree in microwave technology from Uppsala University, Sweden. Between his masters and Ph.D, he worked for about six months as research associate and for about two years as scientist at ISRO satellite center, Bangalore. His other prior experience includes, about two years of teaching, guest researcher at University of Rennes, France and for about nine years in industry with Wavelogics, AB Sweden, where he contributed to their IP in new RFID technologies.

# *At Amrita*

He joined the Department of Electronics and Communication Engineering at Amrita Vishwa Vidyapeetham, Bangalore campus as Professor in October 2012. He was instrumental in setting up RF and wireless research laboratory at Amrita attracting funding from National Pedagogy Mission, MHRD, DST, ISRO. Today his team consists of four faculties, seven Ph.D. scholars and one research associate working in various system and subsystem aspects of RF and wireless technology.

## RF and Wireless Systems Lab @ Amrita

The prime research focusses of the lab are in microwave imaging, microwave powering, RF power amplifiers and radar technology. His approach on applied signal processing and Mathematical behavioural Modeling of RF non-linear and linear subsystems has enabled the team to develop custom computer codes to simulate, visualize and optimize various wireless systems. Currently this approach is being applied to develop and test microwave imaging and portable radar technology for various societal and strategic applications.

## Publications and Awards

His research paper published in IEEE Transactions in 2003 is a first to introduce the concept of unequally spaced antenna arrays through computational optimization with about 400 citations today. He has also published many papers on active antennas, microwave imaging, target localization using electromagnetic waves, behavioral modeling of power amplifiers and applied signal processing. He received a publication award from IEEE Bangalore chapter in 2015 at IISC for his work on interaction of electromagnetic waves with multi-layered media published in IEEE Transactions on Antennas and Propagation, 2015. In 2021, he received Amrita research and innovation award for his work on power amplifiers and target localization as well as Chancellor's award of appreciation for his research on contamination measurements of water using microwaves. More recently, he and co-authors received a best paper award in IEEE-ICEACC-2022 international conference held at Reva University, Bangalore, January 2022 for their paper describing computer graphics based simulation of antenna beam forming



# Faculty Accomplishments



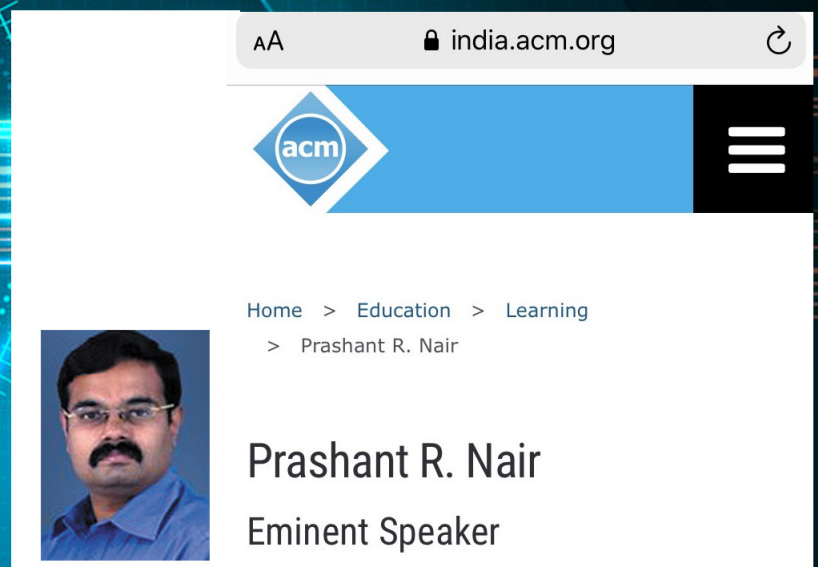
Amrita School of Engineering, Coimbatore

Department of Computer Science & Engineering



Association for Computing Machinery

Amrita Faculty  
**RECOGNIZED**  
as **ACM EMINENT**  
**SPEAKER**



Dr. Prashant R. Nair, Associate Professor, Department of Computer Science & Engineering, Amrita School of Engineering, Amrita Vishwa Vidyapeetham Coimbatore campus has been recognized as an Eminent speaker of Association for Computing Machinery (ACM) for 2021 and 2022. Only 20 computing professionals in India have been selected for the ACM India Eminent Speaker Program (ESP). The objective of this program is to provide ACM Professional and Student chapters in India with direct access to top technology leaders and innovators who will give talks on issues that are important to the computing community.

