



CURIN

Chitkara University
Research & Innovation
Network

RES NOVAE

CURIN Research and Development News

Vol. 2021, Issue 1

R&D Activities

During Jan – Mar 2021

Cover Story

CURIN researchers
bagged top prizes in
3rd Annual Excellence Awards
of the university



TOP STORIES

- 2 funded projects worth INR 1 crore sanctioned
- Improvement in solar cell structure that resulted in better power conversion efficiency proposed
- A fabric that blocks harmful radiations proposed
- Several workshops with national and international collaborations conducted

CONTENTS

CURIN Faculty Members Bagged Top Prizes in 3 rd Annual Excellence Awards	1
Improvement in Perovskite-based Solar Cell Structure Proposed by a Research Group from CURIN	4
Research @CURIN - High Impact Research Papers Published by CURIN during January – March 2021	6
2 Funded Projects Worth INR 1 Crore Bagged by CURIN	9
Workshops and Expert Talks Conducted with National and International Collaborations	11
NewGen IEDC and TEC Activities	14
Patents Filed by CURIN Faculty Members and Scholars	16
Key Activities of Doctoral Research Centre (DRC), Chitkara Business School (CBS)	18
Other Activities - Workshops, Conferences, Webinars Attended by Our Faculty Members and Research Scholars	19
List of Publications	21

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CURIN Faculty Members Bagged Top Prizes in 3rd Annual Excellence Awards

178 faculty members from different departments received cash incentives worth INR 2.5 Cr

Chitkara University organized its third Annual Excellence Awards Function on 27th February 2021. Every year in this awards ceremony, faculty members are recognized, incentivized and rewarded for excellence in initiatives related to research, innovation and entrepreneurship. As many as 178 faculty members from different departments of the university received cash incentives for high-quality publications this year.

The university bagged extramural funding worth INR 12 Cr in the calendar year 2020. All the faculty members responsible for winning these projects were applauded and rewarded. They received citations for their extraordinary efforts. The university was able to file 292 patents in the said year and close to 250 faculty innovators who have filed these patents were rewarded and recognized. Based on the accumulated bonus points in five categories namely quality publications, extramural funding, citations, consultancy projects and patents, the two most coveted awards were also declared. These awards were titled Outstanding Researcher Award 2020 and Eminent Researcher Award 2020.



A total cash incentives worth of INR 2.5 Cr were distributed amongst faculty members in the Excellence Awards Function. Dr. Ashok K Chitkara – Chancellor, Chitkara University and Dr. Madhu Chitkara, Pro-Chancellor, Chitkara University gave away the Awards which was a big encouragement for everybody. They congratulated the winners and applauded the efforts of the faculty members for strengthening the research and innovation ecosystem of the university.

In the 3rd Annual Excellence Awards Function following seven faculty members from CURIN won top prizes –

Dr. S.N. Panda and Dr. Rahul Pandey shared Outstanding Researcher Award 2020



Dr. S.N. Panda | Director (Research)

"The entire credit of this honors / achievements goes to my team of IOT and Cloud Computing Lab - Dr.Rajesh, Dr. Naveen, Dr. Sumit, Ms. Shanu, Ms. Priyanka, Ms. Dimple and Mr. Simran.

I am very much inspired by this line 'No research without action and no action without research'. I always encourage my team and insist them to generate ideas and convert them into real life innovation otherwise the idea will die. Idea generation is a continuous process and the best way to do it is talk to people and don't stop asking questions"



Dr. Rahul Pandey | Asst. Prof. (VLSI, CoE)

"Winning an award acknowledges a job well done! It is an outcome of sheer hard work and it justifies all the pain that goes into the process. Let me remind you about the winner effect in biology which directly connects victory to the brain by releasing certain hormones. This process also does chemical makeup of the brain thereby making an individual more competent, confident, and ready to take even more complex challenges than before. Therefore victories are important, so tune your brain for winning."

Dr. Amandeep Singh was awarded for publishing his research work in Highest H-Index Journal



Dr. Amandeep Singh Bhatia | Asst. Prof.

"Thank you for this award. I am truly honored to receive it. Naturally, this is a thrill for me. I wanted to achieve the very best, and this excellence award is a major driving force for me. It is an award to encourage me to do more and motivate others also to work hard. It will boost the scientific temper and enthusiasm towards the interdisciplinary research."

Dr. Jyotsna Kaushal was awarded under Extramural Funding of STI Hub-DST project as Co-Principal Investigator



Dr. Jyotsna Kaushal | Professor, Centre for Water Sciences

"I appreciate Dr. Archana Mantri madam for leading this project in Chitkara University, Punjab. I am grateful to all team members because serving the community in the area of Water Sciences gives me inner joy and getting this award will further motivate me to work in Water Literacy with great enthusiasm for the upliftment of the communities in rural and remote areas".

Dr. Deepali Gupta was awarded for filing the Highest Number of Patents in the year 2020



Dr. Deepali Gupta | Professor

"I feel obligated to Chitkara University for rendering me with this prestigious award and extending their support and guidance by making the tedious process of patent filing a simplified one. At this juncture I feel motivated to do much more in this direction and I am blissful to senior dignitaries of the University for carrying such a vision of professional growth of their faculty members."

Three faculty members from CURIN were among the Top-5 who received Highest Cash Incentives in the award ceremony



Dr. Jaya Madan | Asst. Prof. (VLSI, CoE)

"Winning is not something that happens suddenly, it is something that you grind out day in day out to realize that dream. Getting recognized at such an august gathering inculcated a thought that winning isn't getting ahead of others, it's getting ahead of yourself."



Dr. Manish Sharma | Professor

"It was a great feeling to receive this excellence award and felicitation on the stage from Honorable Chancellor Sir and Pro-Chancellor Madam. I quote (Dr. APJ Abdul Kalam) 'If you want to shine like a Sun, burn like a Sun' "



Dr. Rahul Pandey | Asst. Prof. (VLSI, CoE)

"It is a huge honour for me to receive the highest incentive award for the research efforts in the academic year 2020. It is just three years since I joined this prestigious University, and I found myself standing among the top researchers/achievers of the University. Many thanks to the management of the University for giving me an opportunity to explore my potential in research. This recognition will motivate me to do my best in time to come as well."

Improvement in Perovskite-based Solar Cell Structure Proposed by a Research Group from CURIN

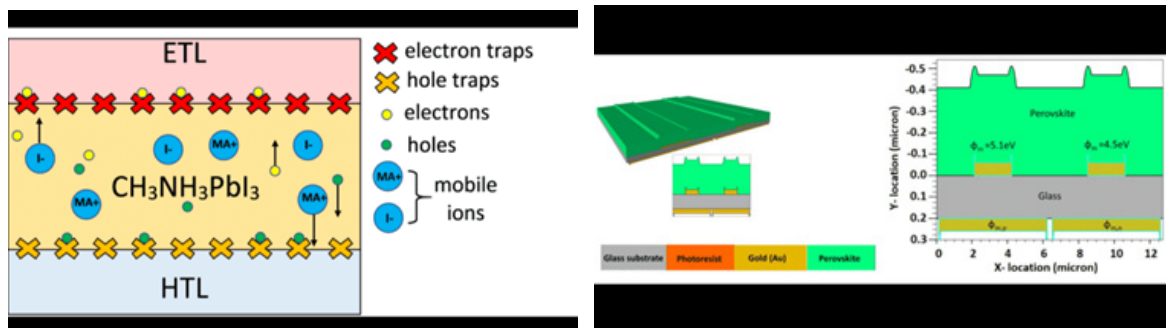
Improvement of 59.4% in power conversion efficiency has been achieved

A numerical study by researchers at VLSI, CoE, CURIN has shown enhanced charge extraction in metal-perovskite-metal back-contact solar cell structure through electrostatic doping. The proposed design resulted in an improvement of 59.4% in power conversion efficiency over previously reported structures. This design also overcomes the fabrication and performance challenges associated with conventional sandwiched architecture using charge transport layers.

