An official newsletter of DEPTH 2023-24

DELTECH PHYSICS AND TECHNOLOGY HUB (DEPTH) DEPARTMENT OF APPLIED PHYSICS DELHI TECHNOLOGICAL UNIVERSITY

BUT

Let us take a moment to appreciate the efforts of scientists who know no limits!

ENGINEERING PHYSIC

ON SUCCESSFUL LANDING OF

CHANDRAYAAN 3



Welcome to the Department of Applied Physics at Delhi Technological University (DTU). Our department's goal is to educate and train future engineers and scientists through high-quality education, utilizing advanced technologies and innovative teaching methods. This prepares our students to tackle current and future challenges while promoting their long-term professional development.

The department provides undergraduate, postgraduate, and doctoral programs. Our esteemed faculty is committed to achieving academic excellence by providing students with quality education and leadership skills. They also engage in research and development (R&D) and have established research laboratories that showcase their varied interests. We also have several collaborations both nationally and internationally.

Additionally, the department has a well-equipped technical infrastructure where students can apply the principles taught in class, improving their understanding of the subjects. We also host various workshops, expert talks, seminars, and training programs for the benefit of both students and faculty. The department has also completed numerous sponsored research and consultancy projects.

Prof. A.S. Rao Head of the Department Department of Applied Physics Delhi Technological University

Department of Applied Physics

VISION

Our goal is to enhance the teaching and learning process by encompassing all aspects of pure and applied physics. This will encourage research and development, resulting in the generation of new knowledge, inventions, and discoveries. We also aim to foster connections between our institute and industry, as well as promote an entrepreneurial mindset for the benefit of all stakeholders and society as a whole.

MISSION

- To establish global and industry standards of excellence by generating new knowledge in all areas related to teaching, learning, research, and consultancy.
- To assist our students in developing their human potential, intellectual curiosity, creative abilities, and becoming lifelong learners who can tackle challenges in both the national and global environment and become true professional leaders.
- Our goal is to prepare and train our students to be responsible citizens who are aware of their commitments and duties, in order to improve our society and make the world a better place to live.
- To become a world-class center for education, research, and innovation in various emerging fields of Applied Physics.
- The goal is to prioritize the advancement of innovative technologies and promote a seamless connection between academia and industry.

About DEPTH

DEPTH is an organization led by students, driven by a shared passion for engineering physics and its practical applications. Our main goal is to cultivate a lively and supportive community that promotes the study and use of physics in engineering fields. We aim to establish an inclusive atmosphere where students can collaborate, acquire knowledge, and develop together. In order to achieve our goals, we provide a wide range of opportunities for our members to improve their skills and broaden their Workshops are understanding. crucial aspect of a our organization, allowing students to explore various topics in physics. These workshops cover basic principles as well as advanced research methods, catering to students of all levels of proficiency. Through interactive sessions and hands-on activities, participants will gain a deeper understanding of the subject matter and develop their practical skills.

We recognize the importance of being exposed to real-world experiences and perspectives. Therefore, we arrange exciting events that include guest speakers from both academia and industry. These highly accomplished professionals share their valuable insights, recount their personal journeys, and provide guidance to our members. Through highlighting the various applications of engineering physics, these events inspire our students and expand their knowledge.

DEPTH is more than an organization; it is a supportive community. We offer a platform for our members to connect, exchange ideas, and collaborate. By building relationships with similar-minded peers, students can explore their interests, seek guidance, and find mentorship opportunities. Our community serves as a support system, promoting personal and professional growth.

Faculty Corner World's Top 2 percent Scientists

Stanford University has recently published an update of the list of the top 2% most widely cited scientists in different disciplines, the World's Top 2% Scientists. This ranking, considered the most prestigious worldwide, is based on the bibliometric information contained in the Scopus database and includes more than 180,000 researchers from the more than 8 million scientists considered to be active worldwide, with 22 scientific fields and 176 subfields taken into account.

- Prof. A. Srinivas Rao (HOD)
- Prof. Rishu Chaujar
- Dr. M. Jayasimhadri
- Dr. Mohan S. Mehata

Faculty Corner Department of Applied Physics continues its trend of excellence

Prof. Rishu Chaujar has received a prestigious DST-SERB POWER with a grant of 38.1 lakhs for her Project "Numerical Modelling and Simulation of Negative Capacitance FinFET for Low Power and Sensing Applications in Biomedical Diagnostics and Environment Monitoring".

