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Master of Science in Chemistry
(Integrated 5-Year Course)
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RESEARCH INTEREST

Design **biomedical devices** for **disease detection** using **Lab-On-Chip** techniques by incorporation of **nano-machines** and **nano-structures**; Development of **nano-manufacturing techniques** to derive solutions for **molecule synthesis** using **biomimetic** approach; **Bioelectronics** and **electrochemistry** for **medical** applications

EDUCATION

Year	Degree/Examination	Institute/Board	CGPA/%
2016-21	5 Year Integrated Mater of Science Chemistry	Indian Institute of Technology, Kharagpur	8.01/10.0
2015-16	Senior Secondary Examination (AISSCE)	CBSE, Kendriya Vidyalaya ONGC Panvel	91.2%
2014-15	Higher Secondary Examination (AISSE)	CBSE, Kendriya Vidyalaya ONGC Panvel	10

PROJECTS/INTERNSHIPS

Masters Term Project, Department of Chemistry, IIT Kharagpur　　　　**Aug 2020 - Present**
Under Prof. C. Retna Raj, Department of Chemistry
- Surveyed techniques for **preparation of material** for improving the electrocatalytic activity for **water splitting**
- Learned about the **synthesis of nano-particles** for enhancing the electrocatalytic activity of an electrolysis

Summer Internship, School of Medical Science and Technology, IIT Kharagpur　　**Apr 2020 - Aug 2020**
Under Prof. Gorachand Dutta, School of Medical Science and Technology, IIT Khargpur
- Learned about disease like **malaria, dengue and viral infection** and their signatures for **disease detection**
- Studied about **biomimetic bilayer lipid membranes** for application in a sensor for disease and toxin detection
- Studied about **solid-state nano-structures** and **microfluidics** for the development of **lab-on-chip** devices

SuperChemistry Self Initiated Project　　　　**Dec 2019 - Present**
- Developing a **software** that aims to the simplify modeling of **hetero biomolecular systems** for **analysis**
- Used **MEAN stack** ($MongoDB$, $ExpressJs$, $Angular$, $NodeJs$), **Electron** and **3Dmol.Js** (molecule visualizer)

Thermo-Electric Harvester for Stoves and Chulha, ProDex, IIT Kharagpur　　**May 2019 - Present**
- Designed **electronic** system to **charge batteries** using Peltier Plates to harvest 25 Watts of power while cooking
- Designed water cooling system for Peltier plates to optimize the consumption of water and maintain efficiency

Improved Cooler: Eco-Friendly Air Conditioner, ProDex, IIT Kharagpur　　**Jan 2019 - Dec 2019**
Extension of the project Evapo-Reefer (See Below)
- Made a design for a cooler that could serve as an AC by changing Evapo-Reefer using the **Maisotsenko Cycle**
- Redesigned dehumidifier and heat-mass exchanger to ensure a **power-efficient recovery of water** and cooling
- Done **statistical thermodynamic calculations** on the data obtained from particle simulation in **blender 2.79**

TaSafe: Foot Wearable Women Safety Device, ProDex, IIT Kharagpur　　**Jul 2018 - Present**
- Did a case study on offense against women and designed a **foot wearable product** that can ensure their safety
- This product electrocutes the assailant and sends alert message with the location of the woman when triggered

Vibronot: Life Without Tremor, ProDex IIT Kharagpur　　　　**Jul 2017 - Dec 2017**
- Did a **case study** on people's sufferance due to shaking of hand from **essential tremor** or **Parkinson's disease**
- Conceptualized a cost-effective glove that helps to reduce tremor on hand with the help of damping mechanism

Evapo-Reefer: Evaporative Cooling in Truck, ProDex IIT Kharagpur　　**Jan 2018 - Jun 2018**
- Studied the problem of food wastage during transportation (18% of total wastage occur during transport)
- Conceptualized a novel environment-friendly truck for vegetables and fruits transportation to reduce this loss
- Used the principle of evaporative cooling to achieve the desired temperatures for storage of fruits and vegetables

FireAxe: Prevention of Stubble Burning, STEP IIT Kharagpur　　　　**Dec 2017**
Mentor: Prof. Pranab Kumar Dan, Assoc. Prof., Rajendra Mishra School of Engineering Entrepreneurship, IIT KGP
- Worked to solve the problem of burning of tonnes of straw post-harvest, resulting in massive CO_2 production
- Designed an addon for combine harvester mainly suited for Indian markets to eradicate resulting air pollution
- Suggested some modifications in the form of this addon that will enable the harvester to cut crops much closer to the ground, avoiding the need to burn and later process the straw, hence enhancing its economic utility

SKILLS

- **Software:** AMBERMD, NWChem, Avogadro, Gaussian, Gromacs, NAMD, Quantum Espresso*, Autodesk Fusion 360, Solidworks, Ansys, FreeFEM*
- **Programming Languages:** C, C++, C#, Python, TypeScript, JavaScript, HTML, CSS
- **Frameworks:** PyTorch*, P5Js, Angular, WebGL, MongoDB, CreateJs, VueJs, ExpressJs
- **Miscellaneous:** Adobe Animate, Blender, Inkscape　　　　　　**'*' Ongoing**

