

Nurturing minds for a better world  
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IIT PALAKKAD

Sahyadri  
**TECH X PRESS**  
REFLECTIONS OF IIT PALAKKAD



## AT A GLANCE

*The Indian Institute of Technology in Palakkad is an autonomous premier science and technology institute under the Ministry of Education, Government of India. Nestled in the Sahyadri mountain range, IIT Palakkad swiftly emerged as one among India's foremost hubs for engineering education. With unwavering dedication to academic brilliance and holistic growth, we champion the mantra of "Nurturing Minds for a Better World".*



## DIRECTOR'S DESK



*Prof. A. Seshadri Sekhar*

It gives me immense pleasure to share the third edition of our institute newsletter, Sahyadri TechXpress, highlighting the vibrant achievements of IIT Palakkad over the past few months. As an institution focused on fostering innovation, research, and excellence, IIT Palakkad continues to excel with significant breakthroughs in various domains such as sustainable technology, artificial intelligence, data sciences, and material engineering. I am delighted to share that our NIRF ranking has improved from 69 to 64 this year reflecting our continuous efforts towards excellence and growth.

Our collaborations with industry leaders are evolving into fruitful partnerships that bridge the gap between academia and industry. IIT Palakkad had the opportunity to welcome several international delegations, including the University of Agder from Norway, the Embassy of France in India, Indobox Inc., Japan, University of Liverpool and sign MoUs with Peradeniya University in Sri Lanka, DAAD Germany, Swinburne University, Australia, University of Rennes and the Harare Institute of Technology, Zimbabwe.

IIT Palakkad has entered into a transformative partnership with the Mehta Family Foundation, a significant milestone

for the institute as a third-generation IIT, marked by the signing of an MoU. This collaboration paved the way for the establishment of the Mehta School of Data Science and Artificial Intelligence, which facilitates research opportunities and fosters advancements in Data Science and AI.

The recent industry events, 'TechConnect @ Coimbatore' and the sixth Industry-Academia Conclave, brought together leaders from diverse sectors. TechConnect marked IIT Palakkad's first industry event held at Coimbatore, attracting over 70 industries and associations with more than 100 delegates. The Industry-Academia Conclave 6.0 served as a vital platform for collaboration, with keynote sessions and panel discussions emphasizing the role of interdisciplinary efforts in driving technological innovation and addressing real-world challenges.

The sixth convocation was a significant event for the institute. The moment was a testament to the growth and evolution of our institution, reflecting not only the achievements of our students but also the collective efforts of our faculty and staff.

As we move forward, I am confident that IIT Palakkad will continue to grow as a center of excellence through a dedicated focus on impactful research, quality education and holistic development. I extend my heartfelt gratitude to our fraternity for the unwavering support that they have rendered. I encourage you to explore the diverse array of articles in this edition and actively contribute to the success of our newsletter with your readership and constructive suggestions.



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# LIMPSES



*Convocation 2024*



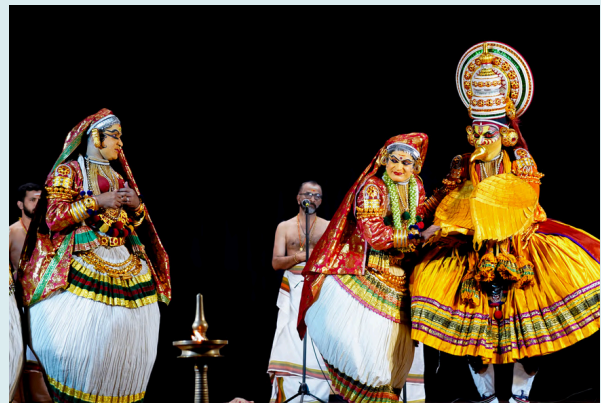
*MoU with Foundries Development Foundation*



*MoU with HIT, Zimbabwe*



*International Students' Meet*



*UG Orientation Program - Kadhakali*



*IAC 6.0*



*MoU with University of Liverpool*



*Mehtha Family School of Data Science and Artificial Intelligence*



*AICTE-QIP-PG Certificate Programme on 3D Printing*



*International Yoga Day*



*78th Independence Day Celebration*



*Science Camp Season 4*



*Plant for Mother Campaign*



## The IPTIF Journey: Forging the Path for Tomorrow's Innovations

IIT Palakkad Technology IHub Foundation (IPTIF) is a Section 8 company established by IIT Palakkad in 2020 as part of the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), supported by the Department of Science and Technology (DST), Government of India. IPTIF operates as a Technology Innovation Hub (TIH) with a primary focus on Intelligent Collaborative Systems (ICS), particularly driving advancements in automation within the Energy and Safety sectors, with additional focus on Healthcare, Agriculture, Automotives, and Defense, among others. IPTIF's mission aligns with India's national vision for technological self-reliance, promoting innovation, entrepreneurship, and international competitiveness.



