Birla Institute of Technology & Science (BITS), Pilani
Practice School Division
Practice School-I course (May 28th – July 23rd, 2024)

PS Chronicles (CSIR & other Govt. Research Labs)

(A compilation of student experience during PS-I)

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From the Desk of the Editor

It is my great pleasure to bring forth the 6th edition of the PS-I Chronicles. This edition features over 1059 articles from PS-I students sharing their experiences during summer 2024.

The basic premise behind the release of PS-I Chronicles is to document the PS-I learning experience of students keeping the below objectives in view.

- To provide more information on the learning experiences by immediate senior students and PS-I faculty about stations, and thereby enlightening the learning opportunity among the student community.
- To provide the faculty with the enhanced information about the type and nature of work carried out at the organization.
- To transform the knowledge gained at the organization into class room teaching and also to identify the scope of deepening the collaborations with organization.

The articles have been classified into six categories based on the industry domain.

- Chronicle 1: Information Technology
- Chronicle 2: Electronics
- Chronicle 3: Chemical, Mechanical, Cement, Textile, Steel, Infrastructure & others
- Chronicle 4; Health Care
- Chronicle 5: Finance and Management
- Chronicle 6: Government Research Labs

I would like to thank students for sharing their experiences during their stint at the organization. I would also like to thank Prof. Arun Maity, Prof. M. K. Hamirwasia and Dr. G Muthukumar for reviewing the articles and providing us the feedback. I would also like to extend my thanks to Mr. Om Prakash Singh Shekhawat, Mr. Shyam Sunder Saini and Mr. Varun Singh of the Practice School Division, of BITS, Pilani – Pilani Campus for their help in bringing out this edition of PS-I Chronicles.

I would be happy to receive any feedback regarding the Chronicles. Please feel free to email me at psd@pilani.bits-pilani.ac.in or at murugesan@pilani.bits-pilani.ac.in.

S. Murugesan

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PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: BHUMIREDDI SAI GAYATHRI (2022A3PS0588H)

Student Write-up:

PS-I Project Title: Defect detection using CNN

Short Summary of work done: I have started my work with a binary classification and the 3,4,5 class classifications where my dataset is large and further worked on code where my dataset is less and in each case tried to increase the accuracy to the maximum

Objectives of the project: Automatic defect identification

Tool used: S/w

Details of Papers/patents: No, not yet but will submit a report for IEEE paper

Brief description of the working environment: The company is good and the mentor whom I was allotted is very supportive and helped in learning more. I was asked to give a weekly presentation on what I worked in the week and have to tell her the results frequently.

Academic courses relevant to the project: My project is a deep learning topic. Python is really necessary to work on it.

Learning Outcome: Different methods to classify images for defect identification.

Name: SUDHIR K (2022A3PS0668H)

Student Write-up:

PS-I Project Title: “DESIGN AND DEVELOPMENT OF FIRMWARE TO CONTROL STEPPER MOTOR USING ESP32 MICROCONTROLLER”

Short Summary of work done: Within the realm of automation, stepper motors stand out for their exceptional ability to perform controlled, incremental rotations. This precise movement makes them crucial components in various applications, from 3D printers and CNC machines to robotic arms and camera positioning systems. However, to unlock the full potential of stepper motors, specialized firmware is essential. This firmware acts as the bridge between user commands and the electrical signals that govern the motor's behavior. This project delves into the design and development of custom firmware specifically designed for an ESP32 microcontroller to control a stepper motor. The ESP32, a powerful and versatile microcontroller, boasts integrated Wi-Fi capabilities and robust processing power, making it an ideal platform for this task. The developed firmware will harness the ESP32's functionalities, to achieve precise control over the motor's direction and speed. This project will meticulously detail the design considerations, development process, and functionalities of the created firmware. Ultimately, it will showcase the successful control of a stepper motor using an ESP32 microcontroller, paving the way for potential applications in various automation projects.

Objectives of the project: This project involves the interfacing of stepper motor and operating it in different modes of rotation to control a conveyor belt which helps in scanning of an object. This has been achieved through the usage of ESP32 microcontroller and RS-485 and also through the help of ARDUINO-IDE software. In this project data is transmitted in hexadecimal form so that the motor can recognize it and also the motor is controlled through the usage of hexadecimal numbers.

Tool used: H/W: ESP32-WROOM-32E microcontroller, PD42-3-1240 stepper motor, MCP 2551 and RS-485, S/W:ARDUINO-IDE and TMCL-IDE

Details of Papers/patents: NIL

Brief description of the working environment: my work enviroinment was good. The location of the PS station was also easily accessible. This project involves the interfacing of stepper motor and operating it in different modes of rotation to control a conveyor belt which helps in scanning of an object. This has been achieved through the usage of ESP32 microcontroller and RS-485 and also through the help of ARDUINO-IDE software. In this project data is transmitted in hexadecimal form so that the motor can recognize it and also the motor is controlled through the usage of hexadecimal numbers. This project proved to be a rich learning experience, solidifying concepts in stepper motor control and unlocking the potential of the ESP32 microcontroller. Through the hands-on process of interfacing the ESP32 with a stepper motor driver and crafting the control firmware, valuable insights were gained. I delved into the intricacies of generating precise timing and sequence controls to achieve the desired motor movements. Furthermore, the project provided practical experience with the ESP32 development environment, equipping me with programming techniques essential for building microcontroller applications. Perhaps most importantly, the project highlighted the significance of driver ICs. By bridging the gap between control signals and the motor's specific electrical requirements, these ICs play a critical role in achieving smooth and precise operation. These acquired skills and knowledge establish a strong foundation for future endeavors, propelling us to explore

more sophisticated motor control functionalities and delve deeper into the exciting world of embedded system design. Also, I have learnt about TMCL-IDE software and its commands to control the motor.

Academic courses relevant to the project: Microprocessor and interfacing and digital design.

Learning Outcome: This project proved to be a rich learning experience, solidifying concepts in stepper motor control and unlocking the potential of the ESP32 microcontroller. Through the hands-on process of interfacing the ESP32 with a stepper motor driver and crafting the control firmware, valuable insights were gained. I delved into the intricacies of generating precise timing and sequence controls to achieve the desired motor movements. Furthermore, the project provided practical experience with the ESP32 development environment, equipping me with programming techniques essential for building microcontroller applications. Perhaps most importantly, the project highlighted the significance of driver ICs. By bridging the gap between control signals and the motor's specific electrical requirements, these ICs play a critical role in achieving smooth and precise operation. These acquired skills and knowledge establish a strong foundation for future endeavors, propelling us to explore more sophisticated motor control functionalities and delve deeper into the exciting world of embedded system design. Also, I have learnt about TMCL-IDE software and its commands to control the motor.

Name: MIRNAL D SEKAR (2022A4PS1504H)

Student Write-up:

PS-I Project Title: Applications of Advanced Image Analysis & Machine Vision Techniques for Industry Automation

Short Summary of work done: Implementation of 4 Convolutional Neural Network Models for Texture Recognition of Fabrics and comparing their Accuracy.

Objectives of the project: Develop a Convolutional Neural Network model for texture detection.
Tool used: Python, Tensorflow, Keras.

Details of Papers/patents: NA

Brief description of the working environment: Working Environment is pretty chill, but they expect a lot of self learning from the students.

Academic courses relevant to the project: Microprocessor and interfacing and digital design.

Learning Outcome: Successfully implemented the model with a great accuracy of 98.7%

Name: RAGHAV JAIN (2022A7PS0075P)

Student Write-up:

PS-I Project Title: Leather grade

Short Summary of work done: Developed windows forms based application using c++ to display processed data by the machine, also developed c++ dynamic linked libraries and integrated it with existing python code.

Objectives of the project: Create frontend c++ and windows forms based application to display processesd data and to create c++Dlls to optimize existing python code.

Tool used: C++, python, visual studio, windows forms

Details of Papers/patents: None

Brief description of the working environment: Good working environment, not as rigrous as expected.

Academic courses relevant to the project: Computer Programming.

Learning Outcome: Frontend using Windows Forms and Dll creation.

Name: ABHIJITH SESHADRI (2022A8PS0611P)

Student Write-up:

PS-I Project Title: Advanced AI-Analysis using NIR Spectroscopy for material classifcation

Short Summary of work done: Our project was based on understanding how NIR signals are transferred from sample to collimator, acquiring them and processing them, and then using the data to train an ML model to perform multiclass classification. For signal processing, we learnt techniques such as Savitzky-Golay filters, detrending, baseline reduction etc. We implement a SVM model using linear kernel, and ran the code both offline and in real-time.

Objectives of the project: To build an AI/ML model for properly classifying plastic samples as they pass under a collimator. Involved in signal acquisition, processing and model training and testing.

Tool used: Python mostly. (No hardware was used, except the spectrometer already established in the system).

Details of Papers/patents: None

Brief description of the working environment: Very cordial and helpful staff, project lead and scientist really interested in making you learn rather than just giving you work. No tedious deadlines or pressure from staff.

Academic courses relevant to the project: CP, AI/ML (if you do take these by second year).

Learning Outcome: 1) learnt basic data cleaning and signal processing techniques 2) learnt ML basics 3) performed real time analysis by deploying ML model

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Name: S TARUN (2022B1A40898P)

Student Write-up:

PS-I Project Title: Analysis of GSR signals for drowsiness markers in driving.

Short Summary of work done: Analysis of GSR signals for drowsiness markers in driving.

Objectives of the project: Analysis of GSR signals for drowsiness markers in driving.

Tool used: H/w - gsr sensor, Arduino mega, s/w - Arduino, python, matlab

Details of Papers/patents: NA

Brief description of the working environment: Really great scientist with collaborative environment

Academic courses relevant to the project: Electrical sciences

Learning Outcome: Analysis of GSR signals for drowsiness markers in driving.