The team of researchers comprising of Dr. Rahul Pandey (Asst. Prof.), Dr. Jaya Madan (Asst. Prof.) and Dr. Rajnish Sharma (Dean, Research and Lead, VLSI CoE) performed numerical simulations and modelling to arrive at an electrostatically-doped metal-perovskite-metal back-contact solar cell structure with power conversion efficiency of 4.13%. Previously proposed structures in the domain had power conversion efficiency of 2.59%. The team has recently reported their findings in IEEE Transactions on Electron Devices.



(L-to-R) Dr. Rajnish Sharma, Dr. Jaya Madan and Dr. Rahul Pandey



The illustrations have been borrowed from this research team's published work in IEEE Transactions on Electron Devices

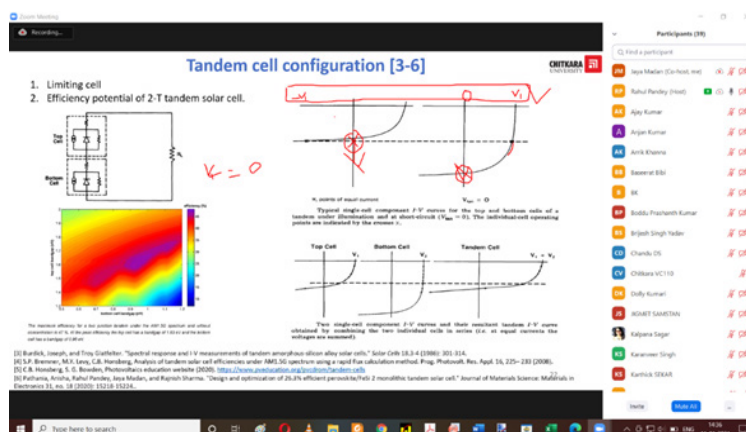
In the earlier reported design of back-contact metal-perovskite-metal solar cell architecture, the carrier collection relied mainly on the Schottky field across the perovskite layer and hence the performance, particularly in terms of open-circuit voltage, was limited by the work function difference between the self-assembled monolayer (SAM)-modified gold contacts. However, this new study carried out by researchers from CURIN established that an electrostatically-doped dipole-field-assisted metal-perovskite-metal back-contact perovskite solar cell structure could overcome the limitations of dipole-field-assisted metal-perovskite-metal back-contact perovskite-based solar cell structures. The team has proposed placing two additional electrodes beneath the glass substrate in order to provide the polarity difference and to create an electrostatically doped p-n junction and corresponding built-in potential inside the perovskite layer near the glass substrate. The induced built-in potential offered additional support to light-generated charge carriers for the enhanced collection probability and helped overcome the limitations of the device reported earlier.

These findings may pave the way for the development of transport layer-free electrostatically-doped, scalable, and low-cost perovskite-based solar cells in the future.

Other Activities of VLSI CoE

Workshops Conducted

- Dr. Rahul Pandey and Dr. Jaya Madan conducted a three-day online workshop cum hands-on training session on Designing Advanced High-Efficiency Tandem Solar Cell using SCAPS-1D during Jan 11-13, 2021. A total of 32 participants from India, Mexico, and China attended this workshop that covered the topics like calculation of filtered spectrum, current matching, construction of tandem J-V curve etc.



- Dr. Rajnish Sharma conducted a five-day workshop entitled Leverage the Best of Research Atmosphere at Chitkara University from April 27 to May 01, 2021. 26 faculty members and research scholars from different departments of the university participated in the workshop. Important topics related to research such as gauging the outcome of research effort, policies of the university to promote research and innovation, ways to engage in high quality and multidisciplinary research and different kinds of indexing services were discussed in the workshop. Participants were given regular assignments to help them in selecting high quality journals for publishing their research work. Workshop contents were very well received and it was evident from the feedback received from the participants.

**LEVERAGE THE BEST OF RESEARCH
ATMOSPHERE AT CHITKARA UNIVERSITY**

Date: 27th April to 1st May, 2021

TOPICS TO BE COVERED

- Write a high quality research paper
- Stay away from plagiarism
- Publish in high quality journals / conferences
- Scopus/SCI/PubMed/ABDC - What & why?

E certificates will be issued to those who would be completing the workshop.

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www.chitkara.edu.in

**CHITKARA
UNIVERSITY**

Resource Person



Dr. Rajnish Sharma
Dean (Research & Academics),
Chitkara University, Punjab, India

Best Paper Award in a Conference

The paper titled A Methodical Survey on Present State of Art for Electrostatically-Doped Tunnel FETs and its Future Prospects authored by Ms. Preeti Sharma (PhD Scholar, VLSI, CoE), Dr. Jaya Madan, Dr. Rahul Pandey and Dr. Rajnish Sharma has been awarded the Best Research Paper at the 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021) organized by Panjab University Chandigarh during March 5 - 6, 2021. This paper is available online on Elsevier's Materials Today: Proceedings.

Research@CURIN

High Impact Research Papers Published by CURIN during January – March 2021

This section provides summaries on high impact research papers published by CURIN during the quarter. A complete list of publications by CURIN faculty members and scholars during January – March 2021 is available in a separate section.

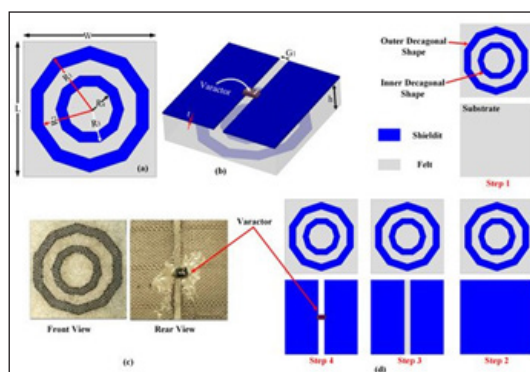
A fabric that blocks harmful radiations

By: Dr. Nitin Saluja

This article is based on the research paper titled Electrically Tunable Left-Handed Textile Metamaterial for Microwave Applications published Dr. Nitin Saluja from Chitkara University, Punjab in MDPI journal entitled Materials.

How would you choose your favorite shirts in future? The shirt which protects you from the mobile radiations increasing every day in the environment. Or it can be a shirt with continuous sensing of your blood pressure. The same is achieved by embedding the high frequency sensors and/or antennas in the shirts. Metamaterials can help in reduction of the radiations through its shape and can block harmful radiations through the textile fabrics we are wearing. Also, it should filter out undesired bands as per the instantaneous requirements. Hence, this paper presents the design of the flexible metamaterial structure which exhibit negative permittivity characteristics in the frequency range of 2.74 to 5.51 GHz, 8.54 to 10.83 GHz and 10.63 to 13.79 GHz. The proposed metamaterial also offers the negative permeability and the negative permittivity in the mentioned later two frequency bands. The metamaterial requirement was to address the following two challenges -

- The first challenge was to achieve the required band characteristics within the desired frequency band. It has been achieved with the help of decagonal shaped split ring resonator and a slotted ground plane. The same has been achieved by designing 2X2 unit cells array. The tunability has been achieved with the selection of 1X2, 2X1 and 2X2 unit cells. The frequency range is tunable with the DC bias of varactor diode.
- The second challenge was to achieve the flexibility of the material as it can take any shape in while wearing the garment. It has been achieved by proving the minimal dependencies on the material conformal shapes. The designed material in this paper is flexible and can take any shape without altering the performance. The simulations and the experimental results presented are in good agreement in the paper.