*Fabrication Lab*

As part of the IIT Palakkad ecosystem, IPTIF fosters an environment conducive to translational R&D and technology/product



*Workshop on 'Advanced 3D Printing and Machine Assembly'.*

development. By encouraging technology translation and training programs on product development, IPTIF plays a crucial role in supporting innovation and nurturing new talent for building indigenous technologies. IPTIF also supports deep-tech startups through various entrepreneurship development programs and strategic investments. It has developed state-of-the-art research, prototyping, testing, and training facilities, such as a Motion Capture Lab for robotics and control, an advanced machining and fabrication lab, and a 3D printing farm to support rapid prototyping for mechanical and electrical projects. Additionally, a specialized motor and battery testing facility (upcoming) will support EV projects in the region, and a 20-seater skill development area will provide software and hardware-based training.

IPTIF has forged collaborations with academia, industries, venture capitalists, and government organizations, both nationally and internationally, to achieve its objectives. Some of its flagship programs, such as the IMPACT Program, Oorja Grand Challenge, Aarambh Pitch Competition, and Samarth Maha Utsav, have attracted some of the finest innovators and startups in the country. Over the past four years, IPTIF has made significant strides, supporting over 58 technology projects with more than 20 matured prototypes, 10 plus patents, one technology out-licensing, and 40 plus publications. IPTIF also boasts a network of 18 plus Entrepreneurs-in-Residence (EIRs) and 26 plus hardware startups associated with the Hub.



*ToT Agreement with Oceanautics Private Limited*

Furthermore, IPTIF has conducted 45 plus upskilling programs, provided 90 plus UG and PG fellowships, and impacted over 2,500 beneficiaries. IPTIF's collaborations with esteemed partners such as Swinburne University, Maruti Innovation, Bosch, Grid India, IKP EDEN, and IVY Camp further strengthen its innovation and technological advancement ecosystem. In the upcoming year, IPTIF plans to expand these achievements, with a particular focus on industry-relevant skill development and collaborative technology development.



*Warbler PSM Private Limited  
Fast charging three wheeler EV*



*Skill Development Area*



## **L-Tyrosine Capped Silver Nanocluster: An Alternative Probe for the Clinical Detection of Hemoglobin**

*Ms. Kavya P and Dr. Supratik Sen Mojumdar*

Hemoglobin (Hb) is an iron-rich tetrameric metalloprotein crucial for oxygen transport in nearly all vertebrates, transferring oxygen from the respiratory organs to the tissues. In healthy adults, normal Hb levels range from 12 to 18 g/dL. Low Hb levels can lead to anemia, a common hematological disorder that affects about one in five people globally, particularly adolescent girls, pregnant women, and preschool children. If left untreated, anemia can impair motor development in children. Furthermore, abnormalities in Hb structure and concentration are linked to various health conditions, including pulmonary fibrosis, congenital heart disease, heart failure, chronic kidney disease, strokes, erythrocytosis, and thalassemia. Therefore, accurate and periodic monitoring of Hb levels is critical for the effective

diagnosis and management of these diseases.