Name: MRUTYUNJAYA E M (2022B2A31774H)

Student Write-up:

PS-I Project Title: APPLICATION OF ADVANCE IMAGE ANALYSIS & MACHINE VISION TECHNIQUES FOR INDUSTRY AUTOMATION

Short Summary of work done: During my PS-I, I delved into the basics of machine learning and deep learning, exploring various image detection algorithms like CNN, R-CNN, YOLO, and SSD. I familiarized myself with machine learning libraries such as NumPy, Pandas, Matplotlib, TensorFlow, and Keras. I implemented and trained a YOLOv10 model for fire/smoke detection using a dataset from Roboflow and experimented with general image detection using pretrained weights on Google Colab. Additionally, I created a simple sequential neural network model from scratch using TensorFlow and Keras, gaining insights into the intricacies of model training and testing, including forward and backward propagation. After testing my model on the Fashion MNIST dataset in Python, I explored the ONNX library for converting my TensorFlow model to ONNX format. I set up a Visual Studio project, integrated the ONNX model with OpenCV in C++, and organized the Fashion MNIST dataset locally. Using OpenCV, I read and processed images for inferencing, and measured the performance using the C++ chrono library. I compared the inferencing speed between Python and C++, processing images individually and in batches. C++ showed significantly faster performance, highlighting its efficiency in handling machine learning model inferencing. To further improve performance, I explored using the CUDA library in C++ to accelerate the program. This project underscored the potential of C++ for high-performance applications in image processing.

Objectives of the project: The project involves using advanced image analysis and machine vision techniques to automate various industrial processes. By implementing these technologies, we aim to enhance efficiency, accuracy, and productivity in manufacturing environments. This approach includes real-time monitoring, defect detection, and automated quality control. Ultimately, it seeks to reduce human error and improve overall operational performance.

Tool used: Various software tools including NumPy, Pandas, Matplotlib, TensorFlow, Keras, OpenCV, Google Colab, Jupyter Notebook, Kaggle, Roboflow, the ONNX library, and Visual Studio. For hardware, I utilized a GPU for CUDA acceleration to enhance program performance.

Details of Papers/patents: NA

Brief description of the working environment: The working environment at CSIR-CEERI, Chennai was good and friendly. All the necessary facilities were offered, and the required research facilities were also available. I'm happy to be doing my PS1 here, which

was my first priority. I also got a project in the domain I was interested in. However, the level of the project was quite high. I was pleased about this because I knew I would learn a lot and improve my skills, but there were many times when I got stuck, and even my mentor couldn't help. Despite this, they expected me to finish it. Additionally, we weren't given training in that domain to complete our project; it was all self-learning, which was difficult as we couldn't find proper resources or help, yet we were expected to finish the project. This was my only concern; other than this, everything was good. Overall, it was a very good experience, and I learned many new things.

Academic courses relevant to the project: BITS F464 Machine Learning, CS F425 Deep Learning , CS F317 Reinforcement Learning, CS F407 Artificial Intelligence.

Learning Outcome: I learned the basics of machine learning and deep learning, and how to use libraries like NumPy, Pandas, TensorFlow, and Keras. I explored and implemented CNN and YOLO algorithms, trained and tested ML models, and optimized them. I converted a TensorFlow model to ONNX format, set up a Visual Studio project, and used OpenCV in C++ to test the model with images. I also organized the Fashion MNIST dataset for use in C++.

Name: KAVYA V(2022B2AA1404G)

Student Write-up:

PS-I Project Title: Advanced NIR Spectroscopy

Short Summary of work done: Built a machine learning model

Objectives of the project: To develop an ml algorithm for plastic segregation

Tool used: Python Excel

Details of Papers/patents: NA

Brief description of the working environment: The working environment was good and friendly. All the necessary facilities were offered, and the required research facilities were also available. Overall, it was a very good experience, and I learned many new things.

Academic courses relevant to the project: Machine Learning, Deep Learning, Reinforcement Learning, Artificial Intelligence

Learning Outcome: Built an efficient model with over 91% accuracy

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PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: UTKARSH THANVI (2022A3PS0493P)

Student Write-up:

PS-I Project Title: Development of Energy and Power Quality Measurement System

Short Summary of work done: In our project, we developed an Energy and Power Quality Measurement System using microcontroller technology. Our design centered around the ESP32 microcontroller and the ADE9000 energy measurement IC. We explored three-phase power systems and implemented SPI communication between components. We designed a custom PCB using DipTrace software, incorporating various essential circuits and components. After manufacturing, we assembled the PCB and conducted initial testing. We also interfaced external devices like keypads and displays. We expanded our project by exploring the ESP32's dual-core capabilities, integrating a GSM module for remote data logging with ThingSpeak and using the Nextion Editor for user interfaces. While we made significant progress, we faced some challenges with communication and voltage issues. This project gave us hands-on exposure to PCB design, microcontroller programming, and system integration, preparing us for real-world engineering challenges in power systems and IoT applications.

Objectives of the project: To design a PCB for measuring multiple factors for three phase supply, and interfacing it with peripheral devices to create an independent device that can be used in remote places.

Tool used: Arduino IDE, Diptrace, Nextion, ESP32, ADE9000, soldiering iron, multimeter

Details of Papers/patents: None

Brief description of the working environment: It was a good experience and the scientist were very nice and friendly.

Academic courses relevant to the project: Power Systems

Learning Outcome: Learned how to design hardware from scratch, soldier components onto it, and trouble shoot the printed circuit board to implement the required functioning.

Name: ANSH GARG (2022A8PS1360G)

Student Write-up:

PS-I Project Title: Weather station using esp32

Short Summary of work done: Made a weather station using esp32 and various sensors like rain gauge wind direction and speed etc Learned how to interface and code them in aurdino ide Displayed the readings on web server.

Objectives of the project: Learning about microcontrollers and microprocessors. Learning how to interfacing it with different device like keypad, 4g gam module.

Tool used: Esp32, thingspeak server, aurdino ide, 4g gsm module, various sensors.

Details of Papers/patents: NA

Brief description of the working environment: It was overall a good experience. The scientist were very nice and friendly.

Academic courses relevant to the project: Microprocessor, Digital Design.

Learning Outcome: I learned how to interface microcontroller with different device and display its reading to a web server.

Name: KUSHAGRA DWIVEDI (2022B1A31133P)

Student Write-up:

PS-I Project Title: Weather Station Integration and Blind Source Separation Algorithm

Short Summary of work done: Worked on the weather station project including many sensors with different different data.
Objectives of the project: To learn about the embedded system of the electronics

Tool used: Weather station sensors

Details of Papers/patents: No patent

Brief description of the working environment: Nice working environment and nice mentor.

Academic courses relevant to the project: Digital design

Learning Outcome: Learnt about the embedded system of electronics

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Name: HARSH DODAL (2022B4A80989G)

Student Write-up:

PS-I Project Title: Simulation of multiple gas detector Ndir gas sensor

Short Summary of work done: Developed a detector in comsol and experimented with dofferent types. Using the detector, made a cavity inside it. Filled the cavity with different media and made a plot for different intensity dips on the spectrum. Developed a completely working simulation of the ndir gas sensor which is more efficient and cost effevtive than the other available gas sensors in the market. We spent the firs 2 weeks reading research papers to develop some idea for the same and then using that idea, completed the project. We are also planning to keep working on the project in the future.

Objectives of the project: To develop a model which can detect multiple gases, to simulate the model in ray optics module.

Tool used: Comsol Ray Optics Module, Heat Transfer module

Details of Papers/patents: None

Brief description of the working environment: The working environment was great and very supportive . We worked under Dr. Vijay Chatterjee who was really helpful and open to all ojr doubts. We were expected to report to the station on time and complete the work. We were provided with enough resources so that we don't face any trouble while doing the project. Not only our Ps faculty helped us but the employees of the station also encouraged us and helped us from time to time.

Academic courses relevant to the project: Ray Optics, Semiconductors

Learning Outcome: Learnt Comsol Ray Optics Module, Heat transfer module and rf module.

Name: MANNAT KOOLWAL (2022B5AA0085G)

Student Write-up:

PS-I Project Title: Multiple gas detection using miniaturized NDIR gas sensor

Short Summary of work done: My PS-1 kicked of by choosing a project of my interest which was Semiconductors. After some through discussion with my mentor we decided to go forward with working on NDIR(Non-dispersive Infra-red) Gas sensors. To start of i was given a lot of research papers to read and understand the basic functioning and the current developments. After about 2 weeks we moved on to compiling our ideas on how to make the sensor more efficient and economic making it compact and available to the general public with a focus on its uses in the medical field. After compiling our ideas we started to learn the basics and uses of COMSOL Multiphysics which was provided by I-Stem. We then divided our project into 3 categories among my fellow interns wit me focusing on designing an Emitter(Heater) using COMSOL Multiphysics. The next few weeks were spent solving problems and simulating the designed heater which was successfully completed by the end. In conclusion we were able to simulate all the three components and the whole sensor using COMSOL Multiphysics to pitch a new efficient and economic sensor.

Objectives of the project: The object was to create/simulate a miniaturized NDIR gas sensor which can detect multiple gasses and can be used in healthcare to detect diseases, various industries and consumer products.

Tool used: COMSOL Multiphysics and my personal laptop.

Details of Papers/patents: NOT YET I am still working on with my mentor to roll one out.

Brief description of the working environment: The working environment was very friendly and good. It felt nice going there everyday and working and exceeded expectation. All the staff were really helpful and the mentor were happy to lend us there valuable time.

Academic courses relevant to the project: Optics, Gen chem, Chem lab, Physics of semiconductor devices, EMT1 and EMT2.