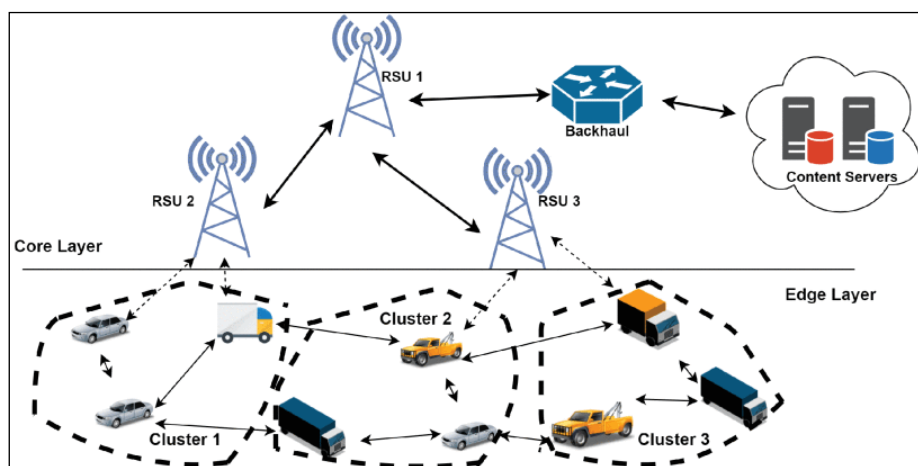
The illustration has been borrowed from this research paper.

Faster multimedia streaming using ICN-based technique

By: Divya Gupta

This article is based on the research paper titled ICN-based Enhanced Cooperative Caching for Multimedia Streaming in Resource Constrained Vehicular Environment published by Divya Gupta and Dr. Shalli Rani from Chitkara University, Punjab, India in IEEE Transactions on Intelligent Transportation Systems.

With the global share and rapid increase in multimedia applications on the internet, the demands of users to get them accessed are increasing prominently. Also, traffic on the internet is increasing exponentially with an increase in the demand for multimedia content by different users on the network. Each user in the network wish to access content with better quality of experience. Nowadays, passengers and even drivers in autonomous vehicles too expect efficient steaming of demanded multimedia content while travelling on the road. In traditional IP based networks, the high mobility of vehicles and short transmission range of infrastructure components offer low performance in terms of content access delay and high network overhead. Moreover, the IP based solutions undergoes address management issues due to ever increasing connected devices on internet. The information centric networking (ICN) is proposed as a promising solution to deal with the IP based address and mobility management issues. The ICN offers content name based searching where demanded content can be fetched from any device carrying the required content copy in contrast to conventional IP's address space searching where content has to be retrieved from target device only. This leads ICN to be referred as a data centric approach instead of host centric approach. Due to the several benefits associated with ICN, it is blended with vehicular networking to provide better quality of experience (QoS) to users. In-network caching is one of the most important inherent feature of ICN along with reduced path stretch, low content retrieval delay, content security and mobility management. Even though challenges are still existing in caching content inside network nodes (such as road side units (RSUs) and on board units (OBUs)) in vehicular environment due to limited resources available to these network components. Moreover, secure delivery of cached content to user is another issue needs to be addressed.



The illustration has been borrowed from this research paper

To promote network performance while dealing with the above mentioned challenges, this paper proposed cooperative caching scheme inside hierarchical network architecture which jointly considered cache location along with combined content popularity and predicted future rating score for deciding content caching inside vehicular network. For hierarchical configuration, the network is classified into two layers where components in edge layer are further categorized in to clusters and core layer mainly comprises core network components which includes RSU, Base Station (BS) and backhaul. The selection of cluster heads among each cluster nodes is performed through weighted clustering algorithm (WCA) which is essential for deciding cache location. The content caching probability is computed through probability matrix where both content popularity and predicted future rating goes into consideration. The user's preferences are predicted dynamically using non-negative matrix factorization (NMF) - a machine learning technique which eventually provides prediction of future rating. The proposed scheme can therefore efficiently cache content after selecting both cache location and content to cache. In addition, the secure delivery of cached content to legitimate user is provided through user authentication at edge nodes. The simulation results proved the significant performance of the proposed scheme in terms of improved cache hit ratio, reduced number of hops required and low content retrieval delay.

Use of DSP techniques in condition monitoring of machining processes in industries

By: Rajwinder Kaur and Meena Pundir

This article is based on the research paper titled Applications of Digital Signal Processing in Monitoring Machining Processes and Rotary Components: A Review published by Dr. Deepam Goyal from Chitkara University, Punjab, India in IEEE Sensors Journal.

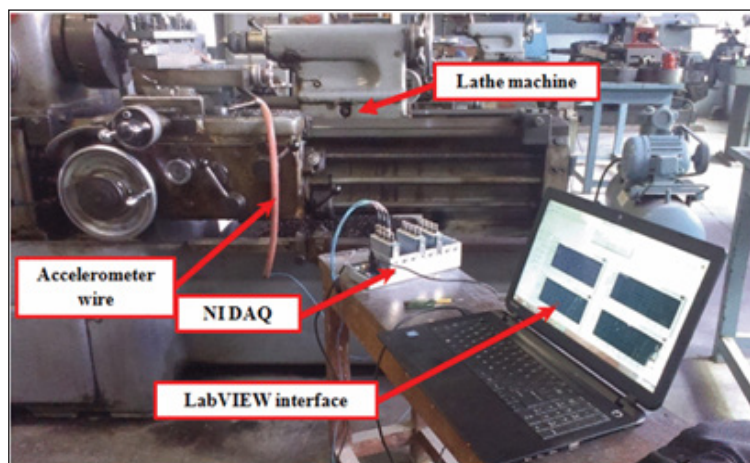
Condition monitoring is a significant requirement for ensuring safe and reliable working of machining processes and rotary components. Recent developments in digital signal processing techniques along with emergence of miniature sensors and high-speed data acquisition devices furnish a peculiar opportunity for the development and implementation of effective, in-situ, non-intrusive condition monitoring methods for a broad range of machining processes and rotary components. The selection of most appropriate signal processing technique, best suited for a particular application, is a major challenge in the field of condition monitoring, especially when working in a competitive industrial environment.

This problem can only be solved if one has a thorough understanding of various aspects such as which parameter to be monitored, aim of monitoring, processing limitations and possible future scope of such monitoring method. DSP techniques have grown a lot not only in numbers but also in terms of quality in recent years and this growth rate will only increase as each day appear new developments in related hardware as well as software.

Signal processing methods applicable to machining processes and rotary components have been investigated in relation to the parameters monitored, purpose of monitoring and future scope for that method. Limitations of such processing methods have also been reviewed to make the reader aware of disadvantages in using a particular signal processing method. Time-domain based signal processing methods used statistical condition parameters such as mean, peak, peak-to-peak interval, variance, root-mean-square error, crest factor, kurtosis and probability density. However, frequency related issues can be better resolved by using frequency domain methods such as fast-Fourier transform, short time Fourier transform, wavelet transform and Hilbert transform. Further in order to deal with high noise problems, one should use some enveloping method such as classical envelope analysis approaches, wavelet filters but these suffer from frequency band selection related problems which can be overcome by using Hilbert-Huang transform method. Further, empirical mode decomposition should be used to solve the problems related to central frequency choice of filter but at the expense of high computational cost.

Thus, it is concluded that blind application of any signal processing technique and the empirical setting of thresholds, can work fine during detection, but not appropriate in assessing seriousness or extrapolating previous and present states into future. The efficacy of diagnostic and prognostic also depends on nature of features derived from signals generated during machining operations.