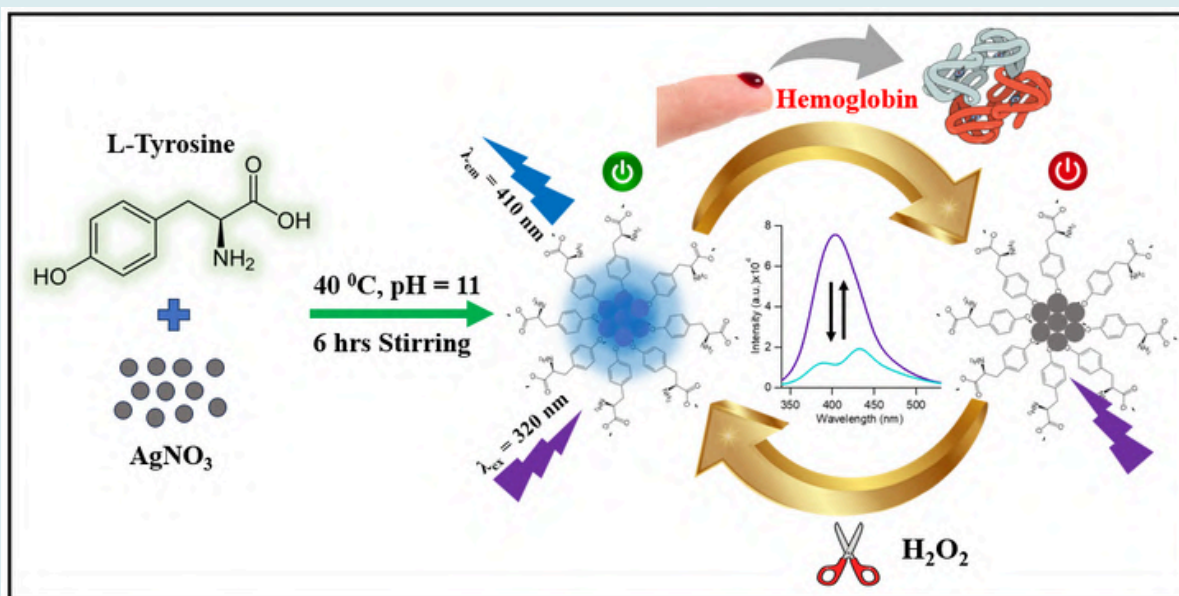
Several analytical methods have been developed for Hb detection, with the colorimetric method using cyanmethemoglobin being one of the most commonly employed clinically due to its accuracy and cost-effectiveness. However, this method involves the use of potassium cyanide, a potentially lethal reagent, and requires expensive laboratory equipment as well as skilled personnel for operation and interpretation. To address these challenges, Dr. Sen Mojumdar's research group at the Department of Chemistry, IIT Palakkad, has engineered a reusable luminescent nano-probe for the simple, rapid, and cost-effective detection of hemoglobin in real blood samples.



*Dr. Sen Mojumdar's Research Group*

The research group synthesized atomically precise L-tyrosine-protected photoluminescent silver nanoclusters (diameter ~2.5 nm) using a simple one-pot method. These nanoclusters exhibit strong photoluminescence (PL) that can be selectively quenched by hemoglobin (Hb) with high sensitivity (limit of detection = 30 pM), positioning them as a promising nano-probe for Hb detection. The observed PL quenching is attributed to the formation of a complex and static charge transfer between the nanocluster and hemin, the cofactor of Hb.

The Fe<sup>2+</sup> ion is crucial for this complex formation, which can be disrupted by hydroxyl radicals generated through the Fe<sup>2+</sup>-H<sub>2</sub>O<sub>2</sub> mediated Fenton reaction. This process restores the PL intensity of the nanocluster, ensuring its reusability. Unlike conventional clinical techniques that often involve toxic chemicals and costly equipment, this nano-probe enables quick, direct, and cost-effective quantification of Hb at the point of care. This innovation paves the way for portable Hb sensors that combine precision and efficiency.



Sample	Concentration of Hb obtained by our method (g/dL)	Concentration of Hb obtained from the Pathology Lab (g/dL)
Donor 1	12.6 ± 0.15	12.4
Donor 2	13.5 ± 0.2	13.5
Donor 3	12.2 ± 0.05	12

*Detection of Hb in real human blood samples*

## Urine fed Self-driven Stacked Electrochemical Resource Recovery Reactor for Smart phone Charging and Biofertilizer production