Learning Outcome: We learnt how to use Comsol Multiphysics (The leading Multiphysics simulation software). Learnt the functioning of Non despersive Infrared Absorbsion in gasses and their detection. Basic optics and material properties of semiconductor devices.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ANIRBAN NAYAK (2022A3PS0705H)

Student Write-up:

PS-I Project Title: Advanced Verification of Digital Circuits using UVM Framework

Short Summary of work done: The scientists at CEERI had written the RTL code for a lightweight GIFT Cipher that can be used in hard security applications.They needed to verify the proper working of their VHDL code. I learnt how to perform functional verification of digital circuits and successfully verified the design-under-test by creating a verification architecture using UVMF.

Objectives of the project: To perform functional verification of a 64-Bit GIFT Encryption Cipher using UVMF.

Tool used: QuestaSim,Xilinx Vivado, UVMF package, Systemverilog, OOPS.

Details of Papers/patents: A paper on the same has been submitted to the International Conference on VLSI Design pending acceptance.

Brief description of the working environment: The working environment was very professional and friendly, no complaints.

Academic courses relevant to the project: Computer Programming, Digital Design, Microprocessor and Interfacing,Analog and Digital VLSI Design.
Learning Outcome: A deeper understanding of VLSI Design Flow and Design Verification.

Name: VIRAJ BONTHA (2022A3PS0817G)

Student Write-up:

PS-I Project Title: DIGITAL FILTER DESIGNING

Short Summary of work done: During the internship at CSIR-CEERI, the focus was on designing decimation filters, particularly CIC, correction, and half-band filters. Initially, a literature review was conducted to understand filter specifications. The filters were

designed and implemented in MATLAB, followed by optimization for hardware use. The CIC filter reduced the sampling rate by discarding some samples while maintaining signal integrity. Correction filters improved CIC filter performance by compensating for non-idealities. The final step involved implementing these filters using fixed-point arithmetic for hardware applications. Practical training in Electronic Design Automation (EDA) tools, such as Cadence Virtuoso, was also undertaken to deepen the knowledge of hardware implementation. The work helped balance hardware constraints while meeting performance criteria, which will be beneficial for future projects.

Objectives of the project: The project aimed to design and implement decimation filters within digital signal processing (DSP). Decimation filters are crucial for reducing a signal's sampling rate while minimizing aliasing. This included studying digital signal processing concepts and implementing Cascaded Integrator-Comb (CIC), correction, and half-band filters using MATLAB, followed by translating these designs into hardware implementations optimized for performance.

Tool used: Software: MATLAB for digital filter simulation and Cadence tools (Virtuoso, Incisive, Genus) for hardware design and verification.

Details of Papers/patents: NA

Brief description of the working environment: The working environment at CSIR-CEERI was research-intensive and collaborative. The team was highly supportive, with mentorship from senior scientists, such as Dr. Jai Gopal Pandey and Dr. M. Santosh Kumar. The expectations from the company were focused on producing optimized digital filter designs that could be translated into hardware efficiently. Learning was primarily hands-on, involving extensive work with MATLAB for DSP and EDA tools for hardware design. The experience provided exposure to real-world applications of digital filters and multirate systems, deepening the understanding of signal processing and hardware design processes.

Academic courses relevant to the project: Signals & Systems, Digital Signal Processing.

Learning Outcome: Understanding the design and implementation of digital filters, especially decimation filters.
Gaining proficiency in MATLAB for digital filter simulation and optimization.
Learning hardware implementation techniques, including fixed-point arithmetic and memory optimization for filter coefficients.
Exposure to Electronic Design Automation (EDA) tools, such as Cadence Virtuoso, for translating MATLAB designs into hardware.

Name: SOUMITRA PODDAR (2022A3PS1346H)

Student Write-up:

PS-I Project Title: Hardware Security and IP logic locking

Short Summary of work done: We were able to integrate two or more logic locking method by modifying their scripts. We were able to show that instead of using complex designs we can use a simple combination of multiple locking schemes. First we identified the circuits which can be of our use. Then we locked them twice using our locking scheme. We then used to run a lot of iterations of multiple types of attacks on the locked circuits to check for resiliency of our models and finally posted the results.

Objectives of the project: The objective of my PS project was to encrypt chip designs from IP privacy. We achieved that by successfully integrating two or more logic locking techniques and optimizing different parameters.

Tool used: Python, Synopsis, Verilog, Shell script

Details of Papers/patents: NA

Brief description of the working environment: The working environment was very chill and nice. The scientist and his PhD scholar were very friendly and interactive. They used to guide us at every step and used to listen to our queries. PS 1 was a great learning experience andi feel that it was totally worth it excluding the initial few days of Pilani's heat. Overall I will highly recommend any junior reading this, who is planning to go into core Electronics, to take CEERI Pilani, as the work done there is phenomenal and the exposure there itself is an eye opening one.

Academic courses relevant to the project: Digital Design, Verilog Language.

Learning Outcome: This was a more digital-encryption side project. I learnt a lot about the need for logic locking and how it is done. What are the various attacks which can compromise our defenses and how we can work around them to enhance the resiliency of our model. Our work was mostly related to python and bash and thus was able to get my hands on a lot of raw coding. Understood how different locking mechanisms work, how they differ from each other and how they can be passed through logic and using different tools.I also got the chance to read a lot of papers, wherein I improved my skills to read research paper and learnt how to write a formal academic report.

Name: VAISHAK SREEJITH (2022A8PS0753H)

Student Write-up:

PS-I Project Title: Posit Accelerator

Short Summary of work done: My work involved proposing a design for Posit to Real number conversion unit and vice-versa, for Posit arithmetic applications, which would also help in better and universal communication of users with Posit systems.

Objectives of the project: Designing Posit to Real number and Real number to Posit conversion units for Posit arithmetic applications.

Tool used: Visual Studio Code, Xilinx-Vivado, AMD-Zynq 7000 ZedBoard FPGA, Icarus Verilog (+ GTKWave).

Details of Papers/patents: Set to publish a paper in the VLSI-D conference.

Brief description of the working environment: The working environment was highly motivating, I received ample help and moral support from the Ph.D. mentors at CEERI. The organization expected us to have our work on our minds through out the internship programme, and to think of out-of-the-box to find creative solutions to our problem statements. My overall learning experience at CEERI was great, and the group discussions conducted in between helped me think spontaneously and elucidate my ideas.

Academic courses relevant to the project: Digital Design, Micro-processing and Interfacing, Micro-electronic Circuits

Learning Outcome: I was able to learn the basics of computer arithmetic, thereby revising my digital design and micro-processing and interfacing courses. I was also able to work with hardware tools and gain experience with hardware descriptive languages.

Name: AYUSH KUMAR TIWARI (2022AAPS0196G)

Student Write-up:

PS-I Project Title: Light weight cipher

Short Summary of work done: Developed a new architecture for KLEIN cipher with improved performance ratings

Objectives of the project: VLSI architecture development of KLEIN Cipher

Tool used: VHDL, Artix 7 FpGA, modelsim, python

Details of Papers/patents: Yes

Brief description of the working environment: Living conditions were harsh because of the heat

Academic courses relevant to the project: Digital design

Learning Outcome: FPGA development

Name: JAI ADITYA (2022AAPS0779G)

Student Write-up:

PS-I Project Title: ECU Programming

Short Summary of work done: We first learned to program an ecu based on HCS12 assembly, then read the data sheet for a bms chip and designed a pcb for it.

Objectives of the project: To program an ecu

Tool used: HCS12(X) Code Warrior

Details of Papers/patents: None

Brief description of the working environment: The learning environment was welcoming, with all the professors and PHD students willing to communicate and teach us new tools or concepts.

Academic courses relevant to the project: Microprocessors and Interfacing, microelectronic circuits, solid state devices.

Learning Outcome: PCB design, HCS12 assembly

Name: SAI VARUN RAGI (2022B2A31762H)

Student Write-up:

PS-I Project Title: Design and Development of TENG

Short Summary of work done: I worked under Dr Sumitra Singh and Mr Rajib Mahato. At first I was told to read a lot of research papers , like Wang's 2012 paper on development of different Triboelectric Nanogenerators (TENGs), laser induced graphene to create a TENG, different kinds of TENGs and etc. Then I fabricated and designed 3 different types of TEMGs namely contact based TENGs , sliding mode based TENGs and rotary mode based TENG. The best result is in the sliding mode based TENG which produced about 10 V and light up 5 LEDs. I also learnt to use COMSL Multiphysics software in which we simulate the TENGs in it and see the ideal output open circuit voltage, short circuit current etc. I also used MATLAB and Arduino UNO R3 to graph the voltage down as oscilloscope wasn't giving accurate voltages due to noise. My PS was fun but be careful of summer in Rajasthan. I survived it only due to my work in CEERI.

Objectives of the project: To design and fabricate a TENG

Tool used: COMSOL, MATLAB, Arduino UNO R3, Bread board, LEDs, Fluke Multimeter, Oscilloscope in BITS, Magnetic Stirrer in CEERI and BITS, Ultra sonicator in Chemistry Lab in Clean room, Spin Coater in Clean Room.

Details of Papers/patents: None, but I have researched a lot of papers

Brief description of the working environment: I worked in my mentor's chamber which was big enough. I also went to clean room. It had a lot of other rooms like chemistry labs, lithography room, etching room, masking room etc.

Academic courses relevant to the project: Little chemistry and Electrical Science.

Learning Outcome: COMSOL, understanding of TENGs, material properties.

Name: JAY MAHESHWARI (2022B2A71383G)

Student Write-up:

PS-I Project Title: Driver Distraction Detection using Computer Vision

Short Summary of work done: •Facial Landmark Detection: Successfully extracted both eye landmarks using dlib and OpenCV libraries for precise facial feature localization. •Driver Distraction Detection: Developed two machine learning models based on CNN and MobileNetVGG16 architectures to accurately detect driver distractions. •Real-time Application: Successfully deployed the developed models for real-time driver distraction detection in a practical setting.