Keeping this in mind, authors have discussed different DSP methods applied in monitoring the condition of machining processes and rotary components, with the goal of providing the researchers an opportunity to agree on and choose the most suitable signal analysis tool and outstanding fault representative features for their use in prognostic methods. This article is intended as a valuable guide for researchers to assist in identification and application of the best possible condition monitoring method for machining processes and rotary components.



The illustration has been borrowed from this research paper

2 Funded Projects worth INR 1 Crore Bagged by CURIN

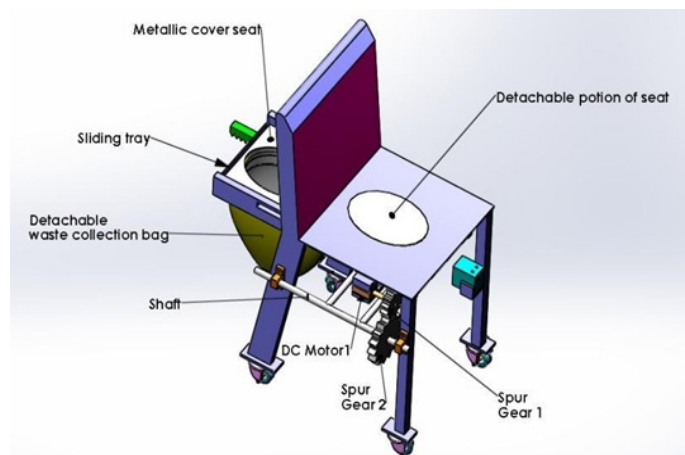
INR 57.48 Lacs from DRDO and INR 43.37 Lacs under TIDE Scheme (Govt)

Researchers at Chitkara University Research and Innovation Network (CURIN) are already doing as many as 13 Government of India (Govt) funded projects, and very recently two more projects worth INR 1 Crore have been sanctioned by Govt to CURIN.

The first project worth INR 57.48 Lacs has been bagged by The Centre of Excellence of Artificial Intelligence and Cyber Security, CURIN and it has been sanctioned by DRDO under the Extramural Research (ER & IPR) Scheme. The project is titled *Design and Implementation of an Intelligent Security Framework for Providing Confidentiality and Authentication to Defence Voice-Communications using Polynomials with the FPGA Implementations*. Dr. K.R. Ramkumar is the Principal Investigator (PI) of the project and Dr. Sudesh Mittal and Dr. Amanpreet Kaur are the Co-PIs. The main objective of this project is to design and implement a quantum safe security algorithm using polynomials to provide confidentiality over the defence voice communications that mitigates current and future security attacks, the same will be implemented as a hardware design for protecting futuristic IoT communications. The emerging quantum computing is a biggest threat to the existing standards of network security algorithms. Researchers are working to discover a new generation of quantum safe and post quantum cryptography algorithms. This research group has designed a novel post quantum cryptography algorithm that provides confidentiality, integrity, and authentication along with a highest data compression rate. The duration of the project is three years.



The second project is titled *Smart Ergonomic Portable Commode Chair* by a team comprising of Dr. Naveen Kumar (PI), Dr. Surya Narayan Panda, Dr. Rajesh Kumar Kaushal, Dr. Kalpna Guleria, and Dr. K.S. Bath from IoT and Cloud Computing Lab. The project has been sanctioned under Technology Intervention of Disabled and Elderly (TIDE) Scheme by the Ministry of Science and Technology, Govt. of India, New Delhi and the sanctioned amount is INR 43.37 Lacs. This project specifically targets the disabled and elderly patients who find it difficult to move even for the basic activities of life such as defecation. This situation

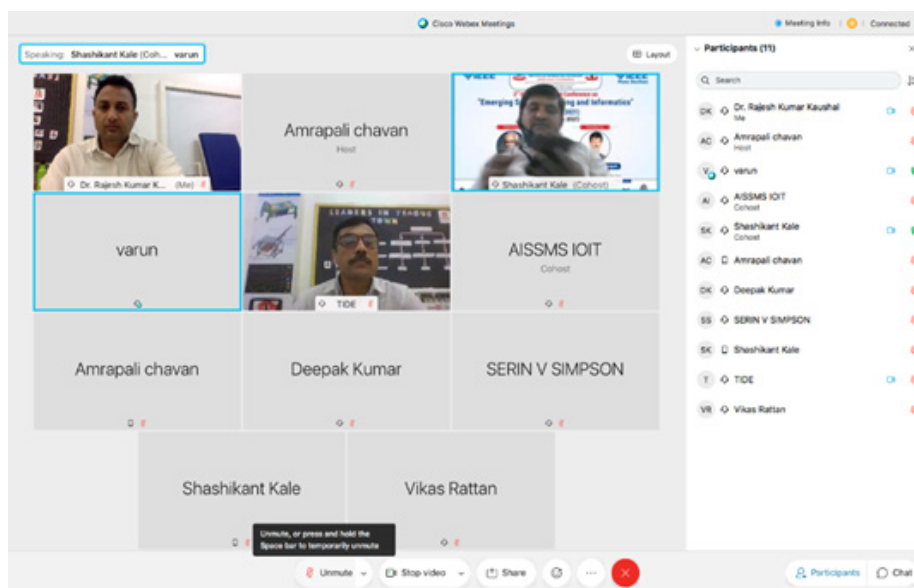


is even more critical when the lower limbs of a person become partially or fully disabled. Therefore, the proposed project has a wide scope for elderly and disabled population.

Faculty Members from IoT and Cloud Computing Lab Chaired Sessions in International Conferences

Dr. Surya Narayan Panda (Director, Research), Dr. Rajesh Kaushal (Associate Professor) and Dr. Naveen Kumar (Assistant Professor) chaired a paper presentation session in IEEE International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE 2021) organized by GCET, Greater Noida on March 4, 2021.

Dr. Rajesh and Dr. Naveen also chaired a special session on Internet of Things: Research and Innovations in the 3rd IEEE International Conference on Emerging Smart Computing and Informatics (IEEE-ESCI-2021) organized by All India Shri Shivaji Memorial Society's Institute of Information Technology, Pune from March 5-7, 2021.



24 Consultancy Projects initiated during January – March 2021

CURIN facilitated 24 consultancy projects that have been carried out by various faculty experts from different departments of the university during January – March 2021. Titles of some of the prominent consultancy projects are –

- ProVitIron rich nutritious bar
- To propose method for the preparation of solution for Sealing HPMC hard capsules.
- Pre and post film production guidance
- Evangelising digital technologies among teachers of CBSE affiliated schools
- Execution of organic horticulture in Murthal
- Structural equation modelling using SmartPLS software

As per the consultancy policy of Chitkara University, 90% of the consultancy fee is retained by the project heads.

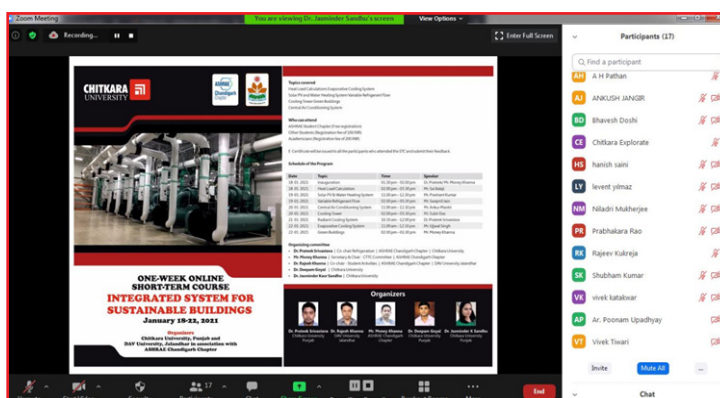
Workshops and Expert Talks Conducted with National and International Collaborations

6 workshops conducted with 6 different national and international collaborations

CURIN faculty members conducted several workshops and experts talks in collaboration with different national and international organizations/bodies. Details of all these workshops have been covered in this story.