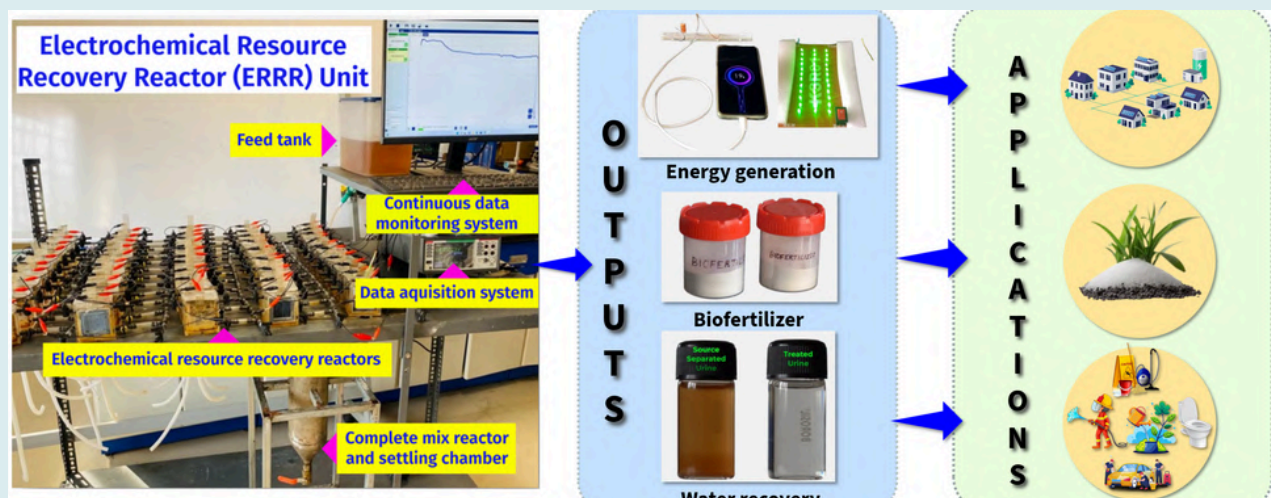
*Dr. Praveena G and Team*

The global statistics on the food-water-energy nexus pose a pressing need to break through centralized conventional practices and switch to decentralized or localized approaches. In this context, source-separated urine, which constitutes 95% water, 2% urea, and 3% nutrients and enzymes, can serve as an alternative source for water, fertilizer, and energy. A plethora of techniques have been researched and commercialized; however, these methods or technologies are limited by: (i) recovering only one value-added product; (ii) energy consumption; (iii) carbon footprint; (iv) centralization; (v) logistics; and (vi) skilled manpower.

The team led by Dr. Praveena Gangadharan from the Department of Civil Engineering at IIT Palakkad has developed a technology for

concurrent energy generation and biofertilizer production from source-separated urine. The technology comprises electrochemical resource recovery reactor (ERRR) units and a microgrid system for concurrent phosphate removal and energy production, ammonia adsorption units for ammonia and water recovery, and a disinfection unit.

The ERRR units recovered 99% of phosphate from source-separated urine as struvite, a slow-release fertilizer that can serve as an alternative to commercial fertilizers. The stacked ERRR unit produced a voltage of 7 V and a maximum power density of 40 W/m<sup>2</sup>. The electricity generated from the redox reactions charged 450 mAh and 2200 mAh smartphone batteries and powered 36 LED lights connected in series.



*Fig.1. - Outputs from the electrochemical resource recovery reactor unit and its potential applications*

The adsorption units recovered over 90% of ammonia and removed color and other organic constituents from the urine.

The treated urine or recovered water is pathogen-free, colourless, odourless, and can be used for non-potable applications such as irrigation, flushing and cleaning. The lab scale set up of the ERRR unit, its outcomes, and potential applications are presented in Fig. 1. Moreover, the innovation aligns with the emerging concept of circular economy and promotes indigenous business models. Furthermore, the research is in progress to enhance the power production and the overall efficiency of the technology. The innovation was recently exhibited in “InvenTive 2024”, the country’s largest R&D innovation fair at IIT Hyderabad

on 19th and 20th January, 2024 (Fig. 2(a) and Fig. 2(b)). The technology was also showcased to raise awareness about sustainable practices and the circular economy during the Institute open house held on 27-28 January 2024 (Fig.3). Furthermore, the team also engaged in fruitful discussions with delegates from both industry and academia during the Industry Academia Conclave 6.0, held on September 20- 21, 2024 (Fig.4).

This work was funded by the Science for Equity Empowerment and Development (SEED) division [No. SEED/SCSP/2021/166/G1], Department of Science and Technology (DST), Government of India (GOI). The developed technology is now being incubated under TECHIN.



Fig. 2(a) The team exhibiting their innovation at ‘InvenTive 2024’.

Fig. 2(b) Interaction with the honourable minister Shri. Dharmendra Pradhan, Minister of Education of India, during the event.



Fig. 3 - Institute open house



Fig. 4 - Industry Academia Conclave 6.0

## Conversation with Mr. Gaurav Saharan

*Given your background in the technical field, what motivated you to choose a career in the government sector over continuing in a technical or engineering role?*

In 2019, when our institute organized its first convocation, I wondered what the first convocation at the very first IIT would have been like. This curiosity led me to stumble upon the first convocation address of IIT Kharagpur by Jawaharlal Nehru. In his speech, Nehru emphasized that in the task of nation-building, administrators must be engineers, and engineers must be administrators. Consequently, the rigid divisions between technical and civil services were effectively eliminated. A seed was planted in my mind at that time.