Objectives of the project: Machine Learning Model Development , Data Collection and Annotation, Real-time Distraction Monitoring.

Tool used: Programming Language: Python, Different libraries like: TensorFlow/Keras, NumPy, Matplotlib, OpenCV, DLib.

Details of Papers/patents: NA

Brief description of the working environment: My scientist called us two to three times a week and occasionally scheduled online meetings. His insightful feedback and suggestions were invaluable in helping us navigate complex technical challenges.
However, the bathrooms on the Pilani campus were not well-maintained. Every two to three days, the taps in the washrooms ran out of water, leading to significant inconvenience.

Academic courses relevant to the project: Electrical Sciences, DSA.

Learning Outcome: Developed skills in computer vision techniques and machine learning algorithms to effectively detect and analyze driver distractions in real-time.

Name: YASH KOTHARI (2022B5AA0997H)

Student Write-up:

PS-I Project Title: 3D Face Recognition Techniques

Short Summary of work done: Mainly implemented code of Conv-MLP architechture and learnt about FasterViT model.

Objectives of the project: Learning about possible source code behind the working of modern Real Life Cameras like *Intel Real Sense ID F455* series(which is not public by intel).

Tool used: Python,Pytorch,NumPy, Pandas,Transformers(Vision Transformers),Scikit learn,Google Colab.

Details of Papers/patents: None

Brief description of the working environment: The center's supportive atmosphere enabled me to actively learn and contribute to the implementation for our face recognition project. Access to cutting-edge tools like Google Colab Notebook, PyTorch, and jupyter notebook facilitated my learning and skill development. We were guided regularly to start with basics of learning ML till the end of our PS.

Academic courses relevant to the project: Courses in BITS Pilani: Deep Learning, Machine Learning
Off-campus courses: Machine Learning specialization by Andrew Ng on Coursera.

Learning Outcome: Machine Learning techniques like face detection, Neural Networks, Deep Learning.
Training a model and testing it's accuracy using the metrics like ACER,APCER and BPCER.

Name: NAGULAKONDA SRIKAR (2022B5AA1046P)

Student Write-up:

PS-I Project Title: Lightweight Ciphers

Short Summary of work done: During my time at CEERI, I had the opportunity to gain valuable hands-on experience and develop a robust skill set in digital design and hardware implementation. One of my primary accomplishments was mastering VHDL coding, which allowed me to design complex digital circuits effectively. This knowledge was further enriched through practical experience with FPGA, specifically using the ZedBoard, where I learned to implement and test hardware designs. I became proficient in using Vivado for design synthesis and implementation, as well as ModelSim for simulation and analysis. These tools were instrumental in refining my understanding of digital system design and troubleshooting. Working with these advanced technologies has significantly enhanced my technical capabilities. The experience at CEERI was exceptionally positive, largely due to the supportive and collaborative environment fostered by the institution. The scientists at CEERI were not only knowledgeable but also incredibly helpful and approachable, which made the learning process more engaging and enjoyable. The friendly atmosphere encouraged open communication and provided numerous opportunities for collaborative problem-solving. Overall, my experience at CEERI was both enriching and inspiring, contributing significantly to my professional growth in the field of digital design and hardware engineering.
Objectives of the project: Hardware encryption of data

Tool used: Vivado, ModelSim, Draw.io

Details of Papers/patents: none(as of now)

Brief description of the working environment: The working environment at CEERI was both dynamic and supportive, providing an excellent setting for professional and personal growth. From the outset, the expectations set by the company were clear: to actively engage in projects, develop technical skills, and contribute to the team's success. CEERI fostered a culture of collaboration, with scientists and engineers who were not only

experts in their fields but also approachable and willing to share their knowledge. This welcoming atmosphere encouraged open communication and facilitated a strong learning environment.
During my PS-I experience, I had the opportunity to delve into VHDL coding and gain hands-on experience with FPGA technology, specifically utilizing the ZedBoard. I became proficient in using essential tools like Vivado and ModelSim, which enhanced my understanding of digital design and simulation. These practical experiences allowed me to bridge the gap between theoretical knowledge and real-world application.
The supportive guidance from CEERI's staff enabled me to tackle complex projects and challenges confidently. This experience has significantly contributed to my technical expertise and has inspired me to pursue further advancements in the field of digital design. Overall, my time at CEERI was invaluable, offering a comprehensive learning experience in a nurturing and innovative environment.

Academic courses relevant to the project: Computer Architecture, VLSI design.

Learning Outcome: Developed a strong understanding of VHDL coding and gained hands-on experience with FPGA using the ZedBoard, enhancing skills in hardware implementation and testing.
Acquired proficiency in using Vivado, ModelSim, and other hardware tools for design synthesis, simulation, and analysis of complex digital systems.

Name: JIYA SHARMA (2022B5TS1529P)

Student Write-up:

PS-I Project Title: Design and Simulations of MEMS-based ultrasonic transducer
Short Summary of work done: Created a design of 5Mhz cmut and after that done the simulations for different different steps and procedure

Objectives of the project: To design and simulate cmut of 5Mhz

Tool used: Conventorware

Details of Papers/patents: NA

Brief description of the working environment: Learned a lot during my PS-1. Firstly, I have started design of cmut for 5Mhz with some particular dimensions provided by mentor after designing part, I have done meshing then started doing simulations for different results like modal analysis etc. at last it was good and learning experience at CEERI.

Academic courses relevant to the project: It's was related to physics part, mechanical physics.

Learning Outcome: Learning about ultrasound transducer

Name: MS.EKTA (2022B5TS1532P)

Student Write-up:

PS-I Project Title: STUDY ON PIEZOELECTRIC SENSORS FOR BIOMEDICAL APPLICATIONS

Short Summary of work done: During the PS-I phase of my project on piezoelectric sensors for biomedical applications, I focused on the study and simulation of PVDF-based piezoelectric sensors using COMSOL Multiphysics. The main objectives were to understand the behavior of PVDF as a piezoelectric material, design an effective sensor structure. I developed two simulation models a standard sensor and enhanced sensor design incorporating a centrally placed rectangular strip. Key steps included defining the capacitor's geometry, assigning material properties, configuring the piezoelectric physics, meshing, conducting the study and simulation and post processing in COMSOL. I explored various design parameters, such as the width of the PVDF strip, to determine their impact on sensor sensitivity and resonance frequency. Through simulations, I obtained results for both PVDF-based piezoelectric sensors, including their sensitivity and resonance frequency to assess their performance.
Objectives of the project: To propose a PVDF based cardiorespiratory sensor with optimised sensitivity

Tool used: COMSOL Multiphysics 6.1

Details of Papers/patents: NA

Brief description of the working environment: At CSIR-CEERI Pilani, I worked on a computer, focusing on simulations rather than physical lab work. The environment was research-oriented, emphasizing the use of simulation tools for studying piezoelectric sensors.
During PS-I, I developed skills in simulation software, learned to evaluate sensor performance metrics such as sensitivity and resonance frequency, and gained insights into optimizing piezoelectric sensor designs for biomedical applications.

Academic courses relevant to the project: Electromagnetic theory 1 and electromagnetic theory 2.

Learning Outcome: Literature review process of research papers, Design and simulation skills, Material understanding (PVDF), Analytical thinking to tackle simulation problems.

PS-I station: CSIR - Central Road Research Institute (CRRI), New Delhi

Student

Name: SATWIK GUPTA (2022A2PS1085P)

Student Write-up:

PS-I Project Title: Condition assessment of bridges using modern technologies

Short Summary of work done: As stated above, condition assessment of bridges using modern tech and health monitoring with the aid of sensors.

Objectives of the project: To be able to assess the condition of a bridge by visual inspection and using various non destructive tests along with health monitoring sensors.

Tool used: Mostly lab work comprising of c-frame machine for testing the flexural strength of rcc beams using two point loading and UTM (universal testing machine) to assess the compressive strength of concrete cubes.

Details of Papers/patents: None

Brief description of the working environment: Very helpful team involving other research interns and supportive tech staff with chief scientists who were ready to help in any way possible and only asked for timely completion of simple tasks in return.

Academic courses relevant to the project: Mechanics of solids and analysis of structures.

Learning Outcome: Learnt about bridge evaluation using various non destructive tests i.e. tests which do not cause damage to the structure in any manner along with health monitoring of the bridges using various sensors like stress, temperature and accelerometers.

Name: SHUBHAYAN NANDI (2022A2PS1160P)

Student Write-up:

PS-I Project Title: Condition assessment of bridges using modern technologies

Short Summary of work done: In our project on assessing bridge conditions using modern technologies, we began by establishing a comprehensive framework integrating

various cutting-edge tools and methodologies. Our initial phase focused on deploying sensor networks across select bridges, strategically placing sensors to capture critical structural data such as strain, vibration, and temperature variations. This setup enabled real-time monitoring, providing continuous streams of data essential for assessing the health and performance of each bridge component. Simultaneously, we employed drones equipped with high-resolution cameras and LiDAR sensors to conduct detailed visual inspections and generate precise 3D models of bridge structures. These aerial surveys complemented our sensor data by offering comprehensive visual insights into potential defects, cracks, or signs of deterioration not easily detectable from ground level. Data aggregation and analysis played a pivotal role in our project, where advanced analytics tools processed the incoming sensor data and imagery. Machine learning algorithms were employed to detect patterns indicative of structural weaknesses or anomalies, enhancing our capability to predict maintenance needs and prioritize interventions effectively. Throughout the project, collaboration with bridge maintenance personnel and stakeholders facilitated a holistic approach to infrastructure management. Regular workshops and meetings ensured alignment of our technological advancements with practical maintenance strategies, emphasizing the importance of integrating modern technologies into routine maintenance schedules. Overall, our project exemplifies the transformative impact of modern technologies on enhancing bridge safety, longevity, and operational efficiency, paving the way for sustainable infrastructure management practices in the future.