One week course on integrated system for sustainable buildings

CURIN, Chitkara University, Punjab in collaboration with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) and DAV University, Jalandhar conducted a one-week short-term course on Integrated System for Sustainable Buildings during January 18 -22, 2021. 32 participants from various institutions and universities participated in the workshop in which following topics were covered - heat load calculations; evaporative cooling system; solar PV and water heating system; variable refrigerant flow; cooling lower green buildings; and central air conditioning system. Mr. Money Khanna (Secretary and Chair, ASHRAE Chandigarh Chapter), and Dr. Rajesh Khanna (Co-Chair, ASHRAE Chandigarh Chapter; DAV University, Jalandhar) supported the program. Dr. Prateek Srivastava, Dr. Deepam Goyal and Dr. Jasminder Kaur Sandhu from Chitkara University organized this workshop and Dr. Prateek was also one of the resource persons. The program witnessed active participation from academia and industry alike from India as well as from abroad.



Workshop on interactive tools for virtual and augmented reality

Immersive & Interactive Technology Laboratory (IITL), CURIN organized a hands-on workshop on Interactive Tools for Virtual and Augmented Reality during February 3-7, 2021. The workshop was conducted in collaboration with Science, Technology, and Innovation (STI) Hub (Catalyzed and supported by Ministry of Science and Technology). The IITL team comprising of Dr. Gurjinder Singh, Dr. Bhanu Sharma, Dr. Neha Tuli, Mr. Narinder Pal Singh, Mr. Shivam Sharma, Ms. Shubham Gargish under the supervision of Dr. Archana Mantri - Vice-Chancellor, Chitkara University, Punjab and Head, IITL Lab was instrumental in delivering such a productive workshop. It was attended by faculty members as well as research scholars and students from different institutions of the country. Participants were overwhelmed by the



capabilities of AR, VR, MR gadgets such as Epson Moverio Smart Glasses, EEG Module (NeuroSky), Lampix, HoloLens, Azure Kinect Developer Kit, Oculus Go Virtual Reality Headset, HTC VIVE COSMOS. Industry experts Mr. Rushiil and Mr. Khushal from Fore Excel India Limited delivered sessions on these gadgets and discussed their technicalities

Science for Fun 2021 – A one day event organized for school students

Center for Water Sciences, CURIN, Chitkara University organized Science for Fun 2021, on March 4, 2021 for primary school students of Standard 3 to 5. The day started with the trees plantation and school students along with their teachers planted trees on the Chitkara University campus. Various science experiments were conducted for the students in the event. Students really enjoyed and participated in those experiments. They enjoyed every moment whether it was demonstration of Phytoremediation or magic tricks in science. Various science experiments related to our day-to-day life were also demonstrated to these students, and in order to give them a flavor of technology, AR/VR-based games were showcased to them. Close to 50 school students participated in this program.



Two-day workshop on learning mathematics through Origami

Chitkara University, Punjab in collaboration with Punjab State Council for Science and Technology (PSCST), Chandigarh and with support from National Council for Science and Technology Communication (NCSTC), DST, New Delhi organized a two-day workshop on Learning Mathematics through Origami during March 13 - 14, 2021. It was delivered by renowned origamist Mr. V.S.S. Sastry who has been conducting numerous such programs for visualization of mathematics concepts. Dr. Archana Mantri - Vice-Chancellor, Chitkara University Punjab, and Dr. K.S. Bath - Joint Director, PSCST, Chandigarh participated in the inauguration ceremony of the program and they motivated the participating students.

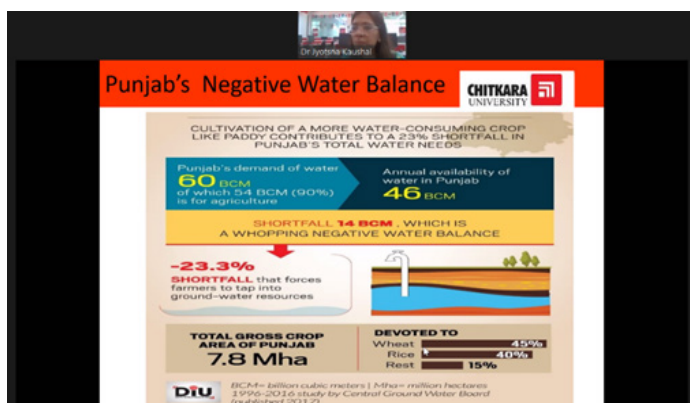


Mr. V.S.S. Sastry illustrated various mathematical concepts through origami models which included visualization of Pythagoras theorem, obtuse, acute angle, quadratic equations, conceptualization of various mathematical formulas, number sets, and platonic solids: tetrahedron, octahedron, hexahedron, dodecahedron, and icosahedron. Conceptualization of arithmetic progression, geometric progression, pie model, folding of parabola, ellipse, hyperbola, and hyperbolic paraboloid was also provided.

Dr. S.N. Panda – Director (Research), CURIN and Dr. Kalpna Guleria - Associate Professor, CURIN coordinated this program.

One day seminar on the occasion of World Water Day

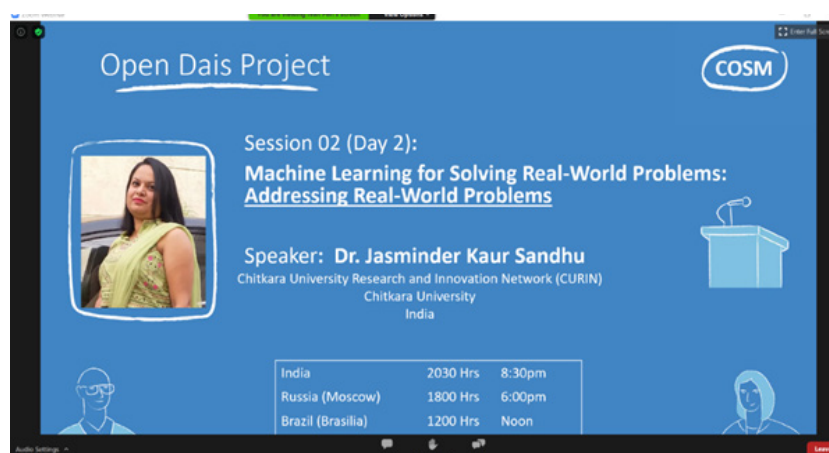
Dr. Jyotsana Kaushal – Professor, CURIN along with experts Prof. Tejo Prakash and Mr. Lohit Jain delivered a one day seminar on the topic Valuing Water. This event was conducted on March 22, 2021 to mark the World Water Day. The event included discussion on the topics like water security and scarcity, land of five rivers - then and now, water structure in arid regions etc. It was attended by 150+ participants from all over the country. The event also featured a detailed discussion on the parameters for defining the water quality used in daily life.



One week open expert talks on Machine Learning for real-world problems in collaboration with ITMO University Russia

Open dais is an education platform that provides an opportunity to researchers around the world to connect with the domain experts anywhere in the world. On this platform all the latest technology areas and upcoming technologies are discussed and this forum is a joint effort of Chitkara University, India and ITMO University, Russia. On this platform, CURIN successfully conducted five-day of open expert talks on the topic Machine Learning for Real-World Problems during March 23 – 27, 2021. These talks were focused on introduction to machine learning, real world application areas of ML, implementation of machine learning models, regression and classification and hands-on experience of using R and Python. It was attended by 182 students and faculty members from different countries. Experts from CURIN who delivered their talks in this program were Dr. Deepam Goyal (Assistant Professor), Dr. Prateek Srivastava (Associate Professor) and Dr. Jasmininder Kaur Sandhu (Assistant Professor). Dr. Jasmininder was also the coordinator of the program. Research Scholars from CURIN including Himanshi Babbar, Shanu Bhardwaj, Dimple Nagpal, Meena Pundir also attended and benefited from this program.