Visit : <https://india.acm.org/education/learning/esp/prashant-nair>

**Congratulations Ms. Gayathri Manikutty and Dr. Prashant Nair,**  
for being selected as top Mentors of Change and featured in the **GEMS of Mentor India Handbook** by NITI Aayog, Govt. of India



Ms. Gayathri Manikutty



Dr. Prashant Nair



## *Top mentor of change of NITI Aayog*

---

Amrita professors Dr. Prashant R. Nair and Ms. Gayathri Manikutty have been selected as top Mentors of Change by NITI Aayog (Planning Commission of India) in an initiative of Atal Innovation Mission's Gems of Mentor, India. NITI Aayog CEO Mr. Amitabh Kant and Dr. Chintan Vaishnav, Mission Director, Atal Innovation Mission (AIM) launched the 'Gems of Mentor India' book, a memoir of inspiring stories of AIM's Mentors of Change from across India on October 1, 2021 the eve of Gandhi Jayanti. Gayathri Manikutty, of our AMMACHI Labs, Amritapuri campus and Dr. Prashant R. Nair, Vice-Chairman, IQAC & associate professor - CSE, Amrita School of Engineering, Coimbatore campus are listed as top Mentors of Change and featured in the GEMS of Mentor India Handbook. Gems of Mentor India is an initiative by Atal Innovation Mission (AIM), NITI Aayog to recognize AIM's exemplary mentors of change. AIM selected mentors who have shown outstanding commitment to mentoring over the last 12 months by helping schools navigate the pandemic to ensure continued tinkering and learning through virtual means.

[https://aim.gov.in/pdf/GEMS\\_of\\_Mentor\\_India\\_27-09-2021.pdf](https://aim.gov.in/pdf/GEMS_of_Mentor_India_27-09-2021.pdf)

## Publication in Scientific Reports of Nature Research Publishing



Dr. Abhilash Ravikumar

A research paper titled “Substrate induced electronic phase transitions of CrI<sub>3</sub> based van der Waals heterostructures” authored by Dr. Abhilash Ravikumar, Assistant Professor, Department of Electronics and Communication Engineering, School of Engineering and co-authored by Mr. Shamik Chakraborty, Ph.D. Scholar has been published in the prestigious Scientific Reports, which is an open access journal from Nature Research Publishing. Scientific Reports is the 11th most cited Journal in the world, which ensures that all the research they publish are scientifically robust, original and of the highest quality. **This journal has an Impact Factor of 3.998.**

## DIGITAL INDIA TWEETS APPRECIATION TO PROTOTYPE ON ORAL CAVITY DRIVE SYSTEM DEVELOPED BY RESEARCH SCHOLAR

**Ms. Palli Padmini**, PhD Fellow of Visvesvaraya PhD Scheme under MeiT<sub>Y</sub>, Government of India has developed a prototype, easily worn and removable device based on oral cavity drive system. The system helps in creating virtual voice for speech disabled people using oral cavity movement. The underlying idea during the research was the utilization of the Oral Cavity Drive System to develop direct tongue movement to speech mechanism through sensors and signal processing algorithms. Blood relation speech samples database was used by voice conversion based on the age of the speech-disabled to make output sound more realistic. The sample is also gender specific and has English language as default with options for Telugu, Tamil, Hindi and Kannada. The system is useful to interpret speech for tracheostomised patients with larynx surgery, speech-disabled due to accidents or voice disorders, spinal cord injury, neuro disorders, medical rehabilitation and for robotics.



# STUDENT ACHIEVEMENTS

## STUDENTS BAG TOP SPOT IN GE HEALTHCARE HACK'E'LTH 2021

HACK-E-LTH hackathon was an 8-week program conducted by GE Healthcare. The student project focused on exploring the use of Amazon Personalize to upgrade the current GE Healthcare E-Commerce website. It showcased a personalized recommendation system that showed relevant recommendations to users based on their past browsing history. The research also showed that the project improved user experience tenfold and increased customer retention. The project was built using Amazon Personalize, AWS Lambda functions, Next.js on the frontend and various other aws tools. The student team from Amrita emerged winners battling 8 teams from partner colleges.