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ARTMENT OF

Dr. Mukhtiyar Singh has been awarded a generous SERB grant of Rs 27 lakhs, for a Machine Learning based project "Machine Learning Assisted First-principles Study of Anomalous Nernst Effect in Weyl semimetals".

University State Research Excellence (SERB SURE) has nominated Dr. Bharti Singh for a grant amounting to Rs 19,76,000/- for the project "Mechanical Energy titled Harvesting using **MXene** Functionalized Polymer Composite Nanofibers and Integrating it with Energy Storage Devices for IoT and Wearable Applications".

PATENTS

The Patents Office of the Government of India has issued a patent for "SYSTEM AND METHOD FOR DETECTING TRIVALENT METAL IONS", an indigenous invention of Dr. Mohan Singh Mehta, Department of Applied Physics.

Creativity Section Travelling Back In Time

Have you ever imagined if the wiring in your brain could be fine-tuned with the Universe?

Mythologists and historians say yes, that is possible!

You must have experienced feelings of being in a situation you've already been in; in the past and have a strong clarity of your acts in it. Well, in the common world, this is known as 'Déià Vu'. The French expression for "already seen" can be a very strange and even unsettling experience. Logically, you know you haven't experienced this moment before, but your brain is telling you otherwise. Déjà vu is a common experience about two-thirds of people have had it. But it's still widely misunderstood. The reason simply is it's hard to study in a laboratory, so our understanding is limited. There are a few theories, though, about what might lead to this "glitch" in the brain.

But this has been associated with traveling back in time. Given that we are constantly drifting across the fabric of space, it might not be wrong to say that we tumble across a bunch of stuff on our way cruising over spaceship "The Earth" or it might be! As we hardly do that, it's because as we all know that the fabric of the space is constantly stretching outwards. making galaxies drift far away from each other and decreasing the chances of possible collisions. But the feeling of Déjà Vu is often associated with one's thoughts (A thought isn't a physical thing but a feeling) falling into a hypothetical singularity point of a wormhole where he is cruising along on his spaceship. His thoughts travel through the wormhole and reach back in time, and therefore he experiences the same situation another time!

All these happen in the author's own Multiverse.

Sahil Sagar Final year, EE

QUANTUM COMPUTING

To delve into the quantum realm of computing, one needs to lay down the foundational blocks of the fundamentals about Quantum Computing. It is an incipient technology that harnesses the laws of quantum mechanics to solve problems far too complex for modern-day classical computers. The problems in this context are those having time complexities of the order of the age of the universe. To put it simply, these problems will roughly take as long as the universe has existed to solve, even if one employs the most powerful supercomputer of the day. And hopefully, we don't want to wait, if we could, until then to get the desired outputs, right?

Quantum Computing is that branch of computer science which involves similar principles on which our nature works and carries out its essential processes. Concepts of Quantum Mechanics, such as Superposition and Entanglement, are the building blocks of this emerging and burgeoning technology.

Have you ever wondered, what if we could have found the vaccine and antidote to the Coronavirus within a few weeks instead of the year it took? How many precious lives could we have saved? And not just Coronavirus, but what if I tell you that we could find the antidote/vaccine to all the incurable diseases, whether that's Cancer, AIDS, Alzheimer's, etc., within weeks? Although this seems very ambitious, all this can be realized through quantum computers.

The evolution of quantum computing can also leverage space research and help us understand the facts that are yet to be discovered by human civilization. In theory, a quantum computer with 300 qubits (Quantum Bits) fully devoted to computing could perform more calculations in an instant than there are atoms in the visible universe (the present quantum computer at IBM has 433 qubits). It is also expected that quantum computing can accelerate our search for extraterrestrial life and lead to the overall growth of mankind. Apart from these applications, quantum computing finds its usage in almost all fields, whether material science, space exploration, battery manufacturing, machine learning, logistics optimization, resource management, finance modeling, artificial intelligence, solar capture, etc. Quantum computers are known to harness the potential and benefits associated with the study of Quantum Mechanics. Modern-day computers work on bits (Os and 1s) to perform all the computations and store our data, whereas in quantum computers, the same computations are carried out by Quantum Bits (or Qubits). With these qubits, it is possible for us to take advantage of some fundamental principles known as Superposition and Entanglement, which also form the basis of quantum computers.