Dr. Jasmininder Kaur Sandhu was also invited to deliver an expert talk on the topic Machine Learning: Real-World Applications and Programming Aspects by the Department of Computer Science & IT, University of Jammu on March 20, 2021.

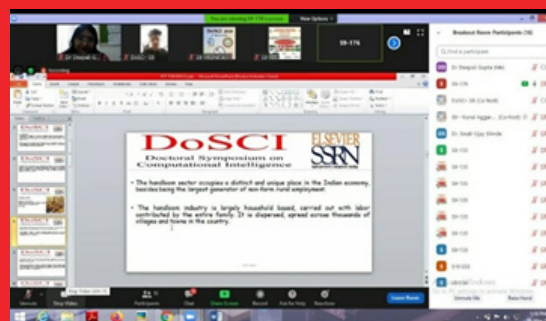


Dr. Deepali Gupta from CURIN participated as resource person in three events

Dr. Deepali Gupta – Professor was invited to chair a paper presentation session in 2nd Doctoral Symposium on Computational Intelligence (DOSCI 2021) that was held on March 6, 2021 and was organized by Institute of Engineering and Technology, a constituent college of Dr. APJ Abdul Kalam Technical University, Lucknow. The track she chaired was titled Decoding Real-world Applications using Computational Intelligence.

On the same day she participated as one of the panel members in the panel discussion event titled Women in Technology 2021. It was organized by Department of Computer Science and Engineering, Chitkara University, Punjab under Chitkara University ACM Student Chapter and Institution's Innovation Council (IIC). The event aimed at empowering girls and women to excel in science, technology, engineering etc.

She also chaired a paper presentation session in First International Conference on Intelligent Robotics, Mechatronics and Automation System (IRMAS 2021) organized by the Centre for Automation School of Mechanical Engineering, Vellore Institute of Technology, Chennai and it was held during March 26-27, 2021.



NewGen IEDC and TEC Activities

18 progress presentations of NewGen IEDC projects, 3 webinars with MSMEs

- On January 23, 2021, Chitkara University NewGen IEDC conducted a get-together event in order to appreciate the support of all those people from Chitkara University who support day to day activities of NewGen IEDC. These people include faculty members from various departments of the university who do review of NewGen IEDC projects and provide technical inputs on continual basis, as well as members from various administrative departments who help us in managing the funds that we have received under this project from Govt. The event was very well received by all the participants, as many as 50 people were invited to attend this event where Dr. Archana Mantri - Vice Chancellor, Chitkara University, Punjab and Chief Coordinator, Chitkara University, NewGen IEDC presented token of appreciation to each one of them.



NewGen IEDC is a program launched by National Science and Technology Entrepreneurship Development Board (NSTEDB), Department of Science & Technology (DST), Government of India and is implemented by Entrepreneurship Development Institute of India (EDII), Ahmedabad, Gujarat. Under this project Chitkara University has received funding of INR 2.87 Crores for the period of five years to support prototyping requirements of at least 100 students' projects. All NewGen IEDC activities are carried out under CURIN.



- During January 28 – 30, 2021, Chitkara University NewGen IEDC conducted annual progress presentations of 18 projects that have received prototyping funding from NewGen IEDC in the year 2020. Student applicants of each of these projects along with their mentors discussed current status of their projects, challenges, future plans and timeline of completion. These sessions were chaired by Dr. Archana Mantri – Vice Chancellor, Chitkara University, Punjab and Chief Coordinator, Chitkara University, NewGen IEDC. The evaluation committee that comprised of faculty members from different departments of the university included Dr. Harvinder Singh (Asst. Prof., Mechanical Engineering), Dr. Abhineet Saini (Associate Prof., Mechanical Engineering), Mr. Gupreet Singh (Asst. Prof., Mechatronics Engineering), Mr. Jagdeep Singh (Asst. Prof., Civil Engineering), Ms. Nishu Bali (Asst. Prof., Computer Applications), Mr. Sumit Kumar (Applied Engineering), and Mr. Amit Kumar (Asst. Prof., Electronics & Communication Engineering).

tion Engineering). The committee members gave their valuable suggestions to the applicants in addressing various challenges students were facing in their projects. The brainstorming that took place during the Q&A sessions generated a lot of new ideas and also led to the formation of new interdepartmental collaborations for completion of some of these projects. The other objective which was to ensure that applicants meet the timeline of their projects was also achieved in these presentations.



- Chitkara University has Govt. of India sponsored Technology Enabling Center (TEC), where the prime objective is to develop an ecosystem in which universities' research/technologies can be used by the MSMEs in addressing various challenges. In order to connect faculty members from our university with the MSMEs in the region, three webinars were conducted in the month of January 2021. These webinars were delivered by representatives from three different MSMEs in the region and more than 100 faculty members from Chitkara University participated in these sessions. After these webinars some of our faculty members approached these MSMEs and they have been able to start joint projects with them. Following are the details of the webinars that were organized –

CHITKARA UNIVERSITY | **GOVT. OF INDIA**
NOVATE+ 2021
 Confluence of Academia, MSMEs and Start-ups to Address Real World Problems

Chitkara University Technology Enabling Centre (CU-TEC)
 Funded and supported by Govt. of India

Presents
MSMEs – Academia Connect Series
 To forge industry-academia collaborations for working on joint projects

Webinar on
Generating Fuel Free Electricity using Force from Moving Vehicles
 A Patented Invention

January 27, 2021 | 2:30 – 3:00PM

Resource Person
Mr. Pawan Bansal
 Industrialist, Inventor and MD
 Bansal Paper Board Mills, Muktsar, Punjab

Register by 26th January, 2021

Registration Link: <http://tinyurl.com/tec-webinar-3>

- o Design and Development of Fire Alarm System for Commercial and Residential Buildings – By Mr. Sumit Grover - Genesis Controls, Ludhiana
- o Design and Development of Injector Driver Circuit for Diesel Engine to Reduce Air Pollution – By Mr. Yogesh Kalia – Medhaavi Centre for Automotive Research, Hoshiarpur.
- o Generating Fuel Free Electricity using Force from Moving Vehicles – By Mr. Pawan Bansal, Bansal Paper Board Mills, Muktsar, Punjab