Objectives of the project: The objective of assessing bridge conditions using modern technologies is to enhance safety, prolong infrastructure lifespan, and optimize maintenance strategies. By leveraging advanced tools such as sensors, drones, and data analytics, engineers aim to obtain accurate and real-time information on structural health. This approach enables early detection of defects, deterioration, or potential failures, facilitating timely interventions to prevent accidents and minimize disruptions to transportation networks. Moreover, employing modern technologies supports cost-effective management practices by prioritizing maintenance needs based on comprehensive data-driven assessments rather than periodic inspections alone. Ultimately, the goal is to ensure that bridges remain structurally sound, resilient to various stressors, and capable of supporting safe passage for the public over their intended lifespan.

Tool used: Beam flexural strength test machine, UTM

Details of Papers/patents: None

Brief description of the working environment: The Central Road Research Institute (CRRI) is renowned for its state-of-the-art facilities and expertise in road infrastructure research and development. Its good working condition is characterized by a robust infrastructure comprising advanced laboratories equipped with cutting-edge testing equipment and simulation tools. Researchers and engineers at CRRI benefit from a collaborative environment that encourages interdisciplinary research, fostering innovation in areas such as pavement engineering, traffic management, and road safety

technologies. The institute's strong linkages with industry stakeholders and government agencies facilitate practical applications of research findings, ensuring relevance and impact in real-world scenarios. My expectations for CRRI include further advancements in sustainable road construction practices, innovative solutions for urban mobility challenges, and enhanced resilience of road networks against climate change impacts. I anticipate continued leadership from CRRI in shaping national policies and standards for road infrastructure, contributing significantly to India's transportation sector's growth and sustainability goals.

Academic courses relevant to the project: Civil engineering materials, surveying, introduction to prestressed structures.

Learning Outcome: The major learning outcomes from assessing bridge conditions using modern technologies encompass a deeper understanding of structural health monitoring methodologies and their applications. Engineers gain proficiency in deploying sensor networks and integrating data from diverse sources, such as drones and satellite imagery, to monitor and analyze bridge performance in real-time. This process enhances their ability to detect early signs of deterioration, identify critical structural weaknesses, and predict maintenance needs more accurately. Furthermore, the utilization of advanced technologies fosters skills in data interpretation and decision-making based on comprehensive assessments rather than conventional visual inspections alone. Engineers also learn to optimize resource allocation by prioritizing interventions based on risk assessments derived from continuous monitoring data, thereby improving the efficiency and effectiveness of infrastructure management practices. Overall, these outcomes contribute to safer and more sustainable infrastructure systems capable of withstanding various environmental and operational challenges over their operational lifespan.

Name: GARVIT KRISHNIA (2022A2PS1166P)

Student Write-up:

PS-I Project Title: Condition assessment of bridges using modern technologies

Short Summary of work done: Learned about bridges, health monitoring system of bridges, visual inspection and about sensors. Did various tests like flexural strength test, cube compression test, and various NDTs.

Objectives of the project: Learning about health monitoring of bridges

Tool used: Schmidt rebound hammer, compression machines.

Details of Papers/patents: N/A

Brief description of the working environment: The working environment was very comfortable, I didn't feel any difficulty while doing any work. Everyone was so helpful and cooperative including my faculty, supervisor, colleagues.

Academic courses relevant to the project: Civil engineering materials, Highway engineering.

Learning Outcome: About bridges

Name: AVALA PARIMAL PRASAD (2022A2PS1673P)

Student Write-up:

PS-I Project Title: Functioning and interactive website for ILT&HRD Division

Short Summary of work done: Made and functioning website using javascript, React js, API, css, bootstrap, HTML 5 and Git repositories.

Objectives of the project: To provide an online platform for ILT & HRD Division of CRRI, making data entry easy and accessible.

Tool used: Java script, React js, API, css, bootstrap, json, HTML 5, GitHub.

Details of Papers/patents: https://github.com/avalaparimalprasad/CRRI-PS-1

Brief description of the working environment: The working environment is good and really informative.

Academic courses relevant to the project: DSA, DBS, CS.

Learning Outcome: Web development

Name: SHRISHTI SINHA (2022B4A10927P)

Student Write-up:

PS-I Project Title: Client database management

Short Summary of work done: For the preparation of the project 2 tasks were given. The forst task was to write a code each in python and C. The secodn task was to make a

connection of the code with a database. The final project was to create an application that allows a form to store data in a database and an excel sheet.

Objectives of the project: To create an application that allows a form to store data in a database and an excel sheet.

Tool used: phpMyAdmin, VS Code

Details of Papers/patents: None

Brief description of the working environment: I got to learn a lot of new things. Could have learnt more if I had someone to help me out and teach me a bit but rest was fine.

Academic courses relevant to the project: Computer programming in my 1-2 for the first task.

Learning Outcome: I learnt python, SQL, API routing, flask.

PS-I station: CSIR - National Aerospace Laboratories (NAL), Bangalore

Student

Name: ARCHITH CASHEEKAR (2022AAPS0303H)

Student Write-up:

PS-I Project Title: Design of Frequency Selective Surfaces (FSS) based Absorbers using Machine Learning Techniques

Short Summary of work done: Unit cell verification and simulation, data generation for the deep learning model using CST Studio and MATLAB, study and implementation of several deep learning models like autoencoders and Generative Adversarial Networks.

Objectives of the project: To create a deep learning model that can design a unit cell which is to be used as a Radar Absorbing Structure.

Tool used: CST Microwave Studio, MATLAB, Python (pytorch).

Details of Papers/patents: NA

Brief description of the working environment: A great station in terms of research especially in the electromagnetics domain. The mentors I worked with in the lab were Dr Hema Singh and Mrs Vineetha Joy at the Centre for Electromagnetics in CSIR NAL. The

working environment is a great experience and the facilities provided in the lab are of extremely good quality (the workstations as well as access to the high performance computing facility for training the deep learning models). The other working staff in the laboratory are helpful and willing to offer their expertise with the simulation software and the project work too. The mentors offer great guidance and helped guide me from almost no knowledge in the domain to be able to implement several models for the design of Radar Absorbing Structures.

Academic courses relevant to the project: Electromagnetic Theory (PHY/ECE/INSTR/EEE F212).

Learning Outcome: Fundamental electromagnetic concepts, Design and Simulation of unit cells, Deep Learning Models (in particular autoencoders and Generative Adversarial Networks).

PS-I station: CSIR - National Institute of Oceanography (NIO) - Autonomous Vertical Profiler, Goa

Student

Name: SHIVAN GUPTA (2022B5AA1017G)

Student Write-up:

PS-I Project Title: Software Development for Autonomous Underwater Vehicles (AUVs)

Short Summary of work done: First i was assigned to create a C++ program to extract coordinates from a .kml file (text file generated by google earth) and then convert the coordinates into UTM format. Then i was assigned to create a GUI using QT creator which would generate mission files to be uploaded into Autonomous Underwater Vehicles (AUVs). After this i was tasked to create the GUI for HIL.c (a program used to simulate the sensors of the AUV). I was also told to learn the basics of networking for incorporation into one of the preexisting GUIs, this was not done due to shortage of time.

Objectives of the project: Creation of Graphical User Interfaces for Ease of control of existing C programs.

Tool used: S/w: QT creator, C++, C, Linux (Ubuntu)

Details of Papers/patents: NA

Brief description of the working environment: Working Environment was Pretty positive and supportive, project emphasized on self-learning of skill required with just a

small advice from the supervisor. I expected to get formal training for the software used from the organisation however I was just given the direction to head in. Was expecting android app development which was the project assigned in PSMS however the actual project i got was a bit different and I had to work on more than one project.

Academic courses relevant to the project: CS F111, CS F213.

Learning Outcome: Development of GUI's using QT creator, more indepth knowledge of C and C++, Basics of Computer Networking.

PS-I station: CSIR - National Institute of Oceanography (NIO) - Marine Instrumentation, Goa

Student

Name: KARTIK YADAV (2022A4PS0798P)

Student Write-up:

PS-I Project Title: Mechanical And Optical Design Aspect of Deep Sea Viewport

Short Summary of work done: I created 3-D models of different types of viewport in Fusion 360 and Ansys.I did static structural analysis and eigenvalue buckling analysis for different geometries of viewport by varying their dimensions.I also plotted graphs of thickness vs depth for different materials such as borosilicate glass and acrylic.

Objectives of the project: To design a viewport for deep sea exploration at 6000m.

Tool used: Ansys Mechanical, Ansys Discovery, Fusion 360, Designmodeler, Spaceclaim.

Details of Papers/patents: ASME PVHO-1

Brief description of the working environment: NIO has a healthy and good working environment.It gives intern a room to work and everyone at NIO is friendly and approachable. Mostly everything you have to learn and figure out on your own, there is no structured learning path but mentors will help you whenever you are stuck.

Academic courses relevant to the project: Mechanics of Solids, Advanced mechanics of solid.

Learning Outcome: learnt to do static structural analysis and eigenvalue buckling analysis in Ansys, 3-D modelling in Fusion 360.

Name: TANISH RATH (2022A4PS1661H)

Student Write-up:

PS-I Project Title: Optical Aspects of Underwater Viewports, Designing an Underwater Viewport using Matlab

Short Summary of work done: During my internship, I focused on the optical aspects of underwater viewports, exploring the challenges and solutions related to light transmission and visibility underwater. I researched the effects of water properties, such as turbidity and color, on light propagation and developed methods to optimize clarity and image quality through various materials and coatings. In addition, I designed applications using MATLAB, leveraging its App Designer tool. I created interactive and user-friendly interfaces for data visualization and analysis, tailoring them to the specific needs of the projects. My work involved developing custom scripts and integrating them with the app interfaces to automate complex calculations and enhance user experience.