Additionally, when I graduated in 2020, while many of my batchmates had impressive résumés and recommendations from professors, I didn't have much to show. The COVID-19 lockdown, however, provided me ample time to focus on my preparation. The biggest driving factor, aside from the desire to contribute to nation-building, was the vast knowledge this exam offered. I never had a favorite subject, and this exam is a boon for people like me who get bored quickly. For me, it was purely a knowledge-gaining process. Every day, I woke up excited to learn something worthwhile. Maybe that's why I didn't miss college that much—although I certainly did (and still do) miss the people.



Mr. Gaurav Saharan

Mr. Gaurav Saharan, is an alumnus of IIT Palakkad who made us proud by securing 28th rank in the Civil Services Exam conducted by the UPSC and got selected to the Indian Forest Service (IFoS). Mr. Saharan is a former student of B.Tech Mechanical Engineering who graduated in the year 2020.

*How did you manage your time and maintain a study routine while juggling the demands of engineering and UPSC preparation?*

I started preparing after graduation, so there was no need to balance my time; I could focus entirely on the Civil Services Exam. I aimed to maintain a manageable, fixed schedule with both short-term and long-term objectives.

*What motivated you to choose IIT Palakkad after completing your 12<sup>th</sup> grade? How do you feel about your decision to join the institute back when you started, compared to how you feel about it now?*

Looking back, if I were ever given the chance to remake my choices, I would still choose IIT Palakkad—provided the same set of people were there, especially the first two batches. With a limited number of seniors and peers, the best part was that you could meet anyone and talk about anything. The spectrum ranged from discussing FIFA with Ishrat to learning Dota with Adithya Oblicity, and even last-minute test-passing techniques from Chaitanya Khawase. These moments were intriguing enough to make me want to relive them. Compared to older IITs, where individuals tend to live in small silos and isolate themselves—hindering personality development—our experiences fostered richer interactions. These enriching experiences, beyond academics, helped us face the realities of life after graduation. After all, education is what remains when one forgets what they have learned.

*Can you share a particularly challenging moment during your preparation journey, and how you managed to overcome it?*

The Civil Services Exam is an annual examination comprising three stages: Prelims, Mains, and Interview. The most painful, difficult, and depressing part of the process was the recurrent failure at the Prelims stage. Failing at this stage forces you to wait another year for your next attempt, and this waiting period, often spent in isolation, can be mentally exhausting. It makes you start calculating the slim selection probability—less than one percent—and, compounded by comparing yourself to batchmates who are doing well, you begin second-guessing your decisions. This was exactly what I experienced after my second failed attempt. However, I was fortunate to have a strong support system. My parents, who never placed any financial pressure on me, and my friends, especially Ishrat Singh, Ankuj, Deepak Meena, and Navjot,



were always just a call away to help address my insecurities. If, by some divine intervention, my friends are reading this, I want you to know that you were always in my thoughts throughout this arduous journey. Lastly, unstructured doses of inspiration—from weekly episodes of One Piece to Kishore’s voice, Sahir’s lyrics, and the timeless buzz of Pink Floyd—helped me persevere.

outgoing, outspoken, and adventurous. However, during my UPSC preparation, I found myself locked in my room, exploring the world from my desk, sifting through piles of paper. There were moments of epiphany, hours of madness, days of boredom, weeks of excitement, and months of monotony.



IIT Palakkad gave me a broader worldview, an analytical mind, and the ability to approach situations with a sense of probability. The coursework at IIT not only helped but also made me comfortable with the multiplicity of life, perspectives, opinions, and uncertainties. It taught me to remain flexible and open-minded, which is essential when dealing with issues from every walk of life, where you are expected to solve problems from multiple dimensions. This is what I gained from my coursework, but I learned even more fundamental lessons outside the classroom.

IIT Palakkad gave me the opportunity to cultivate my courageous and enterprising side. This was an internal revolution, and its outward expression varied both temporally and spatially. At IIT, it manifested in being

What this journey required most was the ability to stare into the abyss with courage. As Albert Camus emphasizes in his famous essay on the myth of Sisyphus, one must imagine Sisyphus smiling.

A special mention goes to Parag Gaikwad (2019), who helped me tremendously with my interview preparation. He patiently addressed all my questions, no matter how silly, and always prioritized my doubts, even during his busy schedule in the final stages of his own preparation. The greatest contribution of IIT Palakkad was the like-minded, focused group it provided, which helped me grow through peer learning and goal alignment.