Superpositions in qubits make the computational power of quantum computers exponentially higher when compared to classical computers, as classical bits can only be in one state at a time (either 1 or 0), whereas qubits can exist in both states simultaneously. This feature of qubits enables them to form more combinations, resulting in higher computational power.

Entanglement is yet another interesting phenomenon of quantum mechanics that can be observed with qubits. A pair of entangled qubits allows them to share information between them instantly. If we measure one of the qubits, we can be certain about the information in the other qubit from the entangled pair. Moreover, if we change the information in one of the qubits, the other qubit instantly adjusts itself according to the changes made to its counterpart. This phenomenon enables the emergence of new communication technologies under the umbrella of Quantum Computing.

> Krishan Walia, Pre-final year, PE

STUDENT TIMES Placement tales Prabhat Narang, Google Hardware

1. How did you prepare for the role in your placement journey?

Ans: I was in Canada for my MITACS internships when the placement season commenced. My internship pertained to the field of Quantum Computing. So naturally, around that time, I was exploring options for applying to Master's in Physics. Coincidentally, Google arrived for campus recruiting related to a hardware role around that time. I was sure of Masters, so I didn't want to sit for placements, but my friends filled out the form on my behalf. I had a good knowledge of electronics as I had worked on a lot of industrial-grade electronics projects. It was a good experience. Mostly digital, VLSI, STA, coding, and hardware modeling are asked in interviews, and I had a good working knowledge of them already because of the kind of projects I had worked on. I just revised my notes on the subjects before the interview. Three interviews took place, and since I didn't bother to tell the interviewers that I am in Canada, my interviews took place at 1 am, 3 am, and 6 am in local time. I was able to answer most questions and cleared the interviews. I had to leave for the University where I was interning at 7 am, so I kind of hurried through the last interview. But all in all, it was a good experience.



2. Were there any challenges you faced during your search for opportunities, and how did you overcome them? Also, what are your future plans?

Ans: As an Engineering Physics student, there are a lot of doubts among interviewers about your knowledge in core subjects. And since we don't study a lot of important core subjects in electronics like Computer Architecture, Analog Electronics, etc., I had to study some subjects on my own and make sure I was at par with the core students. I would work here for a while as there is a lot to learn here. If I am satisfied with the work and I feel I have done enough, I would think about changing the field back to Physics, but if I like the work here too much, I might just continue.

Student Achivements

1. What inspired you to pursue higher studies and research work?

I was certain I wanted to pursue research and contribute in the field of sciences since my high school years. The only possible explanation I can give for my affinity toward sciences is that I am curious by nature. I want to know how things work and why they behave the way they do. Hence, pursuing higher education seems to be the next best step toward my goals.

2. Could you share your journey and the steps you took to reach this point?

I have tried to utilize my time during bachelor's to my best capacity. I have explored and narrowed down my interests by doing multiple internships and gaining new experience.

3. What specific field or area of study are you planning to pursue, and why?

I am currently pursuing my Master's in Astrophysics and Cosmology. I am very interested in observational astronomy, stellar and galactic astrophysics. All these fields are vast, and I still need to choose my exact field of study for now. But probably, for now, I will stick and look for opportunities in astronomy and astrophysics.

4. How did you decide on a particular university or program for your higher studies?

It's a very personalized and rigorous process. There is no general formula or thing to consider, but to identify what you want to do and what the place will offer you. I will advise prioritizing your interests, look for a university which has the facilities to provide opportunities. Also, don't stress much about the program, unlike most Indian institutes, programs in foreign universities provide a very flexible (the flexibility which now DTU has also started to provide).

5. Could you describe any challenges or obstacles you faced during the application process?

The application process is as simple as it gets. But being very competitive, one has to make sure that they give their best. Make a well-formatted resume, write a crisp and convincing letter of motivation, and make sure your letters of recommendation are sorted.

And sent to the University of Time. I started to prepare well ahead of time and didn't face any major problems, but it did take a chunk of my time, and I felt I didn't give enough time to researching and choosing the universities.