GE HEALTHCARE DIGITAL TECHNOLOGY INDIA  
Presents



### HACK'E'LTH 2021

with partner engineering colleges  
A remote project competition

*Unveiling the Winners, Congratulations!*

#### Winner



#### 1st runner up



#### 2nd runner up



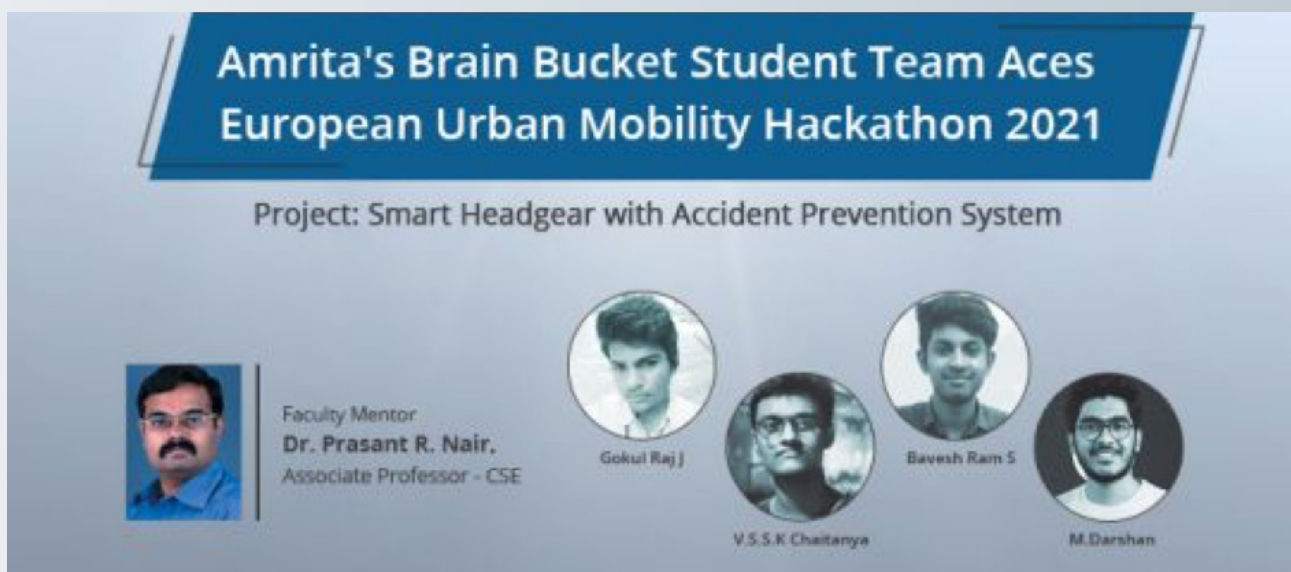
[https://www.linkedin.com/posts/ge-healthcare-india\\_technology-hackelth-gehealthcare-activity-6879649434167320576-cmnS](https://www.linkedin.com/posts/ge-healthcare-india_technology-hackelth-gehealthcare-activity-6879649434167320576-cmnS)

## ***STUDENT DEVELOPS VISUAL STUDIO CODE EXTENSION- JetSet***

---

***Sudhay S*** from the Department of Computer Science, Coimbatore Campus has developed a first of its kind Visual Studio Extension code named JetSet. WebRTC is now a widely used standard that uses a secure version of the User Datagram Protocol (UDP) on the transport layer so as to enable browser and other software to easily and securely use real time communication. Visual Studio Code as we know is a highly adopted light weight text editor with advanced capabilities used by software developers. In conjunction to using the WebRTC technology, a topic in continual research, which enables users to easily get started having a "Peer to Peer connection" with their existing network infrastructure, JetSet for VS Code gives the capability for Visual Studio Code users to transfer files to each other all from within VS Code with no need for external tools and most importantly without any middlemen who have undesired access to the files being transferred. The tool has been installed by around 30 users and users on the internet have shown great interest to the idea. It is also notable that this entire project is open source hosted on GitHub and can be found at