CONFERENCES / COMPETITION / WORKSHOPS

Competition
- $2nd$ for TaSafe, a foot wearable women safety device in **Siemens MakeITReal Hackathon** **(Dec 2019)**
- $1st$ for **Medicure**, an Emergency Bandage that prevents bleeding in wounds, **INAE Youth Conclave** **(Oct 2019)**
- $3rd$ for **Thermo-Electric Harvester for Stoves** in **Rural Technology Hackathon, IIT Kharagpur** **(Dec 2018)**
- $1st$ for **FireAxe**, in **Prod-D, Prakriti, IIT Kharagpur** (Product Designing Competition) **(Mar 2018)**

Conferences and Workshops
- Took Evapo-Reefer in **Clinton Global Initiative Conference at the University of Chicago** ($19^{th} - 21^{st}$, **Oct 2018**)
- Product Engineering and IP Commercialization by **Mr. Kameshwar Eranki (CEO, Vajra Soft)** (5th, **Dec 2017**)
- Product Engineering and Design Idea workshop and won $3rd$ prize in **Design Idea Competition** **(Nov 2016)**

COURSE WORK

Research Interest
- Energy Material
- Solid State Chemistry
- Nanobio Technology Enabled Point-Of-Care
- Biological and Chemical Sensors for Health monitoring and disease diagnosis
- Computational Structural Biology
- Structures and Function of Biomolecules
- Introduction to Quantum Chemistry and Spectroscopy
- Computation Chemistry
- Group Theory for Chemist
- Numerical Solution of ordinary and partial differential equation

Electronics
- Analog Circuit Analysis and Design
- Digital Circuit Analysis and Design
- Network Theory
- Audio Systems Engineering

Other Courses
- Molecular Spectroscopy and Molecular Structure
- Molecular Thermodynamics and Kinetics
- Light-Induced Phenomena in Material
- Strategies and methods in organic synthesis
- Instructional System Design
- Programming and Data Structures
- Product Development

LABORATORY WORK

- **Biophysical Methods :** DNA extraction from sample; Pigment extraction and analysis; Enzymatic assay of protein; Isolation of protein; Electrophoresis; Study of enzyme kinetics; Ion exchange chromatography
- **Computational Chemistry :** Developed molecular dynamics simulation code with python3.6 and using standard data processing libraries; Did molecule optimization and quantum mechanical simulation in Gaussian
- **Analog Circuits:** Learned about characterization of circuits; Developed class A and class B amplifier; Developed phase shift, Colpitt or Hartley Oscillator
- **Digital Circuits:** Made Counters, Arithmetic, Code Converter circuits using gates and registers
- **Advanced Inorganic:** Made organometallic compound crystals and did their analysis using X-Ray Diffraction

SCHOLASTIC ACHIEVEMENTS

Kendriya Vidyalaya (KV), ONGC, Panvel, Mumbai , India
- Participated in the **National Children's Science Congress** about the topic, **Energy: Explore Harness and Conserve** in the year 2012 and 2013 and the topic, **Understanding Weather and Climate change** in 2014
- Bagged the $1st$ position in a **"Cooking Without Fire"** competition in 11th grade of school in the year 2014-15
- Took part in **Mathematics Exhibition**, KV National Science, Mathematics and Environment Exhibition, 2014
- Secured 2nd position in **Regional Level National Financial Assessment**,Navi Mumbai, India in the year 2013
- Participated in **Quiz** for **Kendriya Vidyalaya Regional Level Social Science Exhibition** in the year of 2013
- Secured 1st and 3rd in **Math Quiz and Math Seminar** conducted in the **National Year of Math** in 2012-13
- Took part in **Science Exhibition** demonstrated generation of **electricity from bicycle (2012)**, **automatic switching of street lights (2011)**. Showed methods to detect food adulteration on National Science Day (2013)

POSITION OF RESPONSIBILITIES

Student Member of Indian National Academy of Engineering(INAE) **2019 - 24**
- INAE functions as an apex body that promotes the practice of science and engineering to solve the problem of national importance. INAE Student Member can actively take part in forming of schemes and provide feedback

ProDex: Product Designing Society, IIT Kharagpur **Jul 2016 - Aug 2019**
- **Governor:** Set up a **Product Design Lab**, introduced **AI-assisted product design** and **grants for the society**
- **Sub-Head:** Mentored junior members in developing their skills in Basic Electronics, organized a **workshop** on **Autodesk Fusion 360** and **Inkscape** and taught web development technologies like HTML, CSS, JavaScript
- **Senior Member:** Mentored freshers for Open IIT Product Design, IITKGP and **specialized in CAD modeling**
- **Associate Member:** Participated in the **Open IIT Product Design**, to build the **foundation of product design**

EXTRA CURRICULAR ACTIVITIES

Dramatist, Encore: English Dramatics Society, IIT Kharagpur **2016 - 17**
- Participated in a **Mime** (a silent play) as an actor in Freshers Production of Encore in front of 200 plus audience
- Participated in **Nukkad**, an drama performed on streets to create social awareness at Spring Fest (Jan 2017)
- **Mentored** new incoming freshmen at Encore for their Freshers Production that was held in the October, 2017

Illumination, Azad Hall of Residence, IIT Kharagpur **2016 - 17**
- Participated in making of a themed **Illumination**, and a **12ft x 8ft Rangoli**, in 2016 and 2017 respectively