Patents Filed by CURIN Faculty Members and Scholars

18 Patents Filed During January – March 2021

List of Utility Patents

Sr.No.	Title	Inventors	Application No.
1	AIR QUALITY CONTROL DEVICE IMPLEMENTED WITH AN AIR CONDITIONING UNIT	Rakesh Ahuja, Yash Kumar and Akash Kakran	202111001072
2	APPARATUS AND METHOD FOR AVOIDING COLLISION BETWEEN DOOR AND MOVING OBJECTS	Sonam Mittal, Manish Singla and Harsh Chopra	202111010084
3	ASSEMBLY TO FACILITATE SUPPORTING ENTITY ON STRETCHER	Neha Sharma and Tarandeep Kaur Bhatia	202111001073
4	COMPOSITION FOR PRESERVING STORED GRAINS	Pooja Mahajan and Jyotsna Kaushal	202111000281
5	DISINFECTING AND DRYING APPARATUS FOR CLOTHES	Bhanu Sharma, Ashwani Singh, Archana Mantri, Deepika Sharma, Amandeep Kaur, Meenu Khurana, Poonam Jindal, Geetanjali, Krishan Dutt Sharma and Shubham Gargrish	202111014168
6	EAR RECOGNITION AND AUTHENTICATION DEVICE AND METHOD	Tarandeep Kaur Bhatia and Arshdeep Singh	202111001231
7	EDUCATIONAL DEVICE FOR CHILDREN	Shalli Rani, Himanshi Babbar and Deepali Gupta	202111008795
8	ELECTRONIC EQUIPMENT VISUALIZATION SYSTEM AND METHOD	Gurjinder Singh, Archana Mantri, Bhanu Sharma, Narinder Pal Singh and Rashpinder Kaur	202111004157
9	HOLOGRAPHIC SCREEN CREATION SYSTEM AND METHOD	Tarandeep Kaur Bhatia and Arshdeep Singh	202111007396
10	MULTIPURPOSE FOOTWEAR	Kanwalpreet Kaur, Deepali Gupta, Kamali Gupta, Sheifali Gupta, Vishal Verma, Tirpti Sharma, Raman Gupta, Rupesh Gupta, Soumya Rajan Nayak, Malvinder Singh Bali, and Rakesh Goyal	202111011180
11	NEEDLE STICK INJURY DETECTION DEVICE	Kamalpreet Singh Bhangu, Jasminder Kaur Sandhu, and Amanpreet Kaur Shergill	202111003274
12	ORAL CARE ASSEMBLY	Tarandeep Kaur Bhatia, Sarvesh Tanwar, Neha Sharma, and Sonam Mittal	202111007608

Industrial Design Registrations

CLOCK

By - Tarandeep Kaur Bhatia and Arshdeep Singh

Application No. – 339178



CONVERTIBLE WHEEL CHAIR

By - Surya Narayan Panda, Simranjeet Singh, Naveen Kumar, Rajesh Kumar Kaushal, Tribhav Goel and R.P.S Bedi

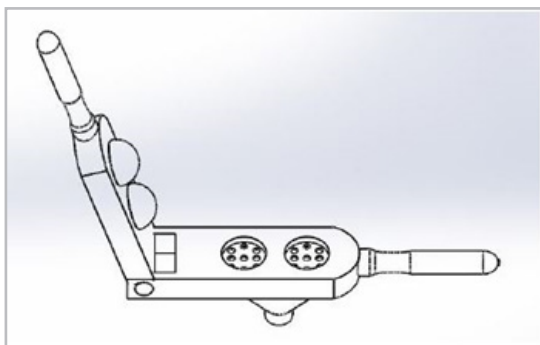
Application No. – 339657



LEMON SQUEEZER WITH RAMUNE OUTLET

By - Shalom Akhai, Prateek Srivastava, Venktesh Sharma, Amit Bhatia

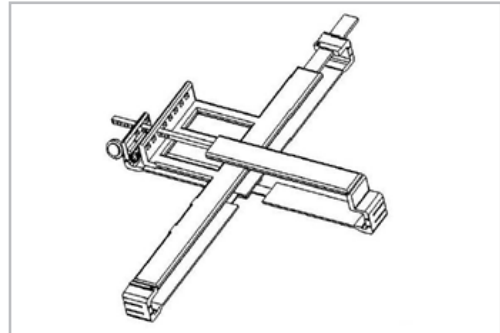
Application No. – 339381



LOCKING DEVICE FOR LAPTOP

By - Rajesh Kumar Kaushal, Naveen Kumar, Simranjeet Singh, Surya Narayan Panda and Suresh Limkar

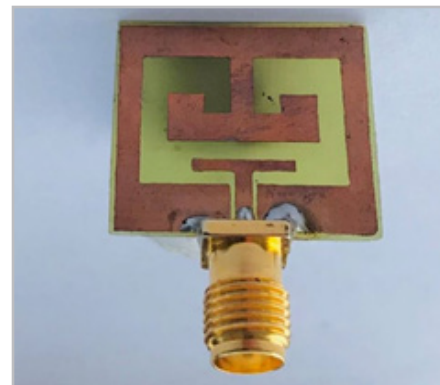
Application No. – 340484



MULTIBAND ANTENNA FOR BLUETOOTH AND X-BAND

By - Shivani Malhotra, Manish Sharma, Rajeev Kumar and Aarti Bansal

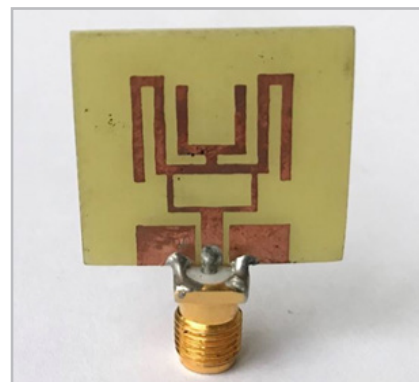
Application No. – 339169



UWB ANTENNA FOR IMAGING APPLICATIONS WITH DUAL FILTERS

By - Manish Sharma, Shivani Malhotra, Rajeev Kumar and Maninder Singh

Application No. – 337873



Key Activities of Doctoral Research Centre (DRC), Chitkara Business School (CBS)

Awards and Recognition, Invited Talks, Participation in Conferences etc.

Awards and Recognition

Dr. Amit Mittal – Professor and Dean, DRC, CBS received two prestigious awards during the Chitkara University Research Excellence Awards 2021 held on February 27, 2021. The first one was the Highest Cited Researcher award at the university level and second one was the award for Highest Cumulative H-Index from Business School.

In the same event Dr. Arun Aggarwal and Dr. Deepika Jhamb from DRC, CBS received certificate of appreciation. Dr. Arun Aggarwal also won a Best Conference Paper Award in a conference that was held at IMS Ghaziabad in February 2021. His paper was titled Understanding the basic Fraud Models and Advancing the Fraud Theory with Integrity Model.



Expert Talks Delivered

- M.D. University, Rohtak invited Dr. Amit Mittal on three occasions during March 8 – 17, 2021 to deliver experts talks for their faculty under Pandit Madan Mohan Malaviya National Mission on Teacher and Teaching (PMMMNMTT), MHRD, Govt. of India program. The titles of his talks were Carving out Quality Research Publications; Current Trends in Global Higher Education and its Influence on Indian Higher Education; and Evolution of Higher Education Sector of India.

He was also invited as keynote speaker by Neville Wadia Institute of Management, Pune for their inauguration of PhD Batch on March 20, 2021.

- On March 20 and 21, Dr. Arun Aggarwal delivered an Online Workshop on Mixed Method Approach for the research scholars of the university.
- Dr. Deepika Jhamb was invited by Neville Wadia Institute of Management, Pune on March 28, 2021 to deliver an expert talk. She delivered a talk on the topic Level of Measurement and Effective Questionnaire Designing.

Participation in a Conference

Dr. Urvashi Tandon presented a paper titled Gamification, VTO, E-Logistics Service Quality as Predictors of Online Shopping: An Empirical Investigation in the 7th International Communication Management Conference (ICMC) 2021 held during January 7-9, 2021 and was organized by Texas Moody, USA.

Other Activities

Workshops, Conferences, Webinars attended by Our Faculty Members and Research Scholars

- Ms. Dimple Nagpal (PhD Scholar) has successfully completed AICTE sponsored two-week online Faculty Development Programme on Computer Vision and Image Processing: Research Issues, Innovation and Application. It was organized by PSNA College of Engineering and Technology, Tamil Nadu during January 20 – February 4, 2021.

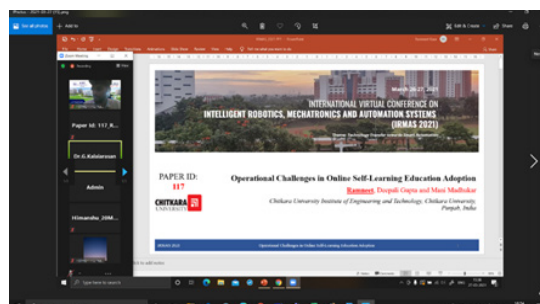
She also presented a paper titled *Hypertensive Retinopathy Screening through Fundus Images - A Review* in the 6th International Conference on Inventive Computation Technologies (ICICT-2021) organized by RVS Technical Campus during 20-22 January, 2021 at Coimbatore, India.

- Ms. Mudita (M.E. Scholar) participated in a national level webinar series titled Cutting Edge Technologies organized by the Department of Computer Science, Kaypeeyes College of Arts and Science, Corsley Hill, Kotagiri and it was held on February 1, 2021.

In addition, she also participated in the International Conference on Machine Learning and Neural Information Systems (ICMLNIS-2021) during March 18-19 that was organized by SVMADC, Tamil Nadu and National Seminar on Publications and Research Ethics organized by Chitkara University Publications on March 17, 2021. She was awarded a Certificate of Excellence for successfully completing a course titled Basics of Coding conducted from January 2021 to March 2021.

Mudita also presented a paper titled *A Comprehensive Study of Recommender Systems for the Internet of Things* at the International Conference on Intelligent Robotics, Mechatronics and Automation Systems (IRMAS 2021) held during March 26-27, 2021 and was organized by Centre for Automation and School of Mechanical Engineering, Vellore Institute of Technology (VIT), Chennai. In the same conference Ms. Ramneet (Research Scholar) presented a paper titled *Operational Challenges in Online Self-Learning Education Adoption*.

- Dr. Mohd. Junedul Haque (Assistant Professor) participated in a special lecture on Quality Management in Research that was held on February 19, 2021 and was organized by Doctoral Research Centre, Chitkara School of Health Sciences, Chitkara University, Punjab. The lecture focused on establishing research quality management cell, quality screening of research, management of the cell, quality policies to be established etc.
- Dr. Naveen Kumar (Assistant Professor) presented a paper titled *IoT Based Smart and Portable System for Remote Patient Monitoring and Drug Delivery* in 1st International Conference on Mechatronics and Artificial Intelligence



organized by Association of Engineers & Technocrats, Faculty of Engineering & Technology, SGT University, Gurugram. It was held on February 26 – 27, 2021.

In the same conference Ms. Taniya Hasija (M.E. Scholar) under the guidance of Dr. Kalpna Guleria (Associate Professor) presented a paper titled *Out Domain Data Augmentation on Punjabi Children Speech Recognition using Tacotron*, and Ms. Meena Pundir (Ph.D. Scholar) under the guidance of Dr. Jasmininder Kaur Sandhu (Assistant Professor) presented a paper titled *Quality-of-Service Prediction Techniques for Wireless Sensor Networks*.

Dr. Naveen Kumar and Dr. Rajesh Kaushal (Associate Professor) have successfully completed online certification programme on Information Security Education Awareness. This Programme was conducted with support from Ministry of Electronics and Information Technology, Government of India. The topics covered during this course were cyber bullying, cyber ethics, password security, WhatsApp security, email security, cyber stalking and browser security.



- Mr. Amandeep Sharma, (M.E. Scholar) presented a paper titled *A Framework for Hotel Inventory Control System for Online Travel Agency using Robotic Process Automation* in International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE) 2021 which was held during March 4 - 5, 2021 at GCET, Greater Noida, India.

In the same conference Ms. Amandeep Kaur (M.E. Scholar) presented a paper titled *Feature Selection in Machine Learning: Methods and Comparison*, Ms. Rajwinder Kaur (M.E. Scholar) presented a paper titled *A Study on Security Attacks in Wireless Sensor Network* and Ms. Diksha Rana (M.E. Scholar) presented a paper titled *Robotic Process Automation for Prioritizing the Refund in Online Travel Agency*.

- Ms. Taniya Hasija (M.E. Scholar) under the guidance of Dr. Kalpna Guleria (Associate Professor) won the best paper award for their paper titled *Recognition of Children Punjabi Speech using Tonal Non-Tonal Classifier* which they presented in 3rd International Conference on Emerging Smart Computing and Informatics (ESCI) 2021. The conference was held during March 5 - 7, 2021 at AISSMS Institute of Information Technology, Pune, India.



In the same conference Mr. Simranjeet Singh (JRF) presented a paper titled *Design and Development of IoT Enabled Hybrid Wheelchair cum Bed*.

- Dr. Shalli Rani (Associate Professor) participated in One Week International Seminar on Electronics and Computing Technology (ISECT -2021) held on March 27 – April 1, 2021 and was organized by SUIT, Odisha, India.

Dr. Shalli Rani – Associate Professor, CURIN won the Lifetime Achievement Award and the Supervisor of the Year Award in an International Conference on Cyber Intelligence and Information Retrieval 2021 organized by the Institute of Engineering and Management, Kolkata, West Bengal.



List of Publications

CURIN faculty members and scholars have published research papers/book chapters in SCI and Scopus indexed journals, conferences, and books. This alphabetically sorted list contains all those publications that have been indexed in Scopus during January – March 2021.

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- [2] A. Kumar, A. Sharma, and R. Kumar, "A Swarm Intelligence-Based Quality of Service Aware Resource Allocation for Clouds," *International Journal of Ad Hoc and Ubiquitous Computing*, vol. 34, pp. 129-140, 2020.
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- [4] A. Pathania, R. Pandey, J. Madan, and R. Sharma, "Performance Evaluation of Lead-free Perovskite Solar Cell with Different Hole/Electron Transport Materials," in *2020 47th IEEE Photovoltaic Specialists Conference (PVSC)*, pp. 2288-2291, 2020.
- [5] C. Kaul, N. Kumar, and M. Sharma, "Tri-Band Monopole Antenna for UMTS (1920–2170 MHz), WiMAX (3.4-3.6 GHz) and WLAN (5.15-5.35 GHz) Wireless Applications," in *2019 3rd International Conference on Recent Developments in Control, Automation & Power Engineering (RD-CAPE)*, pp. 180-184, 2019.
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- [12] H. Bhatia, S. N. Panda, and D. Nagpal, "Internet of Things and its Applications in Healthcare-A Survey," in *2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)*, pp. 305-310, 2020.
- [13] H. Chauhan, D. Kumar, D. Gupta, S. Gupta, and V. Verma, "Blockchain and IoT based Vehicle Tracking System for Industry 4.0 Applications," in *IOP Conference Series: Materials Science and Engineering*, p. 012051, 2021.
- [14] H. Naz, S. Ahuja, and D. Kumar, "DT-FNN Based Effective Hybrid Classification Scheme for Twitter Sentiment Analysis," *Multimedia Tools and Applications*, vol. 80, pp. 11443-11458, 2021.
- [15] K. Guleria, A. K. Verma, N. Goyal, A. K. Sharma, A. Benslimane, and A. Singh, "An Enhanced Energy Proficient Clustering (EEPC) Algorithm For Relay Selection In Heterogeneous Wsns," *Ad Hoc Networks*, vol. 116, p. 102473, 2021.
- [16] K. Kapoor, S. Rani, M. Kumar, V. Chopra, and G. S. Brar, "Hybrid Local Phase Quantization and Grey Wolf Optimization Based SVM for Finger Vein Recognition," *Multimedia Tools and Applications*, vol. 80, pp. 15233-15271, 2021.
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 - [21] M. S. U. Islam, A. Kumar, and Y.-C. Hu, "Context-Aware Scheduling in Fog Computing: A Survey, Taxonomy, Challenges and Future Directions," *Journal of Network and Computer Applications*, vol. 180, p. 103008, 2021.
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 - [26] N. Kumar, S. Panda, P. Pradhan, and R. Kaushal, "IoT Based Hybrid System for Patient Monitoring and Medication," *EAI Endorsed Transactions on Pervasive Health and Technology*, vol. 5, 2019.
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