6. How did your college or society play a part in preparing you for this path?

DTU did provide a strong base and room to grow, both academically and personally. I am grateful for the supportive faculties and opportunities they provided. The flexibility and quality of courses were very good. And being a part of the DEPTH society gave a great alumni network and a chance to work with our esteemed faculty.

7. What advice would you give to your juniors who are considering higher studies and research work?

Just stay focused! Prepare for your applications as early as possible, focus more on your CV, motivation letter, and recommendation letters. Maintain decent grades and develop relevant skills. It is not going to be easy, nor is it going to be a cakewalk. Just be confident, stay motivated; you've got this!

8. Are there any specific resources, organizations, or mentors who have been instrumental in your journey?

Every single experience and piece of advice I received has contributed to my academic achievements. I owe it to our esteemed faculty members, seniors, and my supervisors.

Anish Former President of DEPTH

Student Achivements

1. Please share your journey of securing your internship

I focussed a lot on problem solving, Data structures and algorithms, made sure that I practice a variety of problems on leetcode, GFG, so that I am confident enough to clear the online round. I prepared OOPs, DBMS, and OS as they are important for interviews and also these concepts help once you are a software developer. Besides problem solving and core subjects, I also did web development, and some machine learning.

2. Could you share your journey and the steps you took to reach this point?

I was quite good at programming, and this is a fast growing industry, which offers a lot of good opportunities, hence I chose this field

3. What steps did you take to stand out during the application process?

To stand out in the selection process, I made sure that I had a good grip on DSA. Also I made a good resume, to help me get shortlisted. I also had internship experience in backend development, and had a couple of decent projects on my resume, which helped

4.. What skills and qualities do you believe played a significant role in your successful internship/placement search?

Good command over DSA, and the ability to explain your projects and internships in detail and good knowledge of core subjects played an important role. Also one must watch and read interview experiences online to know exactly what is expected during interviews from a candidate



5. Could you describe any challenges or obstacles you faced during the application process?

One of the challenges was that I was from a non computer science branch, so I needed to prove myself really well, and needed showcase my skills. Also initial this would be really confusing when I tried to solve DSA problems on my own.

6. Your future plans...

My future plans are to explore the software Development industry well, and keep improving upon my skills.

Utkarsh Ramachandra Software engineer

Student Achivements

1. How did you prepare for the role /share your journey of securing your internship/placement?

My preparation strategy has been very clear from the very start since I have always been inclined towards fields like consulting so I have been routinely solving case studies and guesstimates. You can refer to casebooks of other colleges. For product-based cases, one can see videos of exponent on YouTube.

As for aptitude, there are lots of resources on Youtube to get your basics clear and sites like indiabix where you can give free mocks which can help you with time management as well. Apart from these be thorough with your company and role description before the interview. It is necessary to have good communication skills to ace a non-tech interview.

2. Why did you choose the (concerned) field / How did you develop an interest in the field?

I did a product management internship during my summer internship through which I gained a lot of knowledge in the field of product analytics and product fit which I feel greatly helped me in clearing the rigorous 4 rounds of interviews. So yes an internship experience in a similar field gives you a lot of scope to talk about in an interview.

3. What steps did you take to stand out during the application process?

Prepare a thorough one-pager CV which should focus on your achievements and highlight all the facts quantitatively. Have good PORs and focus on quality over quantity. Above all have a decent enough GPA (over 8) to get shortlisted in the preliminary rounds.

4. What skills and qualities do you believe played a significant role in your successful internship/placement search?

I think my PORs and grasp of the skills that I mentioned in my CV did play a significant role. When you have a good number of projects and activities to talk about with the interviewers, it makes a good impression. For non-tech job roles, it's your confidence and your interpersonal skills that can stand you apart from other candidates.



5. Were there any challenges you faced during your search for opportunities, and how did you overcome them

One challenge that most of us face during the placement season is we often get demotivated by multiple rejections. But consistency and patience is a key here. You might end up getting rejected in the 3rd round of an interview or the last round but we need to bounce back, there is no use ranting about something that you don't have control over. It's a matter of luck as well many times. You just need to keep your calm and have faith in your skills and abilities.

