SAPTASHWA BHATTACHARJEE

3rd Year Undergraduate
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Indian Institute of Technology, Kharagpur

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Education

Year	Degree/Certificate	Institute	CPI/%
2021 - Present	B.Tech	Indian Institute of Technology, Kharagpur	9.49/10
2021	AISSCE(XII)	B.D.M.International, Kolkata	97.4%
2019	AISCE(X)	B.D.M.International, Kolkata	97%

Key Projects

Novel Cross Coupled Quadrature VCO for ISRO SERDES Module
Guide: Prof. Mrigank Sharad, Indian Institute of Technology, Kharagpur (*May 2022 - Present*)

- Implemented various schemes to obtain an oscillation frequency range of **500MHz to 1.5GHz** for a range of control voltage from **0 to 1.8V** in **180nm CMOS** technology.
- Parameters such as **jitter** and **phase noise** across all the corners were noted during simulation at various temperatures.
- Ensured **radiation hardening** by splitting each stage into 20 layers to tackle Single Effect Transient and Upset.
- Designed the entire layout of the VCO and checked **DRC** and **LVS** in Cadence Virtuoso Layout Suite.
- Carried out **post-layout simulation** after parasitic extraction and observed the degradation in performance.
- **Input and Ouput Pads** were then integrated with the core layout to make the design ready for fabrication.

Design of 7 bit Frequency Counter type ADC
Guide: Prof. Mrigank Sharad, Indian Institute of Technology, Kharagpur (*Dec 2022 - April 2022*)

- Designed a two stage **OP-AMP** with an open loop gain of **10,000** and a closed loop gain of **100** with capacitive feedback.
- Connected the OP-AMP output to **Voltage to Current Converter** which was then fed into a Current Controlled Oscillator.
- **Current starved oscillator** was implemented. Linear plot of frequency vs current was achieved up to **135 MHz**.
- **Comparator** was coupled to obtain rectangular waveform with full swing from **0 to 1.8V**.
- **7 bit Counter** was used to count the number of pulse occurrence in a specific time period, obtaining digital output depending on the frequency, which in turn depends upon the voltage of the input.
- Entire design was done using **180nm** technology MOSFET Predictive Technology Model**(PTM)**.

The 2023 International Conference on Unmanned Aircraft Systems (*Feb 2023 - April 2023*)

- Performed successful inspection of a factory and detect defects in the infrastructure.
- Navigated the unknown area safely as a part of the Exploration subroutine. Simulation was done in **ROS- Gazebo** environment. It involved **SLAM, Visual Odometry.**
- **Perception:** Detect and classified defects. Data set was provided by the organizers.
- **Pose Estimation:** The ability of the UAV to estimate its pose in a **GNSS denied environment** using onboard sensor data.
- The estimated pose was then compared with very accurate motion tracking system from **CATEC indoor test bed.**

Technical Skills

Programming Languages: C, Python, Verilog, HTML, CSS, JavaScript, AVR C

Softwares: Cadence Virtuoso, Cadence Layout Suite, Ansys HFSS, Tina TI, LT Spice, MATLAB, Simulink, Proteus, Atmel Studio

Coursework Information

Semiconductor Devices*	Network Theory*
Analog Electronic Circuits*	Digital Electronic Circuits*
Electromagnetic Engineering	RF and Microwave Engineering*#
Signals and Systems	Digital Signal Processing*#
Analog Communication*#	Introduction to Wireless Communication#
Systems and Control	Algorithms#
Probability and Statistics	Linear Algebra and Optimization
Advanced Calculus	Linear Algebra, Numerical and Complex Analysis

Courses marked with * also have a lab component.

Courses marked with # are ongoing and will be completed by 3rd week of November 2023.

Awards and Achievements

- Secured an **All India Rank of 1081** in **JEE Advanced 2021** and was among the **top 0.627%** of the **142k** applicants.
- Secured an **All India Rank of 890** in **JEE Mains 2021** and was among the **top 0.09%** out of **1.3 million** applicants.
- Secured an **All India Rank of 624** in **KVPY SX 2020** conducted by Indian Institute of Science(IISc) among **150k+** candidates.
- Secured an **All India Rank of 8** in West Bengal Join Entrance Examination **(WBJEE) 2021** among **65170** candidates.
- Recipient of **Jagadis Bose National Science Talent Search Senior Scholarship 2021**.
- Qualified **Pre-Regional Mathematics Olympiad 2018** among 10k+ students organized by Homi Bhabha Centre for Science Education.

Campus Activities

Mechatronics Team Member, Swarm Robotics, Indian Institute of Technology, Kharagpur (*Aug 2022 - Present*)

- Assisted by seniors in learning Robot Operating System**(ROS)**, Arduino, control schemes like **Optimal Control**, PID Control.
- Participation as a team in the International Conference on Unmanned Aircraft Systems 2023.

First Year Trainee, TeamKART, Indian Institute of Technology, Kharagpur (*Jan 2022 - Aug 2022*)

- Learnt about different aspects of cars like types of suspension, slip angles, caster, camber, toe, KPI, electronic sensors like butterfly sensor, throttle position sensor, crankshaft position sensor etc.
- Performed in-depth analysis of Battery Management System **(BMS)**, its components, topology etc.
- Prepared Failure Mode and Effect Analysis **(FMEA)** of the team's future project: Electric Vehicle.

Web Team Member, Entrepreneurship Cell, Indian Institute of Technology, Kharagpur (*Jan 2022 - May 2022*)

- Developed websites for various events of the cell using HTML, CSS and introductory level of JavaScript.
- Coordinated with the team in organizing the Global Entrepreneurship Summit 2022, flagship event of the Entrepreneurship Cell.
- Took part in the case study of an early stage startup in the food and beverage industry where parameters such as Total addressable market, ROI, PAT, GC, Net Profit and CM2 was analysed.
- The sole purpose is to inspire and support startups emerging from our institute.

Positions of Responsibility

Secretary, E&ECE Department Society (*Oct 28;22 - Present*)

- Coordinated in conducting the Farewell Ceremony of the Batch of 2023 of the Department of E&ECE.
- Hosted Alumni of our department during the Annual Alumni Meet 2023.
- Assisted with initiating a blog series, **Corepedia**, which aims to guide students through core internship preparation.
- Acted as the first point of contact for department students about queries related to department and efficiently resolved them.

Extra-Curricular Activities

- Member of **National Sport Organization**, introduced by the Government of India to promote the development of athletics and sporting activities among the nation's youth.
- Part of four member **Mathematics Olympiad** team of Radhakrishnan Hall of Residence in **General Championship** at Indian Institute of Technology Kharagpur.
- Active participation in **Table Tennis** in Radhakrishnan Hall of Residence at Indian Institute of Technology Kharagpur.
- Part of the silver winning team in **Rangoli**(an event where powdered lime stone, dry rice flour, coloured sand, quartz powder and flower petals are used to create patterns on the floor) at Radhakrishnan Hall of Residence.