The diverse electives, especially the Mathematics courses by Dr. Lakshmi, were

truly gems. These electives provided a strong foundation that later influenced my decision to choose Mathematics as my optional subject –a make-or-break choice for clearing the examination. Beyond the academic courses, individuals like Dr. Kurian, Dr. K.V.N. Surendra, and Dr. Lakshmi offered invaluable insights. I learned more through my interactions with them and my seniors than I did in any lecture.

*What interests did you pursue beyond academics during your time here ?*

I played basketball, thanks to the institute establishing a court by the end of my second year. I also dabbled in DOTA 2 and FIFA with the help of seniors. Nevertheless, I often found myself as a back-row audience member at the institute’s major events.

*What would you like to say to students from technical backgrounds who aspire to take the UPSC exam?*

One thing should be clear to all aspirants, the preparation is a grind and becomes increasingly difficult over time. The only method that works is 'brute force.' Rote learning is essential. Even if you choose a technical optional subject, like I did with Mathematics, you will be surprised by how much you have to cram.

Finally, my advice to students aspiring to join the civil services is to make the most of your time in college. Don’t confine yourself to rigid course compartments. Learn from everywhere and everyone. Attend guest talks, discussions, performances, events, trips, quizzes, and film screenings. All of this knowledge will prove valuable when you later sit down for intensive preparation.



*Mr. Gaurav Saharan with friends*



## Celestial Explorers: The Stellar Society of IIT Palakkad



At Stellar Society, the Astronomy Club of our institute, we don't just admire the stars —we explore them. Weekly stargazing sessions are the heart of the club, where members gather at our exclusive hilltop spot to observe constellations, planets, and sometimes even meteor showers. However, the weather in Palakkad often presents a challenge, with many nights obscured by clouds or rain. But while the skies may hide, our curiosity doesn't.

When stargazing is off the table, the club keeps busy with a variety of engaging activities that deepen our understanding of the universe. This year, the club kicked off with a fresher's introductory session, welcoming new members and introducing them to the exciting world of astronomy. From there, we dove into academic and fun events that captured the spirit of exploration. One such event was the Integration Bee, a math competition that added a thrilling twist to calculus.

Participants raced to solve integrals, with the competition split into prelims and finals. While the prelims involved a written round, the finals put participants on the board to solve problems against the clock. Members of the audience were also able to participate, stepping in to solve problems when contestants were stumped, creating an interactive and lively atmosphere.

On National Space Day, we teamed up with the Quiz Club to host a Space Quiz, testing knowledge on space exploration, astronomy, and the universe. The challenging questions sparked excitement and competition among the participants, making it a memorable event.



*Orbital Mechanics Workshop*



*Space Quiz event*

The club also hosted an Orbital Mechanics Workshop, where participants explored the fundamentals of rocket mechanics. Concepts such as trajectory planning, thrust calculations, and rocket staging were covered. Using numerical solvers in Python, participants simulated and tested these principles in real-time, providing practical insights into orbital mechanics. At Stellar Society, even when the skies are cloudy, our passion for astronomy continues to grow, inspiring curiosity and exploration year-round.



*Stargazing point - Nila hilltop*



*Stellar Society - Core team*



*Integration Bee, the math competition*

# Milestones & memories

## Convocation over the years...

“The first convocation held on 27th of July 2019 was a real euphoria for each of us in the institution. While the institute was still at its infancy during 2019, everyone of us involved in different committees were very keen and determined to make it grand and successful. We were a very small, but vibrant team of young, energetic and experienced grey hairs, who stood together to ensure that the conduct of the convocation function was smooth and elegant by any standards. As IIT Palakkad continued to grow, the convocations in the years 2021, 2022, 2023 and 2024 evolved incorporating more diverse elements. The institute has produced 1260 proud graduates / alumni and is growing stronger and its convocations undoubtedly play a pivotal role in shaping the culture and legacy of IIT Palakkad.”


*Dr. B. Thiagarajan, Joint Registrar, Academics*





“I graduated in 2020. Looking back, if I were ever given the chance to remake my choices, I would still choose IIT Palakkad. Here, my experiences fostered richer interactions. These enriching experiences, beyond academics, helped me face the realities of life after graduation. After all, education is what remains when one forgets what they have learned.”

*Mr. Gaurav Saharan (IFoS), 2020 Batch*




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**Indian Institute of Technology Palakkad**  
**भारतीय प्रौद्योगिकी संस्थान पालक्काड**

Nurturing Minds For a Better World