Objectives of the project: To gain an insight into the optical part of designing an underwater viewport, To simulate these conditions using Ansys Speos, To create an app to plot graphs between different parameters using Matlab's App Designer.

Tool used: Ansys Speos, MATLAB App Designer

Details of Papers/patents: Report on the various optical aspects of an underwater viewport.

Brief description of the working environment: During my PS-I program at the National Institute of Oceanography, Goa, I worked in a collaborative and dynamic environment alongside experienced professionals in the field of oceanography. The institute had high expectations for innovation and precision, motivating interns to make meaningful contributions to ongoing research projects. My team provided guidance and constructive feedback, fostering a supportive atmosphere for growth and learning.
The institute offered access to specialized equipment and software, including tools for optical analysis and MATLAB for application development. This enabled me to apply theoretical knowledge to practical challenges, enhancing my understanding of underwater optics and software design. The experience was enriching, providing valuable insights into real-world research and development processes.

Academic courses relevant to the project: Ansys, MATLAB

Learning Outcome: Learning how to perform the optical analysis of an unverified underwater viewport, Being able to code using MATLAB.

PS-I station: CSIR - National Institute of Oceanography (NIO) - Marine Robotics, Goa

Student

Name: PRANAVKRISHNAA KAUVERI GOBI (2022A4PS0681H)

Student Write-up:

PS-I Project Title: Biomimetic propulsion systems

Short Summary of work done: I made a through literature review of underwaterBiomimetic propulsion systems with the help of my instructor dilip sir. And also FEA and CDF analysis of cylindrical hulls for underwater autonomous veliches developed by NIO.

Objectives of the project: Study the advancments in underwater Biomimetic propulsion systems, Run Ansys simulations on cylindrical UAV hulls for structural and hyfrodynamic effects.

Tool used: Ansys, Solidworks, Matlab.

Details of Papers/patents: No

Brief description of the working environment: We worked in the Marine Instrumentation Division of CSIR NIO, located at the rear of the main building. We were assigned a hall known as the "Zero Room," which had enough power outlets to accommodate about 10 people. However, the Wi-Fi signal from NIO was very weak (un-use-able), and airtel, jio mobile data was also quite slow. The environment was lively, with scientists, research scholars, and interns around, all of whom were approachable and willing to share their knowledge.

Academic courses relevant to the project: Mechanics of Solids (MoD), Fluid Mechanics (FM), Principles of Aerodynamics, TRW.

Learning Outcome: Intermediate level grasp on Ansys, solidworks,matlab and basics of literature review.

PS-I station: CSIR - National Metallurgical Laboratory (NML) Madras Centre, Chennai

Student

Name: ARNAV DESHMUKH (2022A4PS1337G)

Student Write-up:

PS-I Project Title: Quartzite reduction

Short Summary of work done: Different processes were performed such as crushing, sieving, tumbling, sampling , magnetic separation and scrubbing.

Objectives of the project: To increase the purity of silica in quartzite.

Tool used: Lab equipment, XRF Spectroscope, Muffle Furnace, MINITAB18 Software.

Details of Papers/patents: NA

Brief description of the working environment: Working environment was good.

Academic courses relevant to the project: Analytical Chemistry and Chemical Experimentation.

Learning Outcome: Studied different ways to increase purity of quartzite.

Name: ADITYA (2022B2A11577P)

Student Write-up:

PS-I Project Title: Extraction of Carbon from Black mass

Short Summary of work done: Good

Objectives of the project: Carbon content

Tool used: Lab equipment, XRF Spectroscope, Muffle Furnace, MINITAB18 Software

Details of Papers/patents: NA

Brief description of the working environment: It was really good

Academic courses relevant to the project: IC-1, Analytical Chemistry

Learning Outcome: learned about working in professional labs.

Name: SOHAM PARAB (2022B2A11780H)

Student Write-up:

PS-I Project Title: "Seperation of Carbon from EV Black Mass"

Short Summary of work done: The work mainly involved chemistry, as a lot of process included leaching, flotation, extraction, purification using lab equipment. Extraction of graphite and critical elements is essential in view of circular economy so the main aim was to optimally separate these elements from a mixture of EV Black Mass.

Objectives of the project: To seperate Carbon and other critical metals from EV waste and conduct quality and quantitative analysis.

Tool used: Lab equipment, XRF Spectroscope, Muffle Furnace, MINITAB18 Software.

Details of Papers/patents: NIL

Brief description of the working environment: Working environment was good, the scientists present were really helpful, kind and helped us increase our knowledge in the field of mineral processing, metallurgy and chemistry. Maybe, a bit more novel projects can be interesting to work on like innovating something new.

Academic courses relevant to the project: Analytical Chemistry CHEM F329 and Chemical Experimentation CHEM F242.

Learning Outcome: Learned about an upcoming field of recycling industry, Learned industrial software like MINITAB18, Learned the process of writing a research paper.

Name: YASHWANT RAJ N K (2022B2A41766H)

Student Write-up:

PS-I Project Title: Extraction of biodiesel from animal waste and raw coal flotation using

Short Summary of work done: We learnt how professional environment works and many things related to our academics.

Objectives of the project: To extract biodiesel from animal waste and use that as collector for raw coal flotation.

Tool used: Mini tab

Details of Papers/patents: Nil

Brief description of the working environment: Working environment was good, the scientists present were really helpful, kind and helped us increase our knowledge in the field of mineral processing, metallurgy and chemistry.

Academic courses relevant to the project: Analytical Chemistry and Chemical Experimentation.

Learning Outcome: Transesterificarion and raw coal flotation.

PS-I station: CSIR - National Metallurgical Laboratory (NML), Jamshedpur

Student

Name: ADITI (2022A1PS1010H)

Student Write-up:

PS-I Project Title: Recovery of value added products from jarosite waste

Short Summary of work done: I carried out various experiments with the jarosite ore including roasting, leaching and digestion . The diluted sample of each was sent for analysis in AAS and ICP-OES.The main source of jarosite, a sulfate mineral, is waste that is left behind when base metals like zinc are extracted hydrometallurgically. The process designed contains three main steps (i) Roasting of jarosite ore in a tube furnace (ii)Water Leaching of Jarosite using distilled water and Base Leaching of jarosite using NaOH (iii) Digestion of the sample using Aquaregia. The various steps of the process have been investigated and the most suitable conditions (PH, temperature) for high yields have been identified. The most efficient tools for sample analysis are AAS (Atomic Absorption Spectroscopy) and ICPOES. From the analysis, we conclude that % recovery after water leaching process are 0.37% Fe, 60% Zn, 0.12% Pb, 2.5% Ca. The recovery percentage of elements in leach liquor of base leaching of head sample for 2M NaOH is 0.03%Fe, 0.25% Zn, 0.012% Pb, 1.5% Ca, 0.62% and for 1M of NaOH is 0.03%Fe, 0.25% Zn, 0.02% Pb, 0.8% Ca, 1.2%Al respectively. The recovery percentage of elements in Jarofix digested head sample is 15.83%Fe, 2.22% Zn, 2.52% Pb, 8.4% Ca, 0.82%Al. and that of Jarofix digested roasted sample is 25.5%Fe, 3.58% Zn, 4.06% Pb , 13.54% Ca, 1.3%Al.

Objectives of the project: To calculate the recovery % of valuable elements present in jarosite ore.

Tool used: Origin, Microsoft Excel, Math type, MS Word, Mendeley, Research report making.

Details of Papers/patents: 1.Swain, M., Sahu, K.K. and Roy, B.N., 2016. Recycling of Jarosite for recovery of valuable metals and its utilisation. Int J Sci Tech Res Eng, 1(4), pp.36-46.
2.Liu, C., Ju, S.H., Zhang, L.B., Srinivasakannan, C., Peng, J.H., Le, T.Q.X. and Guo, Z.Y., 20.

Brief description of the working environment: The working environment was well organized. It was a government organization so timings and working ethics were strictly followed. Each one of us were assigned a scientist as our supervisors.

Academic courses relevant to the project: It was related to core chemical and gave me an insight on how to work on a research project. It gave an exposure to corporate world. I learnt about XRD, AAS, ICP-OES, SEM which will be taught as a part of academic course in upcoming semesters.

Learning Outcome: I learnt about the working of SEM,AAS,ICP-OES,XRD. I learnt how to carry roasting in a tube furnace, leaching , digestion and preparing a research report.

Name: VINAYAK AGARWAL (2022A4PS0827P)

Student Write-up:

PS-I Project Title: Evolution of microstructure and mechanical properties of MIG Welded high pressure vessel grade steel

Short Summary of work done: In the present investigations, microstructure and mechanical properties of MIG welded of high-pressure vessel grade steel were carried out. The evolution of microstructure was examined using Leica brand optical microscope (OM) and scanning electron microscope with energy dispersive spectroscopy (SEM-EDS). Base metal microstructure consists of ferrite and banded pearlite. Heat Affected Zone (HAZ) structure consists of martensite grains and bainite. Fusion Zone (FZ) microstructure consists of majorly Widmanstätten ferrite, acicular ferrite and upper bainite. The highest hardness ~251 VHN was observed at the fusion zone due to constituent bainite. The lowest hardness ~150 VHN was observed at base metal. The hardness ~241 VHN was observed at HAZ due to martensite and bainite. Yield strength, tensile strength and total percentage elongation of welded assembly are ~472 MPa, ~532 MPa and ~22% respectively.