6. Your future plans...

I would like to explore more about the product field for the time being. Then I plan on doing an MBA and probably switch to consulting in the future. Let's see how this goes.

Anoushka, Sprinklr

Implementation consultant

Times Higher Studies Rohan Bhatia Pranay Khosla

University of Southern California, MS Applied Data Science

M.Sc. Quantum Technology, Australian National University

1. What steps did you take to stand out during the application process?

Ans: I highlighted my research acumen while applying by including all the self-projects and training I had done in this field. I emphasized my programming proficiency by showcasing the implementations of the latest research and was able to explain my work very well during interviews and meetings. I also included my research proposals in my applications, making them as detailed and interesting as possible. All of this helped me get selected for the internship and the assignment of multiple salient projects as well.

2. Were there any challenges you faced during your search for opportunities, and how did you overcome them?

Ans: Yes, I faced many rejections before getting selected for this master's program. Although there are innumerable opportunities in the research domain, the professors and research institutes would typically only hire you if they are starting a new project that requires the specific skillset that you have. Constant followups, cold mailing, and customizing your CV and profile specific to the requirements are just some of the challenges.



Rohan Bhatia, Master's Student



Pranay Khosla, Master's Student, University of Canberra

1. Can you share your journey of securing your internship and Master's?

Ans. At the beginning of internship season, I saw all my friends studying data structures and algorithms (DSA) and interviewing with various companies. I took some tests as well and soon realized that the tech world did not interest me. I had always been inclined towards physics. Although, seeing people secure good internships gave me some major 'fear of missing out' (FOMO)! This was when I started looking for research internships on Google. I came across many, from different nations as well as within India. MITACS was one of them. It was very exciting and overwhelming and seemed like a long shot at that point. I remember going to the academic office to get my transcripts just one day before the deadline in September. Nevertheless, I was able to select projects of my interest and submit the application with an adrenaline rush. I was astounded when I got a call for an interview in December. This is when I started seriously preparing for the interview and finally was selected in February! I would say that a strong academic record was a major factor in my selection apart from some quantum computing skills that I had learned in the past year.

2. For students interested in higher studies, how did you decide on your field of study and the specific programs/universities to apply to?

Ans. If you are considering pursuing higher studies, get ready for a roller coaster ride! You will come across people who will be in awe of your decision and others who will look at you with sympathy. The most valuable piece of advice for someone pursuing higher studies would be: 'Focus on your CGPA.' Apart from this, I advise you to start as early as possible, right at the beginning of your 4th year. This will ensure you do not miss any deadlines and are able to select the courses or universities of your choice.

Times Higher Studies SHUBHAM R&D Software Engineer, Keysight Technologies

International India Pvt Ltd

Class of 2023 Engineering Physics

1. Can you share your journey of securing your internship and Master's ?

Ans. "Consistency" that I barely maintained during the whole placement season. I felt monotonous, doing the same thing everyday for preperation and after 2-3 online tests of Google, Microsoft and Amazon, my confidence dropped down. I stopped preparing, set myself free from this trauma of competition. Then I resumed what I was doing before starting preparation of placement, which was my research projects related to astrophysics. I find myself strong in physics and programming, and the combination of which is research in a field that requires a lot of physics and computation. With this I thought of doing "Go with the flow". Even when I was interested in research, I had still wanted some settlement which only placement could've given. After the exams and final project presentation, when no companies were coming for placement, I lost hope and about two months later this company offered me an opportunity, and I finally felt peaceful. Keysight Technologies, I was finally placed at, with the designation of R&D SWE. They needed a candidate with a strong physics background and good hold on programming (C++/C#). Whatever I studied in 3rd year core subjects were used in the selection process. Hence, the whole process got somehow easier for me. And as my designation is R&D, I'm in an environment where everyone is encouraged for research in new technologies. I feel this is the best place for me to make my career.

2.How did you develop interest in the field?

Ans. Having strong hold (I'd say) in physics with a good programming skill is kind of a gift to me and this shouldn't be wasted. To use this in a better way was to choose the field that I'm into. This interest developed spontaneously with no extra efforts.

3.What skills and qualities do you believe played a significant role in your successful internship/placement search?

Ans. Apart from my problem solving skill, my presentation skill played a significant role in successfully getting the offer letter. After one week of preparation of technical round they gave me another chance (another week) for presenting better solution. This time rather than presenting them the code, I chose to use different approach for solving the problem and presenting the solution, that seemed mind blowing to them (as I could hear their voice and see them impressed).



4.Were there any challenges you faced during your search for opportunities, and how did you overcome them

Ans. After almost the end of campus placement season, I faced some usual challenges of finding an opportunity that any fresher would face off campus. BUT Keysight came in the end when all hopes were lost. So, I think god solved this problem but me.

5. Your future plans...

Ans. To continue my career in this field. To become the best and do what the moment calls for.

Internship Tales

Kanishk Tyagi

Aviral Srivastava

1. Why did you choose the (concerned) field / How did you develop an interest in the field:

My interest in competitive programming sparked my curiosity in problem-solving. Over time, I realized that technology and software development were the perfect platforms to channel this interest. As I delved deeper into programming and its applications, I found myself naturally gravitating towards the tech industry. The dynamic nature of the field and the potential to create innovative solutions fueled my passion further.

2. Were there any challenges you faced during your search for opportunities, and how did you overcome them:

While searching for opportunities, I encountered challenges in finding the right balance between my academic commitments and interview preparation. To overcome this, I created a structured study plan that allocated specific time slots for my academics and interview preparation.

3. Your future plans:

Looking ahead, I am enthusiastic about pursuing a path of growth and prosperity within the technology industry. I plan to continue enhancing my skills, staying attuned to emerging trends, and contributing to innovative projects. My goal is to make a positive impact by leveraging my problemsolving abilities and technical expertise to create solutions that address real-world challenges.





VSP Physics, Harish-Chandra Research Institute

1. Please share your journey of securing your internship.

Perseverance. Preparing for any milestone isn't a piece of cake, especially in research, where results take time. I had been actively brushing up on my skills. With time, I was able to realize some actual research problems that could be tackled. Doing this at an undergraduate level and bam! There you get a good place for the summer.

2. What steps did you take to stand out during the application process?

I tried to be as precise and concise as I could. Although I applied to various universities and programs, HRI is where I finally got the opportunity to enrich my knowledge in fundamental physics.

3. Were there any challenges you faced during your search for opportunities, and how did you overcome them?

Realizing how competitive the world has become, I encountered problems in building my application. Professors in my department, seniors, and research advisors greatly helped me, making me realize the shortcomings in my applications.

SDE Intern-Salesforce

Internships

Hall of Fame

Non-Tech

- AAKHYAT BAGGA, CDOT, 3rd year
- HARSH GUPTA ,Millennium Fellow 2023 & AKRATI JEWELS INC. 2nd yr.
- HARSHIT, HEIV, 2nd yr
- Research
- VISNU SAJITH ,JOINT INSTITUTE OF NUCLEAR RESEARCH, RUSSIA, 4th yr
- CHANCHAL MANDAL ,IISER, TIRUPATI, 3rd yr
- PRATHMESH, ,PHYSICAL RESEARCH LABORATORY,AHMEDABAD, 3rd yr



Faculties and Scholars from the Department of Applied Physics



Glimpse from the Sports Conclave









Doubt Session in one of the Research Talks

Doubt Session in one of the Research Talks





Inaugration of a DEPTH event.

Science Day Celebrations

RESEARCH TALK1

The DEPTH DTU recently organized a remarkable event dedicated to the exploration of oscillation neutrino problems research. This event was held on 13 September 2023 at SPS 7 and drew a crowd of 50 enthusiastic students eager to delve into the depths of physicsThe event upto 1.5 hour of informative session and engaging discussions, providing a platform for students to explore the intriguing world of neutrino problems research.





RESEARCH TALK 2

DEPTH Society recently hosted an enthralling Research Talk on Quantum and Communication. Computing illuminating the captivating realm of quantum technologies and highlighting their pivotal role in shaping our future. The event, which took place on October 19th at SPS 10, garnered a significant audience, drawing inquisitive minds eager to explore the frontiers of quantum computing. Through engaging discussions and an informative session lasting for over 1.5 hours, participants were provided a stimulating platform to delve into the immense potential of quantum computing, poised to revolutionize various fields.



MEET the TEAM



Dr. Deshraj Meena, Faculty Advisor, DEPTH



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