<https://github.com/sudhay23/JetSet-VSCode-Extension>



**Amrita's Brain Bucket Student Team Aces European Urban Mobility Hackathon 2021**

Project: Smart Headgear with Accident Prevention System

Faculty Mentor  
**Dr. Prasant R. Nair.**  
Associate Professor - CSE

Gokul Raj J

Bavesh Ram S

V.S.S.K Chaitanya

M. Darshan

## ***Smart Headgear with concept of modular approach from Student Team aces European Urban Mobility Hackathon 2021***

---

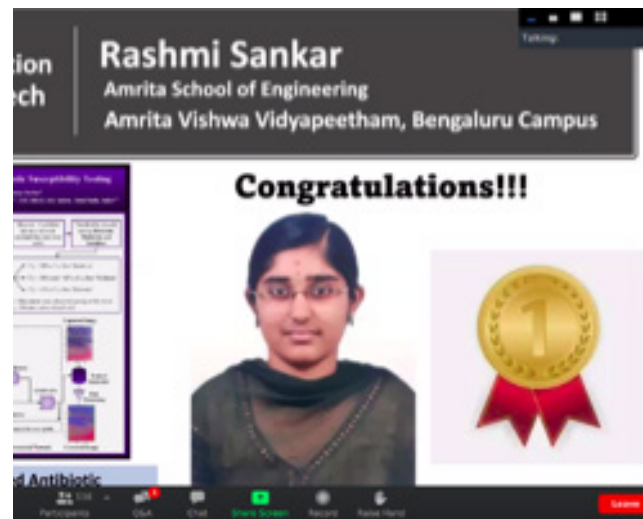
Amrita's Brain Bucket Student Brain Bucket team from Amrita Vishwa Vidyapeetham, Coimbatore campus aces Urban Mobility Hackathon 2021 organized by the City of Riga, funded by the European Institute of Innovation and Technology (EIT) Urban Mobility, an initiative of the

European Union. This global hackathon was held virtually and had a prize money of 3000 Euros. The focus of EIT Urban Mobility is to accelerate positive change on mobility to make urban spaces more livable. AMRITA student team presented a Smart head gear that can be built on a modular approach based on requirements which can be used by Two-wheeler Delivery Personnel in gig economy, motorcycle users, cyclists and children hoping to bring about an improvement in general road behavior and safety. Bavesh Ram S - ECE Third Year, Darshan Jain – CSE Third Year, Chaitanya VSSK – CSE Third Year, Gokul Raj – CSE Third Year formed the team. Dr Prashant R. Nair, Associate Professor, Department of Computer Science and Engineering, Amrita Vishwa Vidyapeetham, Coimbatore campus mentored the team

## ***STUDENT WINS POSTER PRESENTATION IN INTERNATIONAL SYMPOSIUM***

---

Ms. Rashmi Sankar, final year M.Tech. Data Science, Department of Computer Science and Engineering, received the Best Poster Presentation in PG Category at the International Symposium on Artificial Intelligence for Social Good'21. She presented the poster based on her M.Tech. project titled "Efficient Automation of Resazurin based Antibiotic Susceptibility Testing using Computer Vision", under the guidance of Dr. Tripty Singh, along with other researchers Dr. R. Sankar and Ms. Charanya Sankar.



## ***STUDENTS EMERGE RUNNERS UP AT SMART CITY HACKATHON 2021***

---

SMART CITY HACKATHON 2021 was jointly organised by Amrita Vishwa Vidyapeetham, Honeywell Technology Solutions and Bangalore Chamber of Industry & Commerce (BCIC) . The hackathon focused on architecting technology innovations for solving the challenges faced by our cities. Team attHack with member Mr. Rathin Raj R.S., Mr. Sam Jonath D. and Mr. Kavvin U.V from the Department of Electrical and Computer Engineering won the second place.

## **AMRITA RACING SECURES SECOND PLACE AT BUSINESS PLAN PRESENTATION**

Amrita Racing team took part in the VIRTUALS AT FORMULA BHARAT 2021-2022 and won the second place for BUSINESS PLAN PRESENTATION COMBUSTION CATEGORY.



## **STUDENTS ACE CYBER SECURITY CONTEST**

CTF is a National Level Ethical Hacking contest organized annually by Team bi0s in association with Amrita Vishwa Vidyapeetham and Amrita Centre for Cyber Security. The contest is exclusively for students enrolled in an Indian university and aimed at students who have no prior exposure to computer security. In cybersecurity, CTF stands for Capture The Flag. It is a fun way to learn ethical hacking skills, hands-on. Team named c0d3\_h4cki05\_, with team members Ch.J. Ramakrishna (III year ECE), D. Bharath Kalyan (III year ECE), K. Onkar Sandeep (III year EAC), Rajarshi Patra (II year CSE), Anshuman Sahoo (II year CSE) of Amrita School of Engineering, Bengaluru were ranked 9th among 673 teams that participated.

## **NOVEL DETECTION STRATEGY PROPOSED BY STUDENT TEAM BAGS FIRST PLACE IN YOUTH CONCLAVE 2021**

Student team from School of Engineering, Chennai campus with members Mr. Nallam Prem Kishan, Mr. Biyyapu Vishnu Vardhan Reddy, Mr. Mylavarapu Sripritham, mentored by Dr.S.Parthasarathy, from Department of Electronics and Communication Engineering, bagged First Prize for their The novel detection strategy for non-destructive diagnosis of SARS-Cov-2 virus through colorimetric principle. The team emerged winners battling it with 130 teams. The youth conclave was organised Indian National Academy of Engineering, IIT Mumbai, NITIE Mumbai and ICT.

## ***MIGRATION APP DEVELOPED BY STUDENT TEAM ACES AWS GRAVITON HACKATHON 2021***

---

The student team with members Mr.T.Sanjay, Mr.B.Naresh kumar, Mr.Xavier Emmanuel, Mr.Jayanth Vikash, Mr.V.M.Pranavam and Mr.Srivarma, all first year students from Department of Computer Science and Engineering aced the Graviton Hackathon securing First place , in the Best Migration category for their product named Genie - a light-weight chrome extension which enables the users to check if an image is CGI / tampered by simply right-clicking it and choosing a custom entry (Check credibility) from the context menu

<https://youtu.be/QP4wHU66fNk>

## ***Oracle absorbs Student Intern as Senior Software Developer***

---

Jariwala Romin, graduated in 2021 with a degree in B.Tech Computer Science and Engineering was absorbed by Oracle as Senior Software Developer in their Cloud Team after he excelled in securing two prime certifications during his Internship, Oracle Cloud Infrastructure 2020 Certified Architect Associate and Oracle Cloud Infrastructure Foundations 2020 Certified Associate . The second Certification was cleared only by four members of the Team from whole of India. The success of Jariwala is indeed a motivating experience for all his peers and juniors.



# PATENT FOR AN APPARATUS FOR DISINTEGRATING LIQUID INTO FINE DROPLETS

Patent No: 201941028906 awarded on 22/01/2021

## Patents & Publications

### AUTHORS :



Dr. Sivadas V  
Dept. of Aerospace  
Engineering



Dr. Balaji K  
Dept. of Mechanical  
Engineering



Avinash Kumar  
Alumni – Dept. of  
Mechanical Engineering

The conventional approach of perturbing the liquid column by an acoustic source, preferably a compression driver (standard loud-speaker), with an optimum frequency dictates the process. In doing so, efficient breakup of the liquid column, and subsequent generation of fine droplets at a short distance from the injector outlet can be realized. The simple design of this system leads to its easy operation in the practical domain. However, the optimum frequency of the sound wave that has pronounced effect on the liquid disintegration strongly depend on the specific atomizer cavity and the acoustic power. In other words, the resonant frequency is not known a priori. Therefore, fine tuning of acoustic behavior is a prerequisite in the atomizer design.



**AN APPARATUS FOR DISINTEGRATING LIQUID INTO FINE DROPLETS**

**Miniature Acoustic Atomizer**

**Flow Visualization Setup**

**Liquid Jet Breakup Phenomenon under Acoustic Field**

$U_j = 1.1 \text{ m/s}$

$U_j = 4.6 \text{ m/s}$

(12) PATENT APPLICATION PUBLICATION  
 (19) INDIA  
 (23) Date of filing of Application: 12/07/2019  
 (21) Application No: 201941028906 A  
 (24) Publication Date: 22/01/2021  
 (71) International Classification: B01J 11/00  
 (51) Priority Document No: N/A  
 (52) Priority Date: N/A  
 (53) Name of priority country: N/A  
 (86) International Application No: N/A  
 (87) Filing Date: N/A  
 (87) International Publication No: N/A  
 (88) Place of Addition or Application Number: N/A  
 (89) Filing Date: N/A  
 (92) Provisional Application Number: N/A

The Patent Office Journal No. 04/2021 Dated: 23/01/2021

## FEW KEY PUBLICATIONS IN THE YEAR 2021

- \* Dr. S.Parthasarathy, published an article titled "A Metal-free Mesoporous g-C<sub>3</sub>N<sub>4</sub> Nanosheets for Selective and Sensitive Recognition of Ethanol at Room Temperature" in the Journal Sensors and Actuators B (IF:7.4) DOI <https://doi.org/10.1016/j.snb.2021.130828>
- \* Dr.S.Parthasarathy ,co-authored an article titled " Photoluminescence-Based Bioassay with Cysteamine-Capped TiO<sub>2</sub> Nanoparticles for the Selective Recognition of N-Acyl Homoserine Lactones" in the Journal Frontiers in Bioengineering and Biotechnology (IF:5.89) DOI <https://doi.org/10.3389/fbioe.2021.750933>
- \* Dr.M.Venkateshkumar , co-authored a chapter titled "Improvement of Power System Stability and Power Quality of Artificial Intelligent Controller Based Grid-Connected PV System Using Cascaded Multilevel Inverter" in the Journal Recent Trends in Renewable Energy Sources and Power Conversion/Springer Nature Book Series. DOI:10.1007/978-981-16-0669-4\_14
- \* Dr. C.Sarathchandran , published an article titled " Micro-cellular polymer foam supported silica aerogel: Eco-friendly tool for petroleum oil spill clean-up" in the Journal of Hazardous Materials (IF10.588) <https://doi.org/10.1016/j.jhazmat.2021.1255>
- \* Dr.K Jayanarayanan, co-authored an article titled "A sustainable approach for the utilization of PPE biomedical waste in the construction sector" which was published in " Engineering Science and Technology , an International Journal" (IF:4.36, (doi-10.1016/j.jestch.2021.09.006 )
- \* Dr.Nithya K, co-authored an article titled "Micro algal biodiesel synthesized from Monoraphidium sp., and Chlorella sorokiniana: Feasibility and emission parameter studies " which was published in " Fuel" (IF: 6.609) (doi.org/10.1016/j.fuel.2021.121063)
- \* Dr.Duraisamy Kumaresan, Department of Chemical Engineering and Materials Science has co-authored an article titled "Ferroelectric barium titanate microspheres with superior light-scattering ability for the performance enhancements of flexible polymer dye sensitized solar cells and photodetectors " and was published in "Solar Energy" (IF:5.742) ( doi.org/10.1016/j.solener.2021.05.063 )
- \* Dr.Rasana N, Department of Chemical Engineering and Materials Science has co-authored an article entitled "Surface functionalization of CNTs with amine group and decoration of begonia-like ZnO for detection of antipyretic drug acetaminophen " and published in " Applied Surface Science" (IF 6.707)DOI:10.1016/j.apsusc.2021.149981 )
- \* Ms. Sindhu Subramanian, and B.Tech students Sivanesh S, Aswin K.N., Alan Antony , Mohan Surya Varma , Arya lekshmi , Kamalesh K, Naageshwaran M, Soundarya S, published an article titled "Biodiesel production from Custard apple seeds and Euglena Sanguinea using CaO nano-catalyst", and was published in "Bioresource Technology"( IF:9.642) doi.org/10.1016/j.biortech.2021.126418 )

- \* Dr. Nithya K , and B.Tech students P.N. Nirenjan Shenoy, N.M. Arjun, P. Senthil Kumar,A.B. Sree Hari published an article titled “ Recycled mesoporous magnetic composites with high surface area derived from plastic and de-oiled sludge wastes: An empirical comparison on their competitive performance for toxic Cr (VI) removal” and was published in “ Chemosphere” (IF:7.08) DOI: 10.1016/j.chemosphere.2021.133375
- \* Dr.B.Soudharajan co- authored along with Dr.Maneesha Ramesh and students Varma, Deepak Suresh & Nandan, Krishna & P C, Vishakh Raja Pérez, Mireia López & K A, Sidharth and published an article titled “Participatory design approach to address water crisis in the village of Karkatta, Jharkhand, India in the Journal Technological Forecasting and Social Change (IF: 8.593) DOI : 10.1016/j.techfore.2021.121002
- \* Dr.Ramkrishnan R., along with S. Kolathayar, T. G. Sitharam has published an article titled “Probabilistic Seismic Hazard Analysis of North and Central Himalayas Using Regional Ground Motion Prediction Equations” in the journal Bulletin of Engineering Geology and the Environment (IF: 4.298) DOI : <https://doi.org/10.1007/s10064-021-02434-9>
- \* Mr.Manu Madhavan and Gopakumar G published an article titled “ DBNLDA: Deep Belief Network based representation learning for lncRNA-disease association prediction” in the journal Applied Intelligence, Springer (IF:5.086) DOI: <https://doi.org/10.1007/s10489-021-02675-x>
- \* Jithin E.V., G.K.S.Raghuram, Keshavamurthy T.V., Ratna Kishore Velamati, Prathap C., Varghese R.J co-authored an article entitled “A review on fundamental combustion characteristics of syngas mixtures and feasibility in combustion devices”, Renewable and Sustainable Energy Reviews,(IF:14.982.) DOI: 10.1016/j.rser.2021.111178
- \* Radhika N., Sathish, M., Saleh, B., “A critical review on functionally graded coatings: Methods, properties, and challenges”, Composites Part B Engineering,IF:9.078 : DOI 10.1016/j.compositesb.2021.109278
- \* RohitKumar, Ratna Kishore Velamati, Sudarshan Kumar, “Combustion of methylcyclohexane at elevated temperatures to investigate burning velocity for surrogate fuel development”, Journal of Hazardous Materials, DOI: 10.1016/j.jhazmat.2020.124627, IF:9.038.
- \* Sakthivel R, Hoang A.T., Ong H.C., Fattah I.M.R., Chong C.T., Cheng C.K., Ok Y.S., “Progress on the lignocellulosic biomass pyrolysis for biofuel production toward environmental sustainability”, Fuel Processing Technology, DOI: 10.1016/j.fuproc.2021.106997, IF:7.033.
- \* Ratna Kishore V, Singh, P., Chander, S, “Effect of interactions on impingement heat transfer in odd and even element linear arrays of co-axial flames”, International Communications in Heat and Mass Transfer, DOI: 10.1016/j.icheatmasstransfer.2021.105576, IF:5.683.

\* Sasidharan Anoop, Ratna Kishore Velamati, Venkata Ramana Murthy Oruganti, "Aerodynamic characteristics of an aerostat under unsteady wind gust conditions", Aerospace Science and Technology, DOI: 10.1016/j.ast.2021.106684, IF:5.107.

\* Radhika, N, Sam, M., Jojith, R., "Progression in manufacturing of functionally graded materials and impact of thermal treatment-A critical review", Journal of Manufacturing Processes, DOI: 10.1016/j.jmapro.2021.06.062, IF:5.10.

\* Mallikarjuna B., Bontha S., Krishna P., Balla V.K., "Characterization and thermal analysis of laser metal deposited  $\gamma$ -TiAl thin walls", Journal of Materials Research and Technology, DOI: 10.1016/j.jmrt.2021.10.133, IF:5.039.

\* Dr.K.R.M Vijaychandrakala along with PhD Scholar Kiran P published an article titled "New interactive agent based reinforcement learning approach towards smart generator bidding in electricity market with microgrid integration" in the Journal of Applied Soft Computing (IF:6.725). DOI: <https://doi.org/10.1016/j.asoc.2020.106762>

\* Dr.Vijayakumari A published an article titled "A non-iterative MPPT of PV array with online measured short circuit and open circuit quantities" in the Journal of King Saud University - Engineering Sciences (IF:4.695) <https://doi.org/10.1016/j.jksues.2020.04.007>

\* Dr. Chinthala Ramesh co-authored a research paper titled "A Survey on High-Throughput Non-Binary LDPC Decoders: ASIC, FPGA and GPU Architectures" has been published in the IEEE Communications Surveys and Tutorials, which has an impact factor of 23.7.

\* Mr. Pramod R. with B.Tech. students has published a research article titled "Investigation of the Tribological Characteristics of Aluminum 6061-Reinforced Titanium Carbide Metal Matrix Composites" in the Nanomaterials 2021 which is an open access journal with an impact factor of 5.076.



[www.amrita.edu](http://www.amrita.edu)