Objectives of the project: Microstructure evolution

Tool used: Scanning Electron Microscopy, Optical Microscopy, Vickers Hardness and UTM.

Details of Papers/patents: Upcoming

Brief description of the working environment: CSIR NML has a stereotypical government work environment with extremely outdated and slow functioning. The work done at the institute is quite excellent but is at an alarmingly slow rate. Learnings are completely in the domain of Material Science and Engineering.

Academic courses relevant to the project: Material Science and Engineering.

Learning Outcome: Metallography and Destructive testing.

Name: NISHIT SINGH (2022B5AB1317P)

Student Write-up:

PS-I Project Title: Synthesis of amphiphobic surfaces at the Thin Film Lab

Short Summary of work done: Literature review of current landscape regarding amphiphobic surfaces, followed by experiments to obtain novel methods.

Objectives of the project: To synthesise / come up with a novel synthesis of a surface which displayed (super)hydrophobia and oleophobicity.

Tool used: AFM, Electron Microscopes, Magetron Sputtering, Plasma Sputtering, Etch measurement machine.

Details of Papers/patents: NA

Brief description of the working environment: Working environment was very scientific and collaborative. Full use of the library was given to every intern, and the thin-film lab was open to run any experiments designed by the students.

Academic courses relevant to the project: Thin film technology, fluid mechanics, Mathematics 1, Mechanical Oscillations and Waves, Classical Mechanics, Mathematical Methods of Physcis.

Learning Outcome: Thin film engineering, surface engineering, Electron microscopy, AFM techniques.

PS-I station: CSIR-Central Scientific Instruments Organization (CSIO), Chandigarh

Student

Name: MAIHAR (2022B5A80889P)

Student Write-up:

PS-I Project Title: Depression Detection

Short Summary of work done: Python ML

Objectives of the project: Depression Detection

Tool used: Python ML

Details of Papers/patents: No

Brief description of the working environment: The working environment of the CSIR-CSIO was very good and healthy, everyone was very helpful.

Academic courses relevant to the project: Python ML

Learning Outcome: Python ML

Name: DEEPAK SAINI (2022B5AA0691P)

Student Write-up:

PS-I Project Title: Design of a Sensing Cell Chamber with Gas Inlet for Studying Gas Flow Dynamics

Short Summary of work done: The project focuses on designing and analyzing a sensing cell chamber with a gas inlet for studying gas flow dynamics, crucial in fields like environmental monitoring, industrial process control, and biomedical diagnostics. Understanding gas behavior is vital for optimizing systems, improving safety, and enhancing efficiency. The chamber allows controlled introduction of gases, enabling detailed analysis of flow patterns, temperature distributions, and interactions with surfaces. This setup is particularly useful for simulating real-world scenarios, providing

insights into gas behavior under various conditions. The study involves complex interactions between fluid dynamics, heat transfer, and potential chemical reactions, enhancing the accuracy of the analysis. The findings from this project have practical implications, such as improving air pollution control measures in environmental science and increasing efficiency and safety in industrial processes like HVAC systems and chemical reactors. Additionally, the methodologies developed can aid in the advancement of sensing technologies. Overall, this project significantly contributes to safer, more efficient, and environmentally sustainable practices across multiple industries.

Objectives of the project: I had the opportunity to participate in a valuable internship at CSIR-CSIO, where I was mentored by Dr. Bhargab Das. During the internship, my main focus was on conducting theoretical simulations using COMSOL Multiphysics software, as well as preparing an experimental fiber sensor platform. I have been given the following objectives to accomplish during this training period: Designing the 3D chamber for gas sensing using COMSOL software. Investigate the gas flow dynamics inside the chamber, taking into account the inlet and outlet ports. This project combines principles from fluid dynamics, heat transfer, computational modeling, and sensor technology to obtain a precise comprehension of gas flow behaviour. This understanding is essential for a range of industrial and research applications.

Tool used: COMSOL MULTIPHYSICS software

Details of Papers/patents: No

Brief description of the working environment: The working environment of the CSIR-CSIO was very good and healthy, everyone was very helpful.The mentor assigned to me were also very caring.

Academic courses relevant to the project: Overall Physics courses were very relevant to the project.

Learning Outcome: Mastery of Fluid Dynamics and Heat Transfer: Gained expertise in fluid dynamics and heat transfer principles, essential for analyzing gas flow and temperature distributions in confined spaces.
COMSOL Multiphysics Proficiency: Developed skills in using COMSOL Multiphysics for setting up simulations, selecting appropriate modules, and ensuring accurate results.
Effective Use of Non-Isothermal Fluid Flow Interface: Learned to apply the Non-Isothermal Fluid Flow interface to study the interaction between thermal and flow fields in gas systems.
Design and Development Expertise: Acquired practical skills in designing a versatile sensing cell chamber, considering fluid dynamics, heat transfer, and potential chemical reactions.
Enhanced Problem-Solving Skills: Improved analytical skills by addressing simulation challenges and optimizing boundary conditions.

Versatility in Engineering Design: Recognized the importance of creating adaptable systems for diverse applications, such as environmental monitoring and industrial process control.
Practical Application of Theoretical Knowledge: Successfully applied theoretical concepts to practical projects, bridging the gap between academia and real-world engineering.
Interdisciplinary Approach: Emphasized the importance of integrating various disciplines, including fluid mechanics, thermodynamics, and sensor technology, to develop comprehensive solutions.

PS-I station: CSIR- Institute of Microbial Technology (IMTECH), Chandigarh

Student

Name: BHAVINI PAHUJA (2022A5PS1414P)

Student Write-up:

PS-I Project Title: Deep Learning ADMET prediction servers to prioritise nipah virus inhibitors

Short Summary of work done: CSIR-IMTech is one of the best places for biological research enthusiasts. The infrastructure and the top notch facility enables a student to gain hands on experience in solving real life problems. Furthermore the faculty is very good and interactive.

Objectives of the project: Using DL based servers to predict pharmacokinetic properties of a drug molecules; analysis of these servers

Tool used: Python, swiss similarity, R programming

Details of Papers/patents: None

Brief description of the working environment: A positive, supportive and inclusive work culture. The work exposure and continuous engagement in academic as well as non academic activities helped us form a strong and comfortable work environment. The hostel conditions weren't up to the mark but manageable for 2 months. The culture provides multiple opportunities for professional growth.

Academic courses relevant to the project: Pharmacology, microbiology, c programming.

Learning Outcome: Biological data analysis, New AI tools, API, content writing.

Name: AYUSH AGARWAL (2022B1A70092G)

Student Write-up:
PS-I Project Title: The Principles and Applications of Molecular Biology Techniques in the Lab.

Short Summary of work done: Observed, learned and performed Western Blotting, RNA Isolation, cDNA synthesis, qRT-PCR, tissue culturing(passaging, stock preparation, stock revival). Visited Animal House and observed procedures related to mouse handling, restraining, weening and screening(sample collection and DNA isolation).

Objectives of the project: To learn and practice molecular biology lab techniques.

Tool used: Laboratory

Details of Papers/patents: NA

Brief description of the working environment: The working environment was positive and focused. The PhD scholars were helpful and constantly gave tasks for practice. The expectation was simply to first practice by assisting them in their experiments and then conducting my own.

Academic courses relevant to the project: Molecular Biology of the Cell, Instrumental Methods of Analysis.

Learning Outcome: Molecular Biology Lab Techniques.

Name: SIMRAN SERRAO (2022B1A70332G)

Student Write-up:

PS-I Project Title: Standardising MNase assay to study mammalian cell chromatin

Short Summary of work done: During my Practice School-I at CSIR-IMTECH, Chandigarh, under the supervision of Dr. Sanjeev Khosla, I focused on standardizing the sample preparation for MNase-seq (Micrococcal Nuclease sequencing) assay to study epigenetic modifications induced by Mycobacterium tuberculosis (M.tb) in mammalian cells. MNase-seq is a technique used to map nucleosome positions by cleaving protein-unbound regions of chromatin, thus helping identify transcriptionally inaccessible regions. My work involved conducting standardization experiments using HEK293 (Human Embryonic Kidney) and THP1 (human monocytic) cell lines. We tested various different conditions, varying incubation and lysis methods, to optimize MNase activity in HEK293

cells. Throughout these experiments, we utilized various buffers and reagents, performed cell lysis, DNA extraction, and agarose gel electrophoresis to visualize results. I gained substantial hands-on experience in molecular biology techniques, data analysis, and troubleshooting experimental protocols. This project underscored the importance of precise experimental design and optimization in obtaining reproducible results and deepened my understanding of epigenetics and microbiology.

Objectives of the project: The main objective of the project was to standardize the MNase assay to study chromatin organisation in M. tuberculosis-infected cells.

Tool used: Using PCR machine, Spectrophotometer (Nanodrop), Gel Doc for visualising gels after electrophoresis, Centrifuge, Advanced microscopy, Use of Bio-Safety level 2 cabinets.

Details of Papers/patents: None

Brief description of the working environment: The working environment at CSIR-IMTECH, Chandigarh, under the guidance of Dr. Sanjeev Khosla, was highly collaborative and research-intensive, focusing on cutting-edge molecular biology techniques. The lab provided a dynamic and supportive atmosphere, encouraging meticulous experimental design and problem-solving. I had access to advanced laboratory equipment and was able to engage in hands-on research, which involved preparing and analyzing biological samples, conducting DNA extraction, and performing gel electrophoresis. The team was knowledgeable and approachable, fostering an environment conducive to learning and professional growth. This experience emphasised the importance of precision, adaptability, and perseverance in scientific research.

Academic courses relevant to the project: Genetics, Molecular Biology, Recombinant DNA technology.

Learning Outcome: MNase-seq assays, Western blotting, PCR, mammalian tissue culture techniques, protein purification and expression from cellular extracts and other fundamental microbial and molecular biological methods.

PS-I station: CSIR-Indian Institute of Petroleum (IIP), Dehradun

Student

Name: NAINA SHARMA (2022A1PS0784P)

Student Write-up:

PS-I Project Title: Hydrogen production through si cycle

Short Summary of work done: Operated various instruments related to Gas chromatography, ion exchange chromatography, distillation, decomposition.

Objectives of the project: To produce hydrogen

Tool used: Gas chromatography, ion exchange chromatography, distillation, decomposition.

Details of Papers/patents: NA

Brief description of the working environment: Very friendly working environment, a lot to learn from peers as well as professors.

Academic courses relevant to the project: Separation Process, Instrumental Mehods of Analysis.

Learning Outcome: Gas chromatography, ion exchange chromatography, distillation, decomposition processes.

Name: SAARTHAK VERMA (2022A1PS1162P)

Student Write-up:

PS-I Project Title: Solvent extraction of DAO

Short Summary of work done: Solvent extraction of DAO

Objectives of the project: Learning separation processes and provide results for production of lubricants.

Tool used: Lab equipments available

Details of Papers/patents: None

Brief description of the working environment: Good and helpful

Academic courses relevant to the project: Chemical Engineering CDC's

Learning Outcome: Separation processes such as Gas chromatography, ion exchange chromatography, distillation and decomposition.

Name: NAYONIKA SREE VIDHYA SEELAMSETTY (2022A1PS1693H)

Student Write-up:

PS-I Project Title: Crude Oil to Chemicals

Short Summary of work done: It began with a comprehensive overview of petroleum refinery operations, highlighting the various stages involved in transforming crude oil into valuable products through literature survey. Then shifts to a comparative analysis of conventional and integrated refineries, examining the benefits and challenges associated with each approach.A significant portion of the project is dedicated to the topic of crude oil to chemicals, focusing on the pretreatment options available to optimize this conversion. Various pretreatment methods are evaluated for their efficiency and impact on the overall refining process. Got experience to operate FCC Unit, learned the specifics of fluid catalytic cracking (FCC), a crucial process in modern refineries. The mechanics, benefits, and recent advancements in FCC technology are thoroughly examined, providing a clear understanding of its role in maximizing output and efficiency in petroleum refineries.

Objectives of the project: Literature survey to maximise the production of chemicals from crude oil.

Tool used: FCC unit, TGA, HPLC, RGC, Google Scholar.

Details of Papers/patents: NA

Brief description of the working environment: Working Environment: Friendly and respectable. Has a good opportunity to learn
Expectation from the company: Punctuality, Consistency with the work
Living Conditions: 3/5, Campus shares it's compound wall with jungle

Academic courses relevant to the project: Separation Process, IMA

Learning Outcome: Got to know about the future of petroleum refinery.

Name: ARNAV PANDEY (2022B1A11362P)

Student Write-up:

PS-I Project Title: Development of Metal-stuffed coke material for Hydrogen Evolution

Short Summary of work done: The research project focused on the development of coke-based materials as advanced catalysts for the hydrogen evolution reaction (HER), a critical process for sustainable hydrogen production through hydropower. Metal-filled coke, a composite material derived from the incorporation of metal nanoparticles into coke, a carbonaceous material known for its electrical conductivity and mechanical stability, has emerged as a promising candidate. The process entailed creating needle coke with the appropriate characteristics, graphitizing it to convert its amorphous carbon structure to crystalline graphite, and then introducing metal nanoparticles into the coke matrix. I was involved in synthesis and characterization of metal-stuffed coke material for hydrogen evolution reactions (HER), utilizing sophisticated techniques like scanning electron microscopy (SEM) and electrochemical analysis using both linear sweep voltammetry (LSV) and cyclic voltammetry (CV).

Objectives of the project: The create an efficient, long-lasting, and cost-effective catalyst that significantly improves the hydrogen and oxygen evolution reaction.

Tool used: Ivium Software, Origin Software

Details of Papers/patents: NA

Brief description of the working environment: Working environment was great, with experienced researchers and staff who were there to guide me with the working, operation and handling of machines and sophisticated equipments. IIP is quite flexible when it comes to exploring beyond the scope of your research as well. I got to explore so much about research in other labs and divisions also. I learned about different reactors, plants and coking units which were part of other divisions and got to see their working and handling.

Academic courses relevant to the project: General Chemistry, Instrumental Methods of Analysis, Technical Report Writing

Learning Outcome: Hands on experience in a research laboratory, analytical and problem-solving skill enhancement, literature review and report writing skill enhancement.

Name: GAIKWAD OMKAR YOGESH (2022B2A11629P)

Student Write-up:

PS-I Project Title: Extraction and identification of mangiferin using spectroscopy methods

Short Summary of work done: I focused on the extraction and identification of mangiferin, a xanthone compound with significant pharmacological properties, from

mango leaves. The project aimed to develop an efficient extraction process and confirm the identity and purity of mangiferin using advanced spectroscopic techniques. The fine powder of mango leaves was subjected to reflux extraction using absolute ethanol. For identification, I employed Nuclear Magnetic Resonance (NMR), Fourier Transform Infrared (FTIR) spectroscopy, and GC-MS, which provided detailed structural and purity information about the extracted mangiferin. Purification was achieved through column chromatography, using silica gel and solvents like methanol, ethyl acetate, and hexane. The purified mangiferin underwent recrystallization to enhance its purity. Additionally, I conducted molecular docking studies using AutoDock Vina to evaluate the binding affinity of mangiferin with different solvents. This project not only improved my practical skills in analytical chemistry and spectroscopy but also deepened my understanding of the extraction and characterization of bioactive compounds.

Objectives of the project: Gaining hands on experience in analytical chemistry

Tool used: Autodock, Materials studio

Details of Papers/patents: Might publish a paper based on molecular docking of solvents on the mangiferin molecule.

Brief description of the working environment: The working environment was very friendly. People are helpful and fun to work with. Workload depends on the mentor alloted. One gets hands on experience of state of the art instruments and facilities.

Academic courses relevant to the project: IMA (CHEM F313)

Learning Outcome: Gained insights into research methodologies.

Name: BHAVIK GUPTA (2022B2A11694P)

Student Write-up:

PS-I Project Title: Development of one dimensional high entropy alloy catalyst for hydrogen evolution reactions

Short Summary of work done: I worked on development of high entropy alloys, did learn about various new things at the internship such as what is SEM and how a electrochemical oxidation workstation looks like and various kinds of data that we can recieve from the workstation such as cyclic voltammetry, linear sweep voltammetry, chronoamperometry, chronopotentiometry and impedance analyzer.

Objectives of the project: Developing a high entropy alloy which would be useful for hydrogen evolution which would be then useful in Prepration of Hydrogen cell which would be useful in making of hydrogen batteries.

Tool used: Electrochemical oxidation worksatation, CVD furance.

Details of Papers/patents: No papers were published

Brief description of the working environment: The work environment was generally positive, but it largely depended on the guide assigned to you. A good guide would not impose excessive workloads. However, my guide was very strict with deadlines and insisted on timely completion of tasks, which occasionally required working late in the lab.

Academic courses relevant to the project: Electrochemical fundamentals it's a del of chemistry.

Learning Outcome: Learnt about Cyclic voltammetry, scanning electron microscopy, linear sweep voltammetry and impedance. Also how to plot tafel and Mott schottkey.

PRACTICE SCHOOL MILESTONES:

- Conceptualization – 1973
- Extended PS option to all disciplines – 1975
- Inception of PS-I - 1976
- COPSIMS (Computer Operated Practice School Instruction Monitoring System) – 1985
- First PS station abroad – 1991
- PS for Higher Degree – 1992
- Double semester PS for Dual Degree students – 1992
- Combined PS-I operation for Pilani and Goa campuses – 2006
- Combined PS-II operation for Pilani and Goa campuses – 2007
- WEPSIMS (Web Enabled Practice School Instruction Monitoring System) – 2008
- Combined PS-I operation for Pilani, Goa and Hyderabad campuses – 2010
- Combined PS-II operation for Pilani, Goa and Hyderabad campuses – 2011
- BITS Pilani started offering scholarship of Rs. 8,000/- per month amounting to Rs. 44,000 (for the entire duration of PS-II) to selected PS-II students with CGPA 7.00 and above at various research organizations to encourage students to opt for CSIR & other Govt. Research labs - 2012
- PSMS (Practice School Management System) – 2014
- Conceptualization of PS Chronicles - 2015
- Digital Content for Skill gap - 2016
- Enhanced scholarship amount for PS-II students (CGPA 7.00 & above) at CSIR & other Research labs - Rs, 12,000 per month amounting to Rs. 66,000 (for the entire duration of PS-II) - 2016
- Introduction of Subject Matter Expert (SME) for PS-I Projects - 2017
- Digital version of PS Diary - 2019
- Successful implementation of PS-I course in remote mode for 2940 + students during summer 2020 with detailed project identification prior to start of the course - 2020
- Establishment of Student Counselling Cell (SCC) – 2023
- Conceptualization of open house much prior to allotment process - 2023
- Initiated Level of Engagement (LoE) survey for PS-I students during the course – 2023
- Pre PS-II Preferences Survey - 2023
- Conceptualized the live support sessions for students opting for PS – 2023
- BITS Pilani is currently offering an enhanced scholarship of Rs. 20,000 per month amounting to Rs. 1,10,000/- (for the entire duration of PS-II) to selected PS-II students with CGPA 6.00 and above at various research organizations - 2023.
- Complete restructuring of PS transcript - 2023
- Conceptualization of data source page for providing the access to information in a single platform for students - 2024
- Implementation of New Practice School Management System with enhanced capabilities for planning & allotment purposes - 2024.
- Conceptualization of Pre Practice School-I